The development and evaluation of a learning styles assessment tool for the South African higher education context

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DEDICATION

To the memory of my late parents, my father, Milton Mkonto, and my mother, Nonzwakazi Mkonto; no one can fill the void you left in my heart and soul. This study has helped to ease the unbearable pain of losing you, and has given me the strength to persevere. I miss you Mama noTata.

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KEY WORDS

Learning styles

Learning styles assessment models

Learning styles assessment instruments

Higher education

South African higher education context

Learning theories

Adult learner

Adult learning theories

Teaching styles

Mixed method approach

ABSTRACT

The Development and Evaluation of a Learning Styles Assessment Tool for the South African Higher Education Context

This study was aimed at developing and evaluating a learning style assessment tool relevant for the South African higher education context. The introduction of an effective tool for the assessment of learning styles could assist students both in understanding how they learn and in enhancing their role in the learning process; it could also assist lecturers in providing more effective learning opportunities.

A literature study focusing on teaching and learning in higher education in South Africa was conducted. Theories relevant to adult learning were also examined. These included behaviourist, cognitive, humanistic and social learning theories which were found to be relevant for the adult learner. The learning styles, which form the foundation for this study, were explored. Nine learning style theories and instruments were examined for possible adaptation in the South African higher education context. These were: Kolb Learning Style Index, Dunn and Dunn Learning Style Index, Honey and Mumford Learning Style Questionnaire, Felder and Silverman Index of Learning Style, Gregorc Style Delineator, Myers-Briggs Type Indicator, Grasha Reichmann Student Learning Styles Scales, Vermunt Inventory of Learning Styles, and the Centre for Innovative Teaching Experiences. From the nine learning style instruments, the Centre for Innovative Teaching Experiences instrument was selected for adaptation for the South African higher education sector.

A mixed methods approach, which used both qualitative and quantitative methods, was employed in this study. Participants were selected using a non-probability, convenience sampling approach. The sample consisted of eight initial key informants from the four institutions of higher education in the Western Cape, South Africa (who recommended the criteria for the development of a tool for the South African higher education context). The tool was then piloted with 20 participants including: the supervisor, eight initial key informants, six students from the six faculties in an institution of higher education, a linguist and a statistician. The tool was further piloted with 130 students from six faculties in the same institution. At the conclusion of the study, a further 11 key informants, consisting of two psychologists, two staff development practitioners, two student development practitioners and five subject lecturers, evaluated the tool for its usefulness in higher education. Different data collection methods, including interviews, questionnaires and focus group discussions, were used in the study. The data from the interviews was analyzed in order to identify the criteria for a learning styles assessment tool relevant for the South African higher education context. Thematic analysis was used to analyze the data from the focus group discussions. Data from the evaluation of the tool by the students was analyzed statistically. Data from the evaluation of the tool by the key informants was analyzed qualitatively.

The theoretical study revealed that learning styles are personal and different; involve interacting with new and difficult information, and reflecting varying attitudes towards learning and the learning environment. The findings from the interviews conducted with the initial key informants highlighted the following criteria for developing a learning assessment tool relevant to the South

African higher education context: creation of awareness about learning styles, support for teaching and learning, allowance for interrogation of learning, and the encouragement of discussion and dialogue. Other practical criteria relating to the instrument itself included availability, accessibility, user-friendliness, and simplicity of language.

The implementation and evaluation of the learning styles tool developed in this study revealed that such a tool is suitable for use in higher education contexts, both for students and lecturers. Students, lecturers and the key informants emphasized the importance of knowing the learning styles by both students and lecturers. The students revealed that the learning styles assessment tool not only gave them an understanding of their learning styles but also gave them a variety of learning styles to choose from. The key informants revealed that the tool could inform teaching and learning and assist the lecturers in understanding the learning process. The students, the lecturers and the key informants found the language used in the tool clear and simple to be understood by first-year students. They therefore recommended the tool for use by all first-year students in South African universities.

This study offered the following recommendations:

1. The learning styles assessment tool developed for this study could be used to promote more effective teaching and learning in a higher education context.

2. Students should be encouraged to reflect on and question their learning practices.

3. Lecturers should assist students in understanding their role in the learning process and students be made aware of their learning styles through the use of a learning styles assessment tool.

4. Lecturers could use students' learning differences and strengths as a basis for preparing their lectures.

5. Lecturers should also encourage students to use their non-dominant learning styles by varying their teaching strategies.

6. To facilitate language accessibility, the tool could be translated into all official languages of South Africa.

7. The learning styles assessment tool developed for this study could be amended so that it can suit a particular field of study or course.

DECLARATION

I declare that *The development and evaluation of a learning styles assessment tool for the South African higher education context* is my own work and that all the sources that I have used or quoted have been acknowledged by complete references.

Name: Patricia Nosisana Mkonto

Date:……

Signed: ……..

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LIST OF TABLES PAGE

LIST OF ABBREVIATIONS

AC	Abstract Conceptualization
AE	Active Experimentation
AR	Abstract Random
AS	Abstract Sequential
CPUT	Cape Peninsula University of Technology
CE	Concrete Experience
C.I.T.E	Centre for Innovative Teaching Experiences
CR	Concrete Random
CS	Concrete Sequential
DRC	Democratic Republic of Congo
E	Extrovert
F	Feeler
GRLSS	Grasha Reichmann Student Learning Styles Scale
GSD	Gregorc Style Delineator
HEI	Higher Education Institutions
HSRC	Human Sciences Research Council
I	Introvert
ILS	Index of Learning Style
IN	Intuitor
LSI	Learning Style Indicator
LSQ	Learning Style Questionnaire
MBTI	Myers-Briggs Type Indicator
NPHE	National Plan for Higher Education
NQF	National Qualifications Framework
RO	Reflective Observation
S	Sensor

SAQA	South African Qualifications Authority
T	Thinker
VILS	Vermunt Inventory of Learning Styles
ZPD	Zone of Proximal Development

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Students learn in different ways. These differences are often expressed in particular learning styles. Students need to be made aware of their own styles, so that they will be able to take a greater responsibility for their learning (Genovese, 2004). Learning styles can be assessed and applied to the educational environment in such a way as to prepare individuals as independent learners and thinkers (Van Rensburg, 2002). In order to achieve this, students require innovative and creative teaching and learning experiences.

Higher education institutions prepare students for particular careers. It is important that the students are developed and supported to order to obtain the academic skills necessary to reach their goals. Lecturers play an important role in assisting students to attain these goals.

1.2 BACKGROUND TO THE RESEARCH

Higher Education Institutions (HEIs) in South Africa are facing challenges with regard to transformation. According to the White Paper 3 (Department of Education, 1997), the transformation of higher education has to redress past inequalities, serve a new transformation order, meet pressing needs, and respond to new realities and opportunities. To achieve this, “the institutions of higher education have to develop creative ways of learning, teaching, and including modes of delivery to accommodate a larger and more diverse population” (Department of Education, 1997: Section 2:2 unpaginated).

The National Plan for Higher Education (Department of Education, 2001) articulates the broad goals for the transformation of HEIs with regard to student access; in particular it refers to student support as a way of combating the increase in the dropout rate. Student profiles at universities have become more diverse since the entry requirements have been altered to open access to a wider range of students (Fraser & Killen, 2003).

Students with diverse socio-cultural backgrounds, personal characteristics and academic interests now enrol at institutions of higher education in South Africa. However, some of those who matriculated from secondary schools are inadequately prepared for the demands of higher education; as a result they drop out in the first year of study (Hay & Marais, 2004; Loots, 2009). Meeting the needs of tthese students can offer an opportunity for lecturers, but can also pose a challenge, especially when the lecturers themselves are ill-equipped to deal with such learners (Gauss, 2002).

Research conducted by the Human Sciences Research Council (HSRC) confirmed a dropout of 40 percent of first-year students at universities in South Africa (Bitzer, 2009). This has negative implications for the retention, progress and success of students in higher education institutions. With these challenges facing such institutions, there is a need for a paradigm shift in their approach both to teaching and to learning. Higher education institutions should aim to empower students to play an active role in their own learning. For this to happen, the students must know

how to learn, so that they can become more independent as learners. In order to promote this, knowledge of students' own learning styles is necessary.

Recognition and acknowledgement of students' diverse learning styles could prove invaluable in developing them as independent learners. This is particularly relevant for first-year students. However, little research has been done to demonstrate the worth of knowing, acknowledging and recognizing different learning styles in higher education (Van Rensburg, 2002). Institutions of higher education do recognize the usefulness of assessing students' learning styles, but fall short in the implementation of the results because of a lack of quality research (Van Rensburg, 2002). There is a therefore a need for research on learning styles in higher education; this study was designed as a contribution to that research.

Raising lecturers' awareness regarding the diverse learning styles of their students would enable them to adapt their teaching styles. Knowledge of the students' learning styles could be used in the lecturers' curriculum planning. With graduation and retention being growing concerns in an increasing number of universities in South Africa, active learning is attracting an increased attention (Fritz, 2002). Identifying students' learning styles could support lecturers' efforts to establish appropriate teaching strategies. This in turn could lead to students being more successful, which would positively impact retention and graduation rates.

Assessing of learning styles could provide the students with an opportunity to be reflective and to interrogate how they learn. By so doing the students could identify their strong points and limitations in learning.

1.3 AIM OF THE STUDY

The aim of this study was to develop and evaluate a learning styles assessment tool relevant to the higher education context.

The objectives of this study were to:

- Examine existing learning styles theories, models and instruments;
- Identify criteria for the development of a relevant learning style assessment tool for the South African higher education context;
- Develop, implement and evaluate a learning style assessment tool in one higher education institution in the Western Cape in South Africa.

This study was guided by the following questions:

- What does the literature say about learning styles theories, models and instruments?
- What criteria could be used to develop a learning styles assessment tool relevant to the South African higher education context?
- How useful is the tool developed in this study in promoting more effective teaching and learning in a higher education context?

1.4 SIGNIFICANCE OF THE RESEARCH

The importance of this study is that it raises awareness in students and lecturers in higher education about students' learning styles. Such awareness could lead to improvement in both teaching and learning. By understanding their own learning styles, students could become self-directed, and therefore more self-actualized. At the same time, lecturers could more effectively facilitate the learning process.

The development of an effective assessment of learning styles could assist students in using their learning strengths to maximize their learning, and eventually to succeed in higher education. They would also be encouraged to discover different ways of learning, ones which could benefit them as lifelong learners. Assessment of students' learning styles often highlights the emergence of dominant learning styles, but they also need to develop less dominant learning styles, so that they can maximize their responses to diverse learning situations. If the learning styles of first-year students were assessed when they registered for a course, they could be encouraged to utilize their dominant learning preferences effectively, while also developing the less dominant learning styles.

In addition to a practical contribution to teaching in the higher education context in South Africa, this study contributes to theoretical knowledge, particularly of learning styles as a concept and approach within learning theories.

1.5 THEORETICAL FRAMEWORK

The theoretical framework of this study is located within the different learning theories, in the context of higher education and therefore of the adult education framework. The focus of this research is on learning styles. Students have different learning styles, and an awareness of these various styles can contribute to effective teaching and learning.

Learning styles are generally assessed by using learning styles inventories. Each of the types of learning styles inventories analyzes different characteristics and how they impact on a student's learning. Inventories which focus on instructional and environmental preferences identify characteristics such as light, temperature, and motivation (Dunn and Dunn Learning Style Model); the brain dominance model identifies right and left brain preferences (Gregorc Style Delineator); the social interaction model identifies students' relationships with teachers, peers and classroom procedures (Grasha Reichmann Learning Styles Scale); the information processing models analyze how information is obtained and stored (Kolb Index of Learning Style); the perceptual model identifies the use of senses such as auditory, visual and kinesthetic (Centre for Innovative Teaching Experiences); and the personality model describes the level at which personality traits affects a person's orientation to the world (Myers-Briggs Type Indicator).

These inventories are potentially useful tools which can contribute to understanding the role of individual differences in the learning process. Students need to analyze how they learn, applying this knowledge to taking an active role in their own learning and to becoming more independent in their studies. This would then promote teaching improvements and more effective learning.

1.6 RESEARCH DESIGN AND METHODS

A mixed method approach, consisting of qualitative and quantitative research methods, was employed in this study. Data were first collected through a literature review; this included exploring and analysing the literature on learning styles theories, and identifying and accessing learning styles instruments.

Semi-structured interviews were then conducted with key informants in the four higher education institutions in the Western Cape, to determine the feasibility of developing a learning styles assessment tool relevant to the South African higher education context. From these interviews, criteria were established for developing an appropriate learning styles assessment tool. A specific learning styles assessment tool was then constructed through an adaptation of the original instrument.

Identification and measurement of learning styles generally relies on self-reporting questionnaires, in which the students choose the learning style they prefer (Babich, Burdine, Allbright & Randol, 1975). This study included a section where students, in their own voices, reflected on their past and present learning experiences.

The tool developed for the study was piloted first with 20 participants that included the eight initial key informants, six students, three lecturers, the supervisor, a statistician and a linguist. It was then piloted with the participation of 130 students in six faculties in one higher education institution.

The students completed a learning styles assessment questionnaire, in which their dominant learning styles were identified. The tool developed for this study was then evaluated by students, lecturers, academic development staff and psychologists. Two evaluation questionnaires were developed, one for the students and one for the lecturers and the key informants. Responses from these questionnaires were analysed and recommendations for an appropriate tool were made.

Babbie and Mouton (2001) emphasize the importance of ethical considerations in research. The procedures for all ethical practices were followed in this study. Respect for confidentiality, anonymity and transparency was therefore maintained. The aims and purposes of this study were explained to the participants, all of whom signed the research agreement forms before contributing to this study.

1.7 OUTLINE OF THE THESIS

The study is structured as follows:

- Chapter One: Introduction and background

Chapter one provides the synopsis of this study. It gives the reader a summary of what is contained in the different chapters.

It includes an overview of the background of the study, its aims, its significance, and the theoretical framework underpinning it, as well as the research methods and design employed.

- Chapter Two: Learning in higher education

This chapter explores learning in the higher education context. The general background to South African higher education is discussed, and reference is made to the Higher Education Act (Act 101 of 1997), White Paper 3 (Department of Education, 1997), and the National Plan for Higher Education (Department of Education, 2001).

Learning theories applicable to the adult learner in higher education are also explored. These include adult learning theory, behaviourist learning theory, cognitive learning theory, and social learning theory.

- Chapter Three: Learning styles

This chapter identifies nine existing learning styles instruments; these were accessed and examined for their potential use in the higher education context:

- Kolb Learning Style Inventory
- Honey and Mumford Learning Styles Questionnaire
- Gregorc Style Delineator
- Felder and Silverman Index of Learning Styles
- Myers-Briggs Type Indicator
- Dunn and Dunn Learning Style Model
- Vermunt Inventory of Learning Styles
- Grasha Reichmann Student Learning Styles Scale
- Centre for Innovative Teaching Experiences

This study is concerned with learning styles, but there was also a need to explore teaching styles, since learning styles interact with teaching styles. Grasha's teaching styles, Pratt's teaching styles, and Henson and Borthwick's teaching styles are explored for their relevance to learning styles in the higher education sector. The matching of teaching and learning styles for more effective teaching and learning in higher education is dealt with in this chapter. The strengths and weaknesses of the different learning styles and their relevance in the South African higher education context are also explored.

- Chapter Four: Research design and methodology

This chapter is concerned with the research design and methodology employed in this study. A mixed method approach, including both qualitative and quantitative methods, was used. Data were collected through interviews, questionnaires and focus group discussions.

- Chapter Five: Criteria for a learning styles assessment instrument

The overall aim of this study was to develop an appropriate learning styles assessment tool for South African higher education. In order to achieve this, criteria for an appropriate learning styles assessment needed to be determined. Interviews with eight initial key informants from the four institutions of higher education in the Western Cape Province were therefore carried out. These informants gave recommendations as to the kind of instrument which would be relevant for the South African higher education context. The chapter thus explores the criteria for a learning styles assessment tool as determined by these initial key informants.

- Chapter Six: Piloting the learning styles assessment tool

The learning styles assessment tool developed for this study was first piloted with 20 participants including; six students, eight initial key informants, three lecturers, a statistician, a linguist and the supervisor. It was then piloted with the participation of 130 students drawn from six faculties, in one higher education institution in South Africa. This chapter presents students' scores and learning styles from the questionnaire, and outlines the findings from the writing exercise.

- Chapter Seven: Evaluation of the learning styles assessment tool

The tool developed for this study was evaluated by students, lecturers, psychologists and academic development practitioners. It was evaluated so as to identify loopholes and inconsistencies, and to assess its suitability in the higher education context. This chapter presents the evaluation feedback from the participants mentioned above.

- Chapter Eight: Discussion

This chapter discusses the findings from this study, linking these to the relevant research questions. The discussion is framed by the research questions guiding this study:

- What does the literature say about learning styles theories, models and instruments?
- What criteria can be used to develop a learning styles assessment tool that is relevant to the South African higher education context?
- How useful is the tool developed in this study in the context of promoting more effective teaching and learning in the higher education context?

- Chapter Nine: Summary, findings, conclusions, limitations, recommendations

This chapter summarizes the findings of this study, highlights key issues and conclusions, and offers recommendations for further research. The limitations of this study are also highlighted.

1.8 CONCLUSION

This chapter provides an outline of this study, highlighting what it aimed to achieve, and what this study entailed. The introduction and background to this study are presented. The significance of the study, its theoretical framework, and the research methods and design used, are also presented.

The following chapter concentrates on the literature on learning in higher education, including sources concerned with understanding the teaching and learning of the adult learner in the South African higher education context.

CHAPTER TWO

LEARNING IN HIGHER EDUCATION CONTEXTS

2.1 INTRODUCTION

South African higher education institutions are faced with challenges of poor academic performance and high dropout rates (Hay & Marais, 2004). This has a negative effect on student persistence and success and on the throughput rate in higher education. Higher education institutions are under pressure to improve their throughput rate (Fraser & Killen, 2003; Hay & Marais, 2004). In order to meet this challenge, these institutions need to prioritise teaching and learning.

The overall aim of this study is the development and evaluation of a learning styles assessment tool suitable for the higher education context. The literature review for the research focused on learning styles theories and instruments, adult learning, and the South African higher education context. A computer search was conducted in order to access relevant literature in these areas of focus. The aim of the literature review was to ascertain how other people view the concepts and issues relevant to this research, and to identify and analyse other studies which have been conducted in this area of study.

This chapter examines learning in higher education contexts. The South African higher education context is discussed, and reference is made to relevant policies, such as the White Paper 3

(Department of Education, 1997), the National Plan for Higher Education (2001), and the Higher Education Act (101 of 1997), which govern higher education in South Africa. Teaching and learning in higher education are briefly discussed, since learning styles are manifested in the teaching and learning situation. Learning theories are pursued, but not in detail. The theories explored were those particularly relevant for adult learners, and include behaviourist learning theory, cognitive learning theory, social learning theory, and humanistic learning theory.

2.2 SOUTH AFRICAN HIGHER EDUCATION CONTEXT

The South African Higher Education context has changed in many ways. The entry requirements for students in institutions of higher education are changing. At the same time, the student population has become more diverse; in age, socio-economic status and cultural background (Biggs, 2003; Fraser & Killen, 2003). Above all, matriculants entering higher education are struggling to cope with the demands placed upon them; this suggests that they are not adequately prepared for learning at this level (Hay & Marais, 2004).

This situation of underprepared students is not unique to South Africa (Fischer, 2007; Vawda, 2005; Wooseley, 2003). Research has indicated that countries such as America, England and Australia are also grappling with the issues of improving students' retention and participation in higher education (Fischer, 2007; Loots, 2009; McKenzie & Schweitzer, 2001; Wooseley, 2003). Higher education institutions therefore need to devise ways to minimize the negative factors by supporting students so they will be able to thrive in higher education. This includes a learner-centred approach (Vawda, 2005).

Such an approach sees students as active participants in constructing knowledge, rather than simply taking knowledge in passively. A learner-centred approach also sees a shift in the way knowledge is imparted; the role of the lecturer then becomes that of a facilitator and guide (Machemer & Crawford, 2007; Vawda, 2005).

Students entering institutions of higher education come from diverse cultural and social contexts, making them potentially different in terms of "life experiences, expectations, needs and academic potentials" (Fraser & Killen, 2003, p. 254). Educators therefore need be concerned with responding to the students' needs and strengths (Smith, 2002). Institutions of higher learning should provide resources to deal with the learning needs of their students, with the aim of affording them opportunities to enter, persist and succeed in higher education. One way of addressing this is to "generate new curricula and flexible models of learning and teaching, including modes of delivery, to accommodate a larger and more diverse population" (Department of Education, 1997, 1.13 unpaginated). Another way of addressing this problem would be to empower learners by developing their strengths so that they can take ownership for their own learning (Vawda, 2005). In order to do this, the students need to know their own learning styles (Van Rensburg, 2002).

South African higher education includes all the learning programmes leading to qualifications higher than Grade 12, or its equivalent, in terms of the National Qualifications Framework (NQF), as stipulated in the South African Qualifications Authority Act (SAQA), 1995 (Act No. 58 of 1995).

Higher education consists of NQF levels 5-8. Institutions of higher education in South Africa are regulated by the Higher Education Act (Act 101 of 1997), which among other things calls for:

- Formation of a single coordinated higher education system, one which provides programme-based higher education;
- Transformation and restructuring of learning programmes to meet the needs of South Africa;
- Creation of learning prospects and knowledge;
- Encouraging the values which promote human dignity, equality and freedom;
- Respect for the individual's freedom (of religion, opinion, speech, knowledge, and scholarship);
- Promotion of the realization of the potential of every student, regardless of their background, religion or creed; and
- Response to the needs of the country and of the communities, and a contribution to the creation of all forms of knowledge and scholarship in line with international standards.

In response to changes taking place in the institutions of higher education in South Africa, the Education White Paper 3 (Department of Education, 1997, p. 1) called for such institutions to help "redress past inequalities, to serve a new social order, to meet pressing needs, and to respond to new realities and opportunities". Social redress, among other things, includes the provision of resources to higher education institutions to deal with the learning needs of under-prepared students.

The aim is to afford such students opportunities to access and succeed in higher education programmes (Department of Education, 1997). This could be achieved if the students were able to interrogate how they learn, so that they can know and understand how best they can learn further (Felder & Spurlin, 2005).

The policy goals of the White Paper are put into practice by the National Plan for Higher Education (NPHE) (Department of Education, 2001). The NPHE (2001) acknowledges the strengths and weaknesses of the higher education system, and sets out to guide institutions towards meeting its stated goals. With regard to meeting such goals, the National Plan for Higher Education provides a framework for ensuring the fitness of higher education institutions, so that the practitioners in such institutions can meet the challenges which face South Africa in the 21st century (Department of Education, 2001). One of the objectives of the plan is to fast-track redress by opening access to all those who wish to realize their potential in higher education (Department of Education, 2001). It recognizes the changing demographics of the student body, which means that mature students, students from diverse educational, linguistic and cultural backgrounds have access to higher education (Department of Education, 2001). This poses a challenge for teaching and learning, since some of these students are not adequately prepared for higher education learning. In order for effective teaching and learning to take place, lecturers should have knowledge of the experiences and backgrounds of these students (Gauss, 2002). The lecturers need to realize their responsibility in teaching students from diverse educational backgrounds, and this includes the recognition of their learning differences.

The more the lecturers understand the different attitudes and responses of their students; the better will be the chances of meeting the students' diverse learning needs (Vawda, 2005). Furthermore, being able to gauge how students learn could present lecturers with valuable information; this in turn could be used to promote effective teaching. This implies an acceptance of the assessment and utilization of learning styles in higher education, in order to prepare students to become independent learners. Higher education should provide students with opportunities to experiment with a variety of learning styles in order to arm them with different methods for approaching the learning material. Creating awareness about learning styles could result in the use of innovative teaching and learning strategies in higher education.

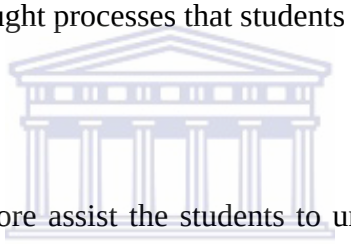
2.3 TEACHING AND LEARNING IN HIGHER EDUCATION

Biggs (2003) contends that teaching in higher education need to support students to achieve higher levels of thinking. This implies that in higher education students cannot acquire higher levels of thinking unless they learn effectively (Biggs, 2003). Effective learning includes students understanding their own individual learning styles, and knowing how best they can use these learning styles (Biggs, 1987).

According to Biggs (2003) theories of teaching and learning are based on the phenomenographic and constructivist theories. The phenomenographic theory is based on the idea that students define what is learnt not what the teacher set to be learnt. The only thing that teaching can do is to change how the student sees the world. The constructivism theory is based on the idea that the student creates knowledge. Both theories emphasize that students create knowledge (Biggs, 2003).

How knowledge is constructed depends on the students' intentions, prior knowledge and how they use the prior knowledge to create knowledge. This is relevant is for adult learning which is intentional and allow the adult learner to utilize prior knowledge in order to understand new information.

Biggs (2003) discussed the relationship between teaching and learning in higher education, arguing that teaching is defined by the quality of learning it promotes. The most important tasks of teaching in higher education include not only transmitting knowledge but also initiating, coaching, supporting and encouraging the thought processes that students use to learn (Vermunt, 1996).



The teaching process should therefore assist the students to understand and make sense of what they are learning and encourage them to search for meaning (Biggs, 2003). Students in higher education enter the learning situation voluntarily, they therefore need to understand and make sense of what they are learning. The aim of higher education is to educate students to reflect, make decisions, and persist independently with their learning (Van Rensburg, 2002).

Donald, Lazarus and Lolwana (2010), Machemer & Crawford (2007) drawing upon learning theorists such as Vygotsky and Piaget, identify seven principles which play an important role in teaching and learning. These principles are discussed below, and are linked to higher education where appropriate.

1. Process as well as content

Students need not only to learn facts and information but also to derive meaning from what they are learning. In order to achieve this, the lecturer should motivate and assist them in acquiring individual learning strategies. In higher education, these strategies include creating learning spaces which promote growth and development for the student (Kolb & Kolb, 2005).

2. Active learning

Teaching and learning should aim at enabling students to become self-directed learners who can take an active role in their own learning. The lecturer should act as a facilitator and a guide in the teaching and learning process, and should provide students with opportunities to become actively involved in the teaching and learning process.

3. Connecting familiar to unfamiliar

Teaching and learning should start at the level of understanding of the students, and then move to where they are supposed to be. When the lecturer introduces new material, he/she needs to start from what the students already know and link it to the new information. This means moving from the known to the unknown. Adult learners have a wealth of experience which can assist them in integrating existing information with new information.

4. Guided discovery

Guided discovery learning requires that the lecturer and the students set clear and understandable goals. In the teaching and learning situation the lecturer must steer the students in the direction of achieving the set goals. Guided learning requires that students combine their previous knowledge, experiences and their own learning strategies to achieve these goals. While adult learners are regarded as independent learners, they still need guidance in order to optimally use their learning strategies.

5. Scaffolding

In the process of scaffolding, the lecturer provides the students with the important information that the student need to know in order to master a certain task. As the students starts to understand the task, the lecturer withdraws his or her support. The aim of scaffolding is enable the students to eventually function independently. This form of scaffolding needs to be provided in the teaching and learning tasks set by the lecturer in the higher education context.

6. Group work and cooperative learning

Group work involves students working collaboratively on a task or project. When using this teaching approach, the lecturer should plan, scaffold and clarify the task.

The role of the lecturer is to supervise the progress and support the social interaction involved. Lecturers need to differentiate their teaching. Group work could assist students to open up and engage in the learning context.

7. Language interaction

Language is an important aspect of teaching and learning. In the teaching and learning situation students need to be encouraged to engage in discussion, reflection, debate, and interactive problem-solving.

2.4 LEARNING IN A SECOND LANGUAGE

"Language includes written, spoken, sign language, mathematical language and other symbol systems" (Donald et al., 2010, p. 55). People interact and communicate with each other through a language. Language is used to express information and ideas (Garton, 1992).

Vygotsky's (1978) sociocultural theory views language as an essential element in cognitive development. According to Vygotsky, language and thinking develop through interaction with others (Garton, 1992; Vygotsky, 1978). In the teaching and learning situation the interaction is between the lecturer (more capable) and the student (less capable). The lecturer needs to assist the student to get to a higher level of cognitive development.

Vygotsky (1978) sees language and thinking as two corresponding activities which are maintained in social contexts (Ivic[2], 2000). These interpersonal activities turn into intrapersonal activities. The main function of language is interpersonal communication in the form of speech. Interpersonal speech shifts to intrapersonal speech, which then induces thinking. Thinking and language are regarded as higher mental functions which are important in the teaching and learning situation (Ivic[2], 2000).

The government of South Africa has attempted to redress past imbalances by acknowledging the eleven official languages of the country. However, English and Afrikaans are still the dominant languages in education and business. At higher education institutions, English and/or Afrikaans are the mediums of instruction. This implies that the majority of students in South Africa are learning in a language that is not their first language. This is referred to as *subtractive bilingualism* (Donald et al., 2010; Nomlomo, 2007), in which the first language is replaced with a second language during learning. As a result of subtractive bilingualism, students can fail to develop competency in the second language or lose competency in their first language (Nomlomo, 2007).

Drawing on the work of Vygotsky (1978, 1985) and others, Donald et al. (2010) have identified the negative effects of learning in a second language:

- The relationship between language and cognition is compromised because, while students think in their first language, the language of learning is the second language. In teaching and learning, cognitive development and academic performance are negatively affected if the student is cut off from his or her first language.

- Students need time to gain competence in a second language, and therefore often lack competency in the language of learning. They then tend to be passive, are uncomfortable in engaging in discussions, and even distrust their own abilities in learning. This has a negative effect on their cognitive development and academic performance.

- If the students' first language is undermined in the teaching and learning context, the students will in turn undermine their own language and culture.

- Where teachers feel incompetent in a second language used as the medium of instruction, this could negatively affect the quality of teaching and learning. Both lecturers and students cannot engage fully, because they are disadvantaged by their lack of competence in the second language. This can lead to communication breakdown, misunderstandings and frustration.

Students who are not competent in the language of learning in the higher education context face the risk of academic failure (Van Rensburg, 2002). It is an assumption of this study that knowledge of learning styles could assist students to overcome the challenges of learning in a

second language, and assist them in selecting those activities which enhance their learning strengths, despite language challenges. It is important that the lecturer understands the processes involved in effective communication in the teaching and learning situation.

For effective teaching and learning to take place in higher education, lecturers need to have an understanding of language dynamics (whether students are proficient in the language of learning) and a basic understanding of learning theories, since this could provide them with information as to what facilitates learning. Learning theories are discussed below.

2.5 LEARNING THEORIES

In order to understand how students learn in a higher education context, it is important to explore relevant learning theories. Such theories focus on the student, specifically on what makes the student learn (Mwamwenda, 2004). Six learning theories have been selected for discussion in this study because of their relevance both to adult learning and to understanding the student in the teaching and learning context. These theories are behaviourist, cognitive, social learning, humanistic, adult learning, and experiential. They are discussed briefly below. This is followed by a discussion of adult learning theories and processes, the main focus in this study.

2.5.1 Behaviourist Learning Theories

Behaviourist learning theory is based on the work of Pavlov (1927) and Skinner (1953).

Behaviourists view learning as a result of stimulus and response, taking place on the basis of association between the stimulus and the response and through the presence of reinforcement (Mwamwenda, 2004). Behaviourist learning theory focuses on learning in relation to change as a result of environmental stimuli. It postulates that learning only takes place when rewards are given for learning. There are two important aspects to this theory, namely classical conditioning and operant conditioning.

The concept of classical conditioning was developed by Ivan Pavlov (1927). Conditioning refers to "learning or modification of behaviour" (Mwamwenda, 2004, p. 171). Classical conditioning offers insight into how a new behaviour is learnt. Pavlov argued that, through association, a person may develop a new behaviour (Mwamwenda, 2004). In order for adult learners to acquire new knowledge, they should be afforded the opportunity to apply such knowledge in the learning situation. Application of such associations assists the students in understanding new knowledge.

The concept of operant conditioning was developed by Skinner (1953). Operant conditioning assumes that behaviour can be changed through reinforcement. In the classroom, the lecturer needs to have clear objectives, and should inform the students not only about how they can meet these objectives but also the rewards they will receive when they succeed.

Rewards thus serve as positive reinforcement, and in turn such reinforcement supports good behaviour (Mwamwenda, 2004).

Behaviourist learning theory has been criticized for focusing only on observable behaviour. It relies more on extrinsic motivation in learning, and tends to inhibit the creativity and independence which are important for adult learners in the higher education context. The theory does not acknowledge students' individuality or the fact that they have different learning styles and therefore learn differently. However, this approach is useful when positive reinforcement is used to strengthen good behaviour.

In higher education, behaviourist theory can be used to promote learning through the introduction of a system of rewards, which may be useful with adult learners. A behaviourist approach could be useful, for example, if students were rewarded initially for succeeding with small parts of their work; this could subsequently be built up into a complete learning package, as success in the small parts would serve as a motivation to learn further.

2.5.2 Cognitive Learning Theories

Cognitive learning theory focuses on how students process information through mental awareness of themselves as processors of information (Mwamwenda, 2004). It argues that "learners are able to control their learning activities and have inherent capacity to learn" (Mwamwenda, 2004, p. 192). It thus focuses on the development of thinking and the ability of the student to integrate new information with existing information. The developers of cognitive learning theory include Bruner (1971), who developed the discovery learning theory; Ausubel (1977), with his receptive learning theory; Gagne (1985), with the conditions of learning theory; and Piaget (1952), with his theory of cognitive development.

Discovery learning

Discovery learning was developed by Bruner (1971). Bruner's theory argues that students are actively involved in the learning process and are instrumental in generating knowledge based on existing knowledge. Knowledge constructed in this manner can be retained for a longer period (Mwamwenda, 2004).

Discovery learning aims to create independent learners. This approach involves learners searching for new knowledge on their own. In order for students to discover new knowledge, the learning environment should create opportunities for them "to engage in thinking, insights and problem-solving as an integral part of their education" (Mwamwenda, 2004, p. 192).

Discovery learning encourages inductive processes in learning, meaning that learning develops from the specific to the general. In discovery learning, students are generally presented with a problem to which they have to discover solutions on their own. In discovering knowledge, the students' dominant learning styles could emerge and they could become aware of their learning strengths.

Discovery learning is useful for teaching and learning in higher education, because of its promotion of a learner-centred education that acknowledges diversity in student learning and hence different learning styles. It emphasizes the importance of motivation, reinforcement, and of the students' cognitive structure for effective learning (Mwamwenda, 2004).

Lecturers should provide their students with opportunities to scrutinize information and to arrive at solutions on their own, since information acquired in this way can be retained for later use.

Receptive learning

Receptive learning was developed by Ausubel (1977). In receptive learning the students are presented with all the possible information on a given topic in its final form (Mwamwenda, 2004). Learning takes place because of the relationship between what the students learn and what they already know. New knowledge is integrated into the existing knowledge. Receptive learning stresses the importance of prior knowledge in understanding new knowledge. Mwamwenda (2004, p. 216) contends that "information is meaningful if it can be related in some way to the learner's past, present or future experiences."

Adult learners bring a wealth of experiences, interests, goals, backgrounds and learning styles to the learning environment, and these strengths need to be acknowledged and put to good use (Nafukho, Amutabi & Otunga, 2005). Receptive learning allows adult learners to use what they already know in reaching out for and understanding new knowledge. Receptive learning encourages deductive reasoning, which means that learning moves from the general to the specific.

Deductive reasoning allows the student to arrive at specific solutions to problems (Van Rensburg, 2002). Lecturers should afford their students opportunities to analyze information and arrive at conclusions, since this teaches the students how to think, learn, and solve problems for themselves

(Mwamwenda, 2004). The role of the lecturer is to create a learning environment that is conducive for students to learn. Teaching in higher education should afford the students the opportunity to select information which they can process using their own learning strengths.

Proponents of cognitive learning theories maintain that students have an innate capacity to learn. These theories are interested in both how learning transpires and how lecturers can act as facilitators of learning. Discovery learning theory sees students as taking an active role in processing and facilitating their learning. Reception knowledge, however, is criticized for not supporting the idea that students in higher education are regarded as independent learners (Van Rensburg, 2002).

Conditions for learning

Gagne's theory (1985) stipulated that in order for learning to take place, certain conditions must be satisfied (Mwamwenda, 2004). This theory identified eight types of learning conditions arranged hierarchically, ranging from the lowest to the highest learning types. The conditions needed to facilitate learning at each level were identified. The lowest types have to be established before the highest can be achieved; thus learning starts with simple skills and builds towards complex skills. The types of learning involved include signal learning, stimulus response learning, chain learning, verbal association, discrimination learning, rule learning, and problem solving (Mwamwenda, 2004).

Gagne's theory (1985) of learning identified three principles, namely *results of learning, process of learning, and conditions of learning* (Mwamwenda, 2004). Acquiring the *results of learning* can strengthen the learner's position. These results can be classified into verbal information, intellectual skills, cognitive skills, attitudes and motor skills.

Process of learning is concerned with processing information through the senses, and with short-term and long-term memory. *Conditions of learning* may be both internal and external. Internal conditions involve using prior knowledge to process new information, while external conditions are concerned with other people helping and guiding the learner in remembering earlier information.

Gagne's theory of learning is particularly important in the teaching and learning situation of adult learners. According to this theory, students need to master the simple tasks first, before moving on to more complex tasks. The teaching and learning situation should be designed to guide the student through the steps to effective learning. Lecturers also need to lay a firm foundation and equip the learners with sufficient information so that they can tackle new data with confidence.

Piaget's cognitive development theory

Piaget's theory (1952) emphasizes the developmental stages at which learning occurs. According to Piaget, learning occurs in stages (Piaget, 1980). Each stage depicts the development of knowledge at that particular stage. These stages are essential for development, since students need

to interact with information which is beyond their developmental stage in order to develop new ideas (Woolfolk, 2001). Students can interact with new information through *assimilation* and *accommodation*. Assimilation takes place when students come across information which fits within their developmental stage. Accommodation refers to when the student interacts with information which is beyond his or her developmental stage; this then requires the student to use higher level methods of thinking (Byrnes, 2001).

Piaget (1980) identified the following stages of development of thinking: *the sensori-motor stage* (from birth to two years of age), *preoperational stage* (from two years to seven years of age), *concrete operational stage* (from seven to twelve years of age), *and formal operations* (from twelve years of age until adulthood). The adult learner falls under the formal operations stage. Students at this stage have developed logical and abstract thinking (Ojose, 2008; Woolfolk, 2001). They should also have developed deductive and inductive reasoning (Ojose, 2008). The adult learner is at a stage where he or she sees the world for how it really is.

As children progress through the various stages, they develop cognitively. Knowledge of Piaget's developmental stages could assist teachers and lecturers to understand the cognitive development of children and students so that they can plan activities which are appropriate for each developmental stage. The adult learner who is at the stage of formal operations has developed the ability to think abstractly and metacognitively. Metacognition is described as 'thinking about your thinking' (Schmidt & Ford, 2003). It is concerned with what the individual knows, how he or she acquires information, and how this information is used to direct learning (Woolfolk, 2001).

Metacognition is used to control thinking and learning, and to promote higher order thinking and learning (Van Rensburg, 2002; Woolfolk, 2001). Metacognition consists of three functions, namely planning, monitoring and control (Woolfolk, 2001). Planning involves deciding on the strategies to use and resources available. Monitoring includes checking and evaluating progress.

Control involves deciding on where to allocate the resources, on the intensity with which to work on the task, and on prioritizing the activities. Within these functions, the students can use different strategies of thinking. Students can develop metacognitive skills by reflecting on their learning and by identifying what is effective and what can be changed. Those who possess metacognitive skills are active learners, capable of taking control of their learning through reflection. Students in higher education, when they become aware of their learning styles, can reflect on their own learning processes and analyze them, with the result that quality education is more effectively achieved.

2.5.3 Social Learning Theories

Social learning theory was developed by Bandura (1977). Also referred to as observational or imitation learning, it is "based on what a child learns in his environment as he interacts and observes others" (Mwamwenda, 2004, p. 185). Social learning theory is concerned with the successful adjustment of an individual in society, through guiding the individual's behaviour and bringing it into line with society's norms, beliefs and values. Social learning theorists identify three types of learning, namely direct experience, observational learning, and self-regulation (Mwamwenda, 2004). Direct experience sees the student thinking, interpreting and making sense

of information received. Observational learning refers to learning through observation of others. Self-regulation refers to students' ability to regulate their learning processes. This includes rewarding themselves when they meet their goals, and changing those aspects which are not working.

Mwamwenda (2004) identifies the factors which facilitate social learning, namely, *attention, memory, motor skills, reinforcement, identification, status of a model* and *nurturant model.* Students need to focus their attention if they are to learn effectively. The information they learn needs to be stored in memory so that it can be retrieved when required. For the information to be understood, the students need to apply it in practice after observing. Rewarding students for academic achievement reinforces effective learning. Those who are not doing well academically can identify with those who achieve better academically, and hence change their ineffective learning behaviours. Lecturers, through their position of power, can also influence students to learn effectively and thus to succeed. Lecturers who develop positive interpersonal relationships with their students promote effective learning, especially as the students do not want to disappoint them.

Social learning theories see social contexts as important to learning (Lave & Wenger, 1991; Osman & Castle, 2006). Students take part in learning activities through which they are involved in a process of engagement in a community of practice (Lave & Wenger, 1991). In these activities, the adult learner "builds social relationships, shares knowledge, tools and resources for the benefit

of all" (Osman & Castle, 2006, p. 517). For effective learning, higher education should therefore promote social relationships and shared knowledge.

Vygotsky's (1978) socio-cultural theory is the basis of the social learning theory which proposes that social interaction influences cognitive development. He claims that learning occurs at the Zone of Proximal Development (ZPD) (Vygotsky, 1978). The ZPD, according to Vygotsky, is the distance between what is known and what can be known. It is the space where people cannot solve problems on their own but need the guidance of a lecturer or collaboration with a more capable peer (Donald et al., 2010). Vygotsky's theory encourages collaboration between the lecturer and the student, in which the lecturer guides the student to create his or her own meaning. Learning can thus be a shared experience for both the student and the lecturer. In this way, the student can be elevated to a higher level of understanding (Donald et al., 2010). In order to access the ZPD, Vygotsky encourages scaffolding and reciprocal teaching (Woolfolk, 2001). Scaffolding requires the lecturer to provide the students with the opportunities and the support needed to increase their knowledge. The lecturer maintains the students' interest by motivating them and making their tasks more manageable. Reciprocal teaching encourages the creation of a platform for communication between the students and the lecturer.

Vygotsky (1978) also emphasizes the interdependence between the individual and the social processes. He therefore focuses on the connections between people and the cultural context in which they act and interact in shared experiences (Woolfolk, 2001). Vygotsky's socio-cultural learning theory contends that children develop within their own cultures.

People use the tools which develop from their culture to navigate their social environment; these tools support higher levels of thinking, such as reasoning and problem solving (Woolfolk, 2001).

Vygotsky regards language as critical to cognitive development (Woolfolk, 2001; Donald et al., 2010), since it provides the means for expressing ideas and asking questions. Language and thought cannot exist in isolation, so both outer and inner forms of language guide cognitive development.

Vygotsky's theory (1978) suggests the existence of cultural learning styles, defined as the way a group of people within a society or culture tend to learn and pass on new information. Fasokun, Katahoire and Oduaran (2005); Goduka (1998); Ladd and Ruby (1999) recognize that culture, language and social factors have an impact on learning. Hale (1986) contends that language and culture shape the mind according to the world-view, the life-view, and the mental processing styles of a person's culture. This is further supported by Goduka (1998) and Strydom, Heyns and Grobler (1999) when they suggest that there is a relationship between culture and learning and that learning styles are influenced by how a culture socializes its children and its youth.

However, Goduka (1998) cautions against the notion that certain learning styles are related to an individual's culture, as this could be both promising and dangerous. It could be promising in the sense that it would ensure that certain ethnic groups would not be labelled as not being intelligent, academic non-achievement among these groups having often been associated with conflict

between teaching and learning styles. However, it could also be dangerous, in the sense that it could lead to ethnic stereotyping (Cuthbert, 2005; Goduka, 1998). Although certain ethnic groups share a common culture, history, background and social experiences, there is no one learning style that works for all students, or even for any particular ethnic or cultural group (Goduka, 1998).

2.5.4 Humanistic Learning Theories

Humanistic learning theory was developed by Carl Rogers (1942) and Abraham Maslow (1954). It sees the student as a holistic individual who strives to fulfill his or her full potential, and is concerned with the emotional and affective aspects of learning. Understanding the needs of the student in the process of education is therefore important for the humanistic theorist (Nafukho, Amutabi & Otunga, 2005). The individuality of each student is acknowledged and valued. Each student is seen as having the potential to succeed in higher education (Van Rensburg, 2002). Lecturers need to realize that students enter the learning environment with well-developed ideas and codes of behaviour, which are linked to the individual's self-esteem and values (Nafukho et al., 2005).

Humanistic learning theory emphasizes the value of the student and the relationship between the student and the lecturer. In essence, the humanistic view recognizes the importance of interpersonal relationships in teaching and learning (Fasokun et al., 2005). These relationships include transparency, openness, caring and respect for the students, in order to assist them towards developing their full potential (Fasokun et al., 2005). This theory also stresses the importance of intrinsic motivation and the need for self-actualization in learning.

Central to the humanistic learning theory are two major concepts: *free will* and *drive* (Fasokun et al., 2005). Adult learners, through their free will, make a conscious decision to enrol in higher education and choose the courses they want to do. Drive is seen as the action which follows upon that choice (Fasokun et al., 2005, p. 54). Once adult learners have made their choice, they will work towards succeeding in higher education, actively taking ownership of their learning. Humanistic learning theory thus promotes individuality and the use of students' own strengths in learning.

Humanistic theorists advocate for a learner-centred education in which a student's individuality is encouraged. Learner-centred education is promoted in higher education and students are seen as active participants in the learning process, so that they can achieve self-actualization, self-maintenance and self-enhancement (Fasokun et al., 2005). The humanist view emphasizes how learners can be assisted to take actions aimed at the realization of their full potential. It is concerned with the needs, perceptions and feelings of the students, as well as how they use information and relate to other people (Fasokun et al., 2005).

The humanist theory is guided by seven principles that are applicable to adult education (Fasokun et al., 2005):

- Learning should be based on freedom of choice
- Learning must not be threatening
- Experiences are at the centre of learning and self-actualization
- Participation is required

- Self-evaluation is desirable
- Growth and self-actualization are the adult's motivational forces
- Self-concept and self-esteem should be considered in designing learning programmes

2.6 ADULT LEARNING THEORIES AND PROCESSES

Although the implications for adult learning have been highlighted in the previous section, this section focuses particularly on the adult learner, and on teaching and learning in higher education contexts. Attention to adult learning was highlighted by Knowles (1980) in the theory of "andragogy".

The terms 'adult learning' and 'adult education' are used interchangeably (Fasokun et al., 2005). Knowles (1975) and Stierer and Antoniou (2004) recognize the difference between higher education learners and learners at school: learners at school attend compulsorily, whereas adult learners volunteer to attend higher education. The adult learner is someone who has a developed self-concept, has a wealth of knowledge, is concerned with application of knowledge gained through learning, and is intrinsically motivated (Kolb & Kolb, 2005). Adult learning includes self-directed learning, experiential learning, and motivation for learning, which are discussed below.

2.6.1 Adult Learning

Fasokun et al. (2005) identify adult learning as those activities relating to learning which encompass both formal and informal education, and which take place throughout the adult's life. Merriam (2001) argues that andragogy has become the most learner-centred approach, since educators are required actively to involve adult learners in the learning process.

Andragogy promotes self-directed learning, which is at the centre of adult learning and teaching (Fasokun et al., 2005). Adult learning has also been defined as purposeful action intended to bring about desirable change in the individual and society (Indabawa & Mpofu, 2005).

In the South African Constitution (1996), adults are defined as people who are 21 years and older. At this age, the learner is accountable for his or her actions and the consequences thereof. However, in the African context, age is not the sole determinant, as the fulfillment of certain roles and functions also plays an important part (Fasokun et al., 2005).

Knowles (1980) identified the following characteristics of an adult learner:

- *Self-concept*

As the adult learner matures his or her self-concept moves from dependency to self-reliance. The independent self-concept of the adult learner can direct the individual's own learning (Merriam, 2001). In the teaching and learning situation, the lecturer needs actively to involve the adult learners in the learning process; at the same time, the adult learners need to be free to direct themselves. The self-concept of students is strengthened when believe that they can perform certain tasks (Mwamwenda, 2004).

- *Experience*

The adult learner has accumulated a wealth of experience and knowledge, which includes work-related activities, family responsibilities, and previous education (Merriam, 2001). This experience could be a rich resource in the learning situation. The lecturer needs to connect to this experience, to recognize its value, and to relate the teaching and learning process to it.

- *Willingness to learn*

Adult learners are willing to learn things that they know they can apply in real-life situations (Merriam, 2001). They must see the reason and the need to learn something, and how it can be applied to their work or other responsibilities. In the teaching and learning situation, the lecturer needs to facilitate the learning material in such a way that it reflects the interests of the adult learner. The lecturer needs to provide a learning environment which stimulates the adult learners' eagerness to know.

- *Orientation to learning*

Adult learners are goal-oriented (Merriam, 2001). They see learning as a process which assists them in achieving their full potential. They want to apply the knowledge gained in the learning process to shaping a better future. In the teaching and learning situation, the lecturer needs to show the adult learners how to reach their goals.

- *Motivation to learn*

The adult learners' motivation to learn is usually intrinsic, and they generally want to succeed. They want to see the benefit in what they learn. In the teaching and learning situation, the lecturer therefore needs to show the adult learners the benefits of the learning process, particularly in relation to the near future. According to Knowles (1980), adult learning should be able to generate the following goals for the student:

- *Be able to understand themselves:* understanding their strengths, weaknesses, desires, interests and goals;

- *Have respect, love and love for others:* they should be open-minded about people and ideas;
- *Should acquire skills in order to reach their highest potentials:* realization of one's capacities will add to the well-being of oneself and the society;
- *Should understand the value of human beings*, should be able to acknowledge, respect and value traditions; and
- *Be able to appreciate society and the ability to direct change tactfully:* to be able to take part in making decisions which could affect and influence the social order.

Through the learning process, the student constructs his or her knowledge, based on existing knowledge, through interaction with information and the environment (Van Rensburg, 2002). In so doing, the adult learner becomes independent and self-directing.

2.6.2 Self-directed Learning

Self–directed learning was a brainchild of Knowles in 1975. This view contends that learning is ongoing and approaches to adult learning should therefore involve an analysis of the relationship between teaching strategies and the learning situation (Knowles, 1978) and is not limited to instruction or a classroom (Merriam, 2001). Knowles (1975, p. 18) defined self-directed learning as:

> A process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes.

Self-directed learning has in recent years received attention in the higher education context because of its humanistic approach (Levett-Jones, 2005). It is based on respecting the independence of an individual who chooses to learn for personal development (Merriam & Caffarella, 1999). Self-directed learning focuses on the process whereby adult learners take ownership of their own learning. They set their own goals and strive towards achieving them, identify the resources and skills needed to achieve these goals, and assess their own progress (Brookfield, 1995).

In the teaching and learning situation the learners do not receive information passively, but instead take responsibility for their learning and even set learning outcomes (Levett-Jones, 2005). They understand their own learning styles, their learning strengths, and the outcomes they wish to achieve (Merriam, 2001). Self-directed learning increases students' confidence in their own abilities and their capacity to learn. It enables them to acquire essential attributes, such as the development of independent learning skills, a sense of accountability, responsibility and assertiveness (Levett-Jones, 2005). In this approach, the lecturer needs to allow students the freedom to devise appropriate learning strategies. For self-directed learning to thrive, the learning environment should be flexible, challenging and non-threatening (Robotham, 1995).

Self-directed learning is relevant to this study in the sense that learners are encouraged to recall previous learning experiences and to identify those experiences which helped or hindered the effectiveness of their own learning (Robotham, 1995). As part of developing a learning styles

assessment tool for the South African higher education context, the students in this study were required to reflect on their previous learning experiences.

Self-directed learning has been criticized for concentrating on the individual as the key figure in this kind of learning, and for ignoring the social context (Merriam, 2001).

2.6.3 Experiential Learning

Experiential learning theory, which draws on the works of Dewey, Jung, Lewin, Rogers and others and was further developed by Kolb (1984), has been affirmed by many researchers in adult learning (Hansman, 2001). This type of learning is based on the belief that the teaching of adults should be grounded in the adults' experiences, and that these experiences represent a valuable resource (Kolb, 1984). Experiential learning thus adopts a student-centred approach to education (Kolb & Kolb, 2005).

Experiential learning is learner-centred, since it starts from the premise that one learns by doing (Cuthbert, 2005; Felder & Brent, 2005; Machemer & Crawford, 2007; Vawda, 2005). It is concerned with how experience is changed into ideas in order to integrate new experiences (Kolb & Kolb, 2005). The learning process therefore plays an important role in integrating new experiences. Experiential learning theory is built on six propositions (Hansman, 2001):

- *Learning is seen as process rather than outcome*. In higher education, learning can be improved by engaging students in a process that improves their learning. The process

should include feedback on the usefulness of their learning. Experience is at the heart of the learning process (Kolb, 1984).

- *All learning is relearning*. In teaching and learning, students' existing knowledge should be examined and tested in order to integrate it with the new knowledge. In the learning process, the learner engages with the learning material by moving backwards and forwards, reflecting, acting, feeling and thinking.

- *Learning requires resolving conflict between opposing modes of adaptation to the world.* The learning process is driven by conflict, differences and disagreement. For effective learning to take place, students need to confront these conflicts, differences and disagreements, which could be related to life experiences, beliefs, and new ideas (Kolb & Kolb, 2005). These differences can be difficult to resolve, and may require support for the adult learner. Institutions of higher learning need to create an environment in which both students and lecturers can open lines of communication, using their experiences as a resource in the learning situation (Kolb & Kolb, 2005).

- *Learning is a holistic process.* In the teaching and learning situation, the student as a complete individual is involved in the learning process. Learning is not only concerned with cognition; it also involves thinking, feeling, perceiving and behaving (Hansman, 2001). Higher education needs to provide learning experiences which cater for the individual student in his or her totality.

- *Learning results from the interaction between the person and the environment*. In the teaching and learning situation, new knowledge is integrated into existing knowledge through assimilation.

- *Learning is the process of creating knowledge*. Students are involved in creating knowledge. Knowledge is produced and reproduced.

In order to learn, students need to value and own their experiences. Prior experience and knowledge exist, so the lecturer needs to build on what the students already know (Kolb & Kolb, 2005). As a result, students will be able to reflect on their prior knowledge in the light of the new ideas, thus creating new knowledge.

2.6.4 Motivation for Learning

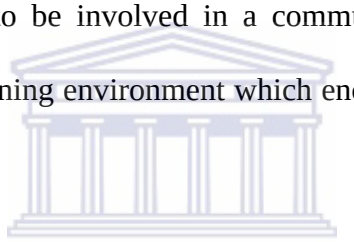
Motivation is another aspect of adult learning which has received considerable attention (Fasokun et al., 2005). It is seen as the driving force behind any action. It can be either intrinsic or extrinsic. Intrinsic motivation is internally determined and purposeful. This kind of motivation is explained by the cognitive theory which states that the need for achievement influences behaviour (Fasokun at al., 2005). Extrinsic motivation, on the other hand, lays emphasis on the belief that human behaviour is determined and directed by incentives or rewards. Extrinsic motivation is explained by the behaviourist theory of Skinner's operant conditioning, in which motivation is influenced by conditions outside the individual.

Motivation is vital for adult learning. Unlike learners at school, adult learners are intrinsically motivated to learn because they tend to know what is important to them and why it is important (Fasokun et al., 2005). Adult learners enroll at an institution of higher education because they want to satisfy certain needs and desires through goal-directed behaviour (Fasokun et al., 2005).

Knowles (1980) found that adult learners were motivated if they had control of their learning. Fasokun et al. (2005) maintain that adult learners are motivated to learn if the learning is stimulating, learner-centred, and needs-oriented. Russell (2006) attests to five factors that are a source of motivation for adult learners:

- *Social relationships*: The adult learner participates in education for the sake of social contact. He or she tends to find social satisfaction in learning activities (Fasokun et al, 2005).

In higher education, the adult learner is presented with the opportunity to make friends, to develop social networks, and to be involved in a community of practice (Wenger, 2000). Lecturers need to provide a learning environment which encourages social interaction, such as group work.



- *External expectations*: The adult learner is motivated by the need to comply with instructions from someone else, or to meet the expectations or recommendations of someone with formal authority. In higher education, the adult learner will be given instructions by the lecturer and will have to comply with these instructions, although the adult learner might be in a position of authority in another context. In the teaching and learning situation, the adult learner abides by the rules and expectations of the lecturer in order to achieve his or her personal goals.

- *Social welfare*: By engaging in learning, adult learners acquire skills which prepare them to become responsible members of society and to serve society. They tend to have learning needs which are linked to fulfilling their roles in society.

- *Personal advancement*: Through learning, adults can acquire skills that will enable them to achieve higher status in a job or in the community. Higher education learning prepares adults to achieve their goals and to occupy their rightful places in society.

- *Escape /Stimulation:* Learning for the adult student could also serve as a way of relieving boredom and offering a break from routine.

- *Cognitive interest*: The adult student is motivated to learn for the sake of learning. He or she seeks knowledge for its own sake in order to satisfy an inquiring mind. The lecturer needs to provide the adult learner with supplementary material to cater for these needs.

In the teaching and learning environment, motivation for effective learning can be influenced by personal control, by learning strengths, by a supportive learning environment, by an awareness of one's own learning style, and by the encouragement offered by feedback. The student in such an environment could then become a self-directed learner who sets high standards of aspiration. In order for students to thrive in the teaching and learning situation, both intrinsic and extrinsic motivations should be present.

2.7 SUMMARY AND CONCLUSION

This chapter explored the South African higher education context, teaching and learning in higher education, and the relevant adult learning theories and processes. The student population in South African higher education institutions has become more diverse, which implies that students have different learning needs. The challenge for institutions of higher education is to provide resources

to deal with the students' learning needs. The White Paper 3 (1997), National Plan for Higher Education (2001), and Higher Education Act (101 of 1997) recognize the challenges facing higher education, and call for new ways of teaching and learning in order to address students' diverse learning needs. One way of addressing these challenges is to teach students how to learn. Creating awareness of and drawing on learning styles could play a role in minimizing these challenges.

Learning theories help in explaining and understanding what happens in the teaching and learning situation. The behaviourist theorists believe that behaviour can be changed through rewarding positive learning. Humanistic theories emphasize support for the adult learner in taking action to become self-actualized, maintaining that students are active participants in their own learning. The cognitive learning theorists are concerned with how students learn and how their thinking takes place. These theories include discovery learning, reception learning, the conditions of learning, and metacognition (Mwamwenda, 2004). Social learning theory stresses the importance of social interaction in learning, and that people learn from one another. The context from which the student comes also has an impact on learning.

The adult learner is an independent, self-motivated and experienced individual who is goal oriented. Adult learning theories play an important role in adult education. Such theories emphasize the importance of active participation and prior experience in learning. This prior experience serves as a basis for new knowledge, while the application of knowledge in other contexts is important for the adult learner. Through the learning process, students can create their own knowledge.

The following chapter explores the learning styles theories and instruments, and their relevance for the higher education context. A great deal of research has been conducted on learning styles resulting in the development of a variety of learning styles instruments. The trend in higher education is to create awareness among lecturers and students about such styles. A theoretical knowledge of learning styles therefore becomes important.

CHAPTER THREE

LEARNING STYLES

3.1 INTRODUCTION

The overall aim of this study is the development and evaluation of a learning styles assessment tool relevant for the higher education context in South Africa. This chapter addresses one of the objectives for this study, which was to examine existing learning styles theories and instruments.

In this chapter, relevant learning style theories, models and instruments are identified and examined. Research on learning styles has resulted in the development of many learning styles theories and models (Bacon, 2004; Smith, 2002)). These theories and models have led to the creation of a number of learning style instruments. These instruments are believed to assist students in identifying how best they can learn, and also assist the teachers and lecturers in using the learning styles as the basis of their instruction (Genovese, 2004).

In this study, nine learning style instruments were identified, accessed and examined for possible use in the higher education context:

- Kolb Learning Style Indicator (LSI)
- Honey and Mumford Learning Style Questionnaire (LSQ)
- Gregorc Style Delineator (GSD)
- Felder and Silverman Index of Learning Styles (ILS)

- Myers-Briggs Type Indicator (MBTI)
- Dunn and Dunn Learning Style Model
- Vermunt Inventory of Learning Styles (ILS)
- Grasha Reichmann Student Learning Styles Scales (GRSLSS)
- Centre for Innovative Teaching Experiences (C.I.T.E.)

3.2 DEFINITION OF LEARNING STYLES

Students differ from each other physically, psychologically and culturally, and therefore often have different learning styles (Fasokun et al., 2005; Irvin & York, 1995). They have different ways of absorbing information: by seeing, hearing, reflecting and acting, reasoning and intuition, analysing and visualising (Felder & Spurlin, 2005). It is therefore imperative for educators to understand that one model of instruction may not suit every student (Fasokun et al., 2005; Hawk & Shah, 2007).

A great deal of research has been conducted on learning styles in seeking to understand how students learn. As a result, there are many learning styles theories and models (Bacon, 2004). The lack of a single definition of learning styles has been criticized extensively; as this causes confusion as to what learning styles really are (Bowles, 2004; Gould & Caswell, 2006). Cassidy (2004) attributes the disparity in the definitions of learning styles to the fact that research in the field has spread from psychology, where it originated, to other disciplines. This has allowed diverse ways of understanding and examining learning styles (Cassidy, 2004; Hall & Moseley, 2005). An example of such a definition is that of Dunn and Dunn (1993), who define learning style as the manner in which students try to make sense of new and difficult information.

Shaw (1996) defines learning styles as those elements which students bring to a learning environment and which have an impact on how they learn. Booth and Brooks (1995, p. 3) define learning styles as: "…a compilation of patterns of behaviour that appear consistently in the learning process of an individual from the initial stimulation to the final recognisable product of learning." A further definition, by Dunn and Griggs (2000, p. 136), is that "Learning styles address the biological uniqueness and developmental changes that make one person learn differently from another". Hilliard (1989, p. 67) defines learning styles as "consistency in the behaviour of a person or a group of people that tend to be habitual, the manifestation of predisposition to approach things in a characteristic way." With this definition it becomes evident that both individuals and groups can have distinctive learning styles.

From the range of definitions of learning styles, the following assumptions can be drawn:

- Learning styles are personal and different
- Learning styles are context driven
- Learning styles involve information processing
- Learning styles involve interacting with new and difficult information
- Learning styles involve attitudes towards learning and the learning environment
- Learning styles are dynamic and depend on the task at hand

In order to identify learning styles, various learning styles models have been developed. These models make use of learning styles instruments which contain questionnaires, designed to help individuals to evaluate their best ways of learning. Each instrument has a theoretical basis.

3.3 LEARNING STYLES MODELS AND INSTRUMENTS

Most learning styles are formulated around the "onion model" developed by Curry (1990). The onion model is comprised of four layers (Williamson & Watson, 2007). The fourth layer describes how learners interact with the learning environment and instructions. These are the most noticeable traits. This layer is the focus of the Dunn and Dunn Learning Style Index (Dunn & Dunn, 1993). The third layer describes the students' social interactions. The second layer concentrates on how information is processed. This layer is the focus for the Center for Innovative Teaching Experiences and the Kolb Learning Style Index (Kolb, 1984; James & Maher, 2004). The inner layer focuses on learning behaviour associated with the learner's personality type. It is considered to be the most stable and cannot be simply transformed or adapted. This layer is presented by the Myers-Briggs Style Indicator (Myers & McCaulley, 1986).

Learning style models assume that knowledge of learning differences in students could help them understand how they learn, and consequently enhance teaching and learning (Bacon, 2004, Genovese, 2004). Every student has a learning style. Accommodating this learning style could result in improved attitudes towards learning, and in increased productivity, academic achievement and creativity (Dunn & Griggs, 2000). Felder and Spurlin (2005) assert that students make use of all learning styles sporadically, but they have preferences which may be strong for a specific learning style.

Over the years, several models of learning styles have been used (Hall & Moseley, 2005). Research on learning styles conducted by Hall and Moseley (2005) identified 71 models of learning styles, proposed between 1902 and 2002.

For the sake of this study, nine learning styles instruments were analysed for possible use in a South African higher education context. The reason for choosing these learning styles instruments was that they are applicable to the adult learner. These instruments were:

- Kolb Learning Style Indicator (LSI)
- Honey and Mumford Learning Style Questionnaire (LSQ)
- Gregorc Style Delineator (GSD)
- Felder and Silverman Index of Learning Styles (ILS)
- Myers-Briggs Type Indicator (MBTI)
- Dunn and Dunn Learning Style Model
- Vermunt Inventory of Learning Styles (ILS)
- Grasha Reichmann Student Learning Styles Scales (GRSLSS), and
- Center for Innovative Teaching Experiences (C.I.T.E.)

3.3.1 Kolb Learning Styles Inventory (LSI)

Kolb's experiential learning theory is a development of the work of Rogers, Jung, Dewey, Lewin and Piaget (Pickworth & Schoeman, 2000). These theorists emphasize the need for grounding learning in experience. Kolb believes that the learning styles of individuals are unlikely to change in the long run, implying that individual learning styles are stable, a sentiment shared by Dunn (Cuthbert, 2005).

Kolb's theory emphasizes the importance of experience in learning. His model, called "experiential learning", describes learning as a process (Kolb, 1984, 1985). Experiential learning is a holistic approach, since it addresses cognitive, emotional and physical aspects of learners. On the basis of this approach, Kolb developed a Learning Style Inventory, designed according to how learners perceive and process information (Kolb, 1984, 1985).

The process of experiential learning follows a cycle of learning which starts with the attainment of 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 Active Experimentation (AE). Learners who score high on CE on the inventory are those who rely heavily on feeling-based judgement. They are sensitive towards people, that is, in their approach to learning they tend to be oriented more towards their peers than to authority figures. This means that they benefit more from engaging with fellow students than with lecturers. These students tend to be extroverts.

Students who score more on RO on the inventory have a tentative, impartial and reflective approach towards learning. They rely more on being careful when making judgements, viewing things from different perspectives, and searching for meaning in things. Students who score high on AC, on the other hand, rely more on the logical analysis of ideas, on systematic planning, logical thinking and rational evaluation. They prefer to deal more with objects and symbols than with people. They learn best in impersonal, authority-directed situations. A student with a high score on AE tends to be more practical and hands-on, relies more on experimentation, is a risk

taker, and can influence people and events through action. This student learns best when involved with projects, homework, small group discussions, and so on.

With experimentation, new concrete experiences surface, therefore requiring the cycle to resume (Allinson & Hayes, 1988). Different abilities are vital for each stage of the cycle. This then brings about the issue of people having different abilities and undertaking learning differently, and hence having different learning styles. Kolb classifies students' learning in two ways: (1) how they take in information, and (2) how they process information. The four types of learning styles identified by Kolb (1985) are:

- *Diverger*

Students with this learning style are imaginative, reflective and creative. They see long term implications of things. They view concrete situations from different angles and sort the information into a meaningful whole. They are people oriented. Diverger is a combination of CE and RO.

- *Assimilator*

Students with assimilator learning style learn best through reflective thinking and taking risks. They process information through figurative representation and thinking. They are concerned with ideas and abstract concepts. They pay attention to detail and like to do one thing at a time. Assimilators are a combination of AC and RO.

- *Converger*

Students converger as a learning style learn best when they have to think, analyse and apply new ideas to real life. They are task oriented and want to get results. They organise information so that

it focuses on a particular problem centred on practical thinking. They follow instructions with care and accuracy. They use a combination of AC and AE.

- *Accommodator*

Students with this learning style ask lots of questions, like taking risks and like to experiment with different techniques. They like to get involved in new experiences. They rely more on others for information rather than their own analytical abilities. They solve problems in an intuitive trial-and error fashion. Accommodators use a combination of CE and AE. The instrument Kolb uses to assess learning styles is called the Learning Style Inventory (LSI). The LSI consists of statements which are grouped in nine sets of four.

The students rank the statements according to how best they describe the students learning orientation. The ranking produce scores that relate to the four learning modes; CE, RO, AC, and AE. The LSI is a self-scoring questionnaire in a form of a 'tick box', which takes about thirty minutes to complete. The LSI describes how individuals learn, and how they deal with ideas and everyday situations.

A criticism of Kolb's learning style instrument is that it does not take into consideration different cultural experiences and situations, and can therefore only be used in a limited range of cultures. The idea of following a sequence, stages or steps, is not in line with experience (Cuthbert, 2005). In reality, steps, sequence or stages can be jumped or can take place simultaneously. Also Kolb's instrument is said to focus on a particular learning style; it does not cater for other situations, such as memorization and information assimilation (Markham, 2004). Kolb's learning style inventory

(LSI) has also been found to be unsatisfactory in reliability and validity. However this has been refuted with the suggestion that the latest version had a proven reliability (Cuthbert, 2005). This could not be considered for adaptation in this research because some studies have already been done in South Africa using Kolb (Van Rensburg, 2002; Vawda, 2005).

3.3.2 Honey and Mumford Learning Styles Questionnaire (LSQ)

Honey and Mumford's theory is grounded in Kolb's experiential learning theory, which emphasizes the importance of experience in learning (Honey & Mumford, 1986, 2000). Honey and Mumford (1986) developed their Learning Styles Questionnaire with styles closely corresponding to those defined by Kolb.

Their Learning Style model identifies four learning styles, namely activist, pragmatist, reflector and theorist (Allinson & Hayes, 1988; Honey & Mumford, 1986).

1. *Activist*

Activists learn best through taking part in new experiences. They are action heroes who like challenges. They like to be involved in teamwork and problem-solving activities.

They thrive in learning situations where they have to take the leadership position, such as presentations and discussions.

2. *Reflector*

Reflectors learn best through observation and analysing events from different perspectives. They like to think carefully before acting. They thrive in learning situations where they are given time to plan, and are given sufficient information to work with so that they can produce carefully considered analyses and reports.

3. *Pragmatist*

Pragmatists learn by testing out information and using the information in making decisions and solving problems. They like to link the subject matter with reality. They prefer to be involved in practical work. They thrive in learning situations where they are given immediate opportunities to implement what they have learnt.

4. *Theorist*

Theorists learn best by incorporating observations into a conceptual framework. They like structured situations with clear guidelines. They like to question and probe information. They thrive in learning situations where they are given information to analyse, evaluate and then generalize (Cuthbert, 2005; Allinson & Hayes, 1988).

Honey and Mumford's Learning Style Questionnaire (LSQ) consists of 80 tick box questions (Mumford, 1986). The 80 statements consist of four subsets of 20 items, each subset measuring each of the four learning styles of activist, reflector, pragmatist and theorist (Honey & Mumford, 1986). All items carry the same weight, and the aim is to discover general behavioural trends. The items are statements which require the user to indicate a level of agreement or disagreement. In scoring, each item loads into one of the four scales: Activist, Reflector, Theorist and Pragmatist.

Honey and Mumford's Learning Style Questionnaire (LSQ), which is similar to that of Kolb, has also been criticized for the same reasons as Kolb's, and for its inability to discriminate between learning styles (Cuthbert, 2005). A study done in South Africa by Pickworth and Schoeman

(2000), testing Honey and Mumford's Learning Style Inventory (LSI) and Kolb's Learning Style Questionnaire (LSQ) on undergraduate students in science and humanities in higher education contexts, produced four factor solutions and high internal reliability for the LSI and LSQ (Cuthbert, 2005; Pickworth & Schoeman, 2000).

3.3.3 Gregorc Style Delineator (GSD)

Anthony Gregorc is a lecturer who developed the Gregorc Style Delineator (GSD), which was designed to be used by children and students (Gregorc, 1982). The GSD is based on the cognitive mediation theory which focuses on the perceiving and ordering of information (Cassidy, 2004). According to Gregorc's theory, information is effectively and efficiently received and expressed through the channels in the human mind (Williamson & Watson, 2007). It is based on the functions of the left and right brain hemispheres (Gregorc, 1979, 1982). Gregorc (1979) intended to identify differences in learning. His theory is made up of different theories of behavioural, psychoanalytic, humanistic and interpersonal psychological sciences (Heineman, 1995).

Gregorc defines the learning styles as being made up of individual characteristic traits which distinguish how a student learns and adapts to his or her environment (Cassidy, 2004).

His mission is to prompt self-knowledge, promote deeper awareness of others, foster harmonious relationships, reduce negativity harm, and encourage rightful actions (Heineman, 1995; Cassidy, 2004).

His theory was developed on the premise that all students have a preference for learning which is unique and individual. The instrument associated with Gregorc is the Gregorc Style Delineator (GSD). It consists of 40 words, arranged in 10 sets of 4 words (Joniak & Isaksen, 1988). The respondents rank 4 words in each item, from the most to the least descriptive of themselves, scored from 1-4 respectively. The GSD identifies four different learning styles (Gregorc, 1982; Williamson & Watson, 2007):

1. *Concrete sequential (CS)*

Students with a concrete sequential learning style are hard-working, and study in a structured and methodical manner. They are consistent and arrange their information accurately, supported by relevant facts. They plan and see that their plans are executed. They thrive in a learning environment in which there is stability and order.

2. *Concrete random (CR)*

Students with a concrete random learning style are quick and intuitive. They are innovative, creative and independent learners who like to try out new things. They are adventurous and prefer a stimulating learning environment, one which challenges them to experiment and explore. They thrive in new and challenging learning environments.

3. *Abstract sequential (AS)*

Students with an abstract sequential learning style are analytic, logical and systematic. They prefer abstract information which they organize in an objective and structured manner. They thrive in a quiet learning environment which allows them to be analytic.

4. *Abstract random (AR)*

Students with an abstract random learning style are sensitive and compassionate. They are imaginative, spontaneous and flexible, and thrive in a learning environment which allows them to combine feelings and ideas.

Gregorc believes that people are inherently drawn towards one or two learning styles. The Gregorc Style Delineator focuses on ethnic and gender differences among learning styles. Research on the Gregorc instrument has shown a high level of reliability and validity (Williamson & Watson, 2007). However, it has been criticized for a lack of theoretical basis. The GSD was not considered for this study because it could not be accessed.

3.3.4 Felder and Silverman Index of Learning Styles (ILS)

Richard Felder and Linda Silverman formulated a learning style model entitled Index of Learning Styles (ILS). This was designed to capture the most important learning differences among engineering students in higher education contexts, and has been used broadly (Felder & Silverman,1988; Felder & Spurlin, 2005).

The LSI categorizes students according to where they fit on a number of scales relevant to the ways they receive and process information (Felder & Silverman, 1988; Felder & Spurlin, 2005). Felder and Henriques (1995) and Felder and Silverman (1988) and state that students' learning styles can be determined by answering five questions:

- What type of information does the student prefer to perceive?

- Through which sense is the information perceived?
- What kind of information is the student comfortable with?
- How does the student prefer to process information?
- How does the student move towards understanding?

The ILS is a 44 forced choice instrument that classifies students in four categories: Sensing-Intuitive, Visual-Verbal, Active-Reflective, Sequential-Global (Felder, 2002; Felder & Silverman, 1988; Genovese, 2004). The ILS identifies the four dimensions of learning styles as a continuum, with one learning preference on the far left and the other on the far right (Felder & Henriques, 1995; Genovese, 2004).

1. Sensory and Intuitive

Students with a sensory learning style gather the information through the senses. Sensors like dealing with facts and experimentation, and are good at memorizing facts. They thrive in a learning environment where the pace is slow and methodical. On the other hand, students with an intuitive learning style gather information through speculation, imagination and hunches (Felder & Henriques, 1995; Felder & Silverman, 1988). Intuitors are quick and are prone to make mistakes in the learning process. Because they are innovative, they thrive in a learning environment in which they have to try out new things.

2. Active and reflective

Active learners like to be hands-on with information. They thrive in learning situations where they have to discuss, explain and test out information, and work best in groups. Reflective learners like to scrutinize, analyse and manipulate information (Felder & Silverman, 1988). They thrive in learning situations in which they can work alone.

3. Visual and Auditory

Research has shown that people receive information through visual, auditory and kinaesthetic (Felder, 1988). This confirms the existence of visual, auditory and kinaesthetic learning styles. Visual learners learn best when they see things presented to them in the form of pictures, diagrams, or demonstration.

Auditory learners work best when they hear and verbalize information. They thrive in learning situations in which they are involved in discussions, where information is explained verbally, and where they have to explain information to others.

4. Sequential and global

Sequential students like to follow steps in finding solutions, while global students first need to grasp the bigger picture before solving complex pictures (Bacon, 2004; Felder & Brent, 2005; Felder & Spurlin, 2005). Sequential students thrive when the learning material is presented in a fixed, predictable manner. Global students, on the other hand, like to deal with complex and difficult material.

The ILS was criticized for grouping together constructs which cannot be classified as learning styles and for having low internal reliability (Genovese, 2004). Like most learning style instruments, it was also criticized for theoretical confusion. This instrument was therefore not considered for this study.

3.3.5 Myers-Briggs Type Indicator (MBTI)

The Myers-Briggs Type Indicator (MBTI) was developed by Isabel Myers and Katherine Briggs in the early 1940s to see how individuals take in information, make decisions and relate to other people (Myers & McCaulley, 1986). The MBTI is based on the personality theory of Carl Jung (Myers & McCaulley, 1986). It has been extensively used in educational contexts to identify learning styles that are associated with each of Jung's personality types. MBTI has been mostly used in the corporate world (James & Maher, 2004).

The MBTI consists of 126 items, with data on four sets of preferences, resulting in 16 learning styles. It takes about 30-45 minutes to complete the instrument, which identifies preferences according to pairs of opposing preferences on four scales (Williamson & Watson, 2007).

1. *Extroverts (E) or Introverts (I)*

Extrovert students try things out and focus on the external world. These students do best in learning situations where they work with other people; they are action oriented and prefer interacting with people. Introvert students, on the other hand, prefer to think things through alone in their minds. They focus on the inner world of ideas, concepts and ideas. As a result, they thrive in learning situations in which they can work on their own.

2. *Sensors (S) or Intuitors (IN)*

Students using the sensing learning style take in information through their senses. They are practical, and like to focus on facts and procedures. They thrive when they are in a structured environment and are given clear and concrete information. By contrast, intuitive students, rather

than simply gathering facts, seek out patterns and relationships among the facts they have gathered. They do best when they can use imagination and creativity in inventing new information.

3. Thinkers (T) or feelers (F)

Students with the thinker learning style are not easily convinced of the truth of an argument, and take a logical and analytical approach to learning. They need to have evidence and reason in order to be convinced.

Students who have the feelers learning style are appreciative; they like to make decisions that are personal and based on humanistic consideration. These students are sensitive to the needs and reactions of other people. They tend to be good at persuasion and facilitating differences among group members.

4. Judgers (J) or perceivers (P)

Students with the judgers learning style like to focus on completing one task before moving to the next. Judgers plan their work ahead to avoid stress. They thrive when they are given targets and deadlines. Perceivers, however, like to multitask.

They tend to move to the next task without completing the one they are busy with. They do best when they have to work under pressure (Felder & Brent, 2005; Gauss, 2002).

MBTI has been widely used in over 100 research studies and has been found to have many strengths. In particular, it identifies more approaches to learning and is more standardized than most learning styles (Randall, 1995). Though it has scored good ratings for validity and reliability,

problems have also been noted. MBTI has been found to be complicated when used in a typical classroom, and the instrument only caters for students who choose stronger preferences indicators, rather than those who choose weaker preferences (Williamson & Watson, 2007). Furthermore, it is said to measure cognitive styles, not learning styles (Markham, 2004).

The MBTI could not be used for this study, since the research focuses on identifying learning styles not cognitive styles, and the instrument to be used had to be simple, user-friendly, accessible and available. Furthermore, in order to use the MBTI a fee was required, and interpretation of the results in MBTI has to be done by a professional.

3.3.6 Dunn and Dunn Learning Styles Model

The Dunn and Dunn Learning Style Model was developed by Rita and Kenneth Dunn in 1979 in New York. This model is based on the theory that each individual has a unique set of biological and developmental characteristics (Dunn & Dunn, 1993). This implies that individual students learn differently; and that each student has a unique style of learning with individual strengths and weaknesses. The model was developed for students ranging from secondary school to university, in order to improve the performance of all such students. The main aim of the Dunn and Dunn learning style model was to improve teaching through the identification and matching of students' learning styles with effective teaching opportunities (Dunn & Dunn, 1979, 1993). According to Dunn and Griggs (2000, p. 11), the model is based on the following assumptions:

- Most individuals can learn

- Instructional environment, resources, and approaches respond to different learning styles strong points
- Every individual has strong points, but these strong points are different
- Individuals learning preferences can be measured
- If students are exposed to an empowering environment, have resources they can be successful in their learning
- Lecturers can use the learning styles as a basis for their teaching
- Students can maximise the use of their learning styles strong points when dealing with new and difficult learning material (Dunn, Griggs, Olson, Beasely & Gorman, 1995, p. 354).

Dunn and Dunn's model of learning styles (LSI) is divided into five categories (Dunn & Griggs, 2000), namely:

1. *Environmental preferences:* These include preferences for sound, light, temperature, and classroom layout in order to learn

2. *Emotional preferences:* These preferences include level of motivation, persistence, responsibility and need for structure

3. *Sociological preference:* This includes whether students prefer to learn alone, in pairs, with peers, or in a team.
4. *Physiological preference:* This includes students' preference for using visual, auditory or kinaesthetic stimuli when learning
5. *Psychological preference:* Psychological preferences are concerned with information processing based on a global and analytical approach.

The global students learn best when they are concerned with the whole picture and with the end results, a tendency which is associated with right brain dominance. On the other hand, analytical students prefer to learn individual details in a sequence and then put all the parts together in order to form the whole; this approach is associated with left brain dominance.

The Learning Style Inventory (LSI) is the instrument used to assess learning styles. It contains 104 forced choice statements. After reading the statements, the students select one of five choices in response to the statements. The LSI cannot be manually scored; instead, it is scored using a computer-assisted scoring programme (Dunn & Griggs, 2000). The programme analyses the results and provides a description of the individual's learning styles.

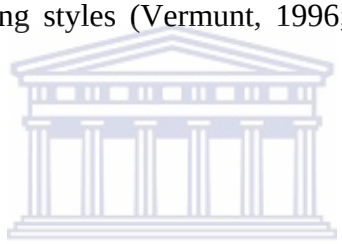
The Dunn and Dunn model measures preferences rather than strengths. The advantage of the model is that it affirms preferences, rather than aiming to remedy weaknesses (Cuthbert, 2005). The Dunn and Dunn model could not be used for this study because it requires the use of a computer-assisted programme which would not be available for the participating students. Since not all our students have access to computers, the study required an instrument that was simple, user-friendly and did not need sophisticated technology.

3.3.7 Vermunt Inventory of Learning Styles (VILS)

The Vermunt inventory of learning styles is based on the modern constructivist theory which states that knowledge is constructed and reconstructed by individuals (Donald, Lazarus & Lolwana,

2010). The Vermunt inventory defines learning styles in terms of processing strategies, regulation strategies, mental modes of learning, and learning orientation (Cassidy, 2004; Markham, 2004; Vermunt, 1996). It was developed as a diagnostic tool for use in the context of higher education in Holland (Boyle, Duffy & Dunleavy, 2003).

The LSI has 100 items and is divided into two parts, A and B. Each item consists of a statement where the participant has to indicate, on a five-point scale, the extent to which the statement applies to him or her. One indicates 'strongly disagree' and five indicates 'strongly agree'. The Vermunt LSI identifies four learning styles (Vermunt, 1996; Boyle, Duffy & Dunleavy, 2003; Cassidy, 2004; Markham, 2004).



1. *Undirected learning style*

Students with this learning style have difficulty in identifying important information in a study material. They treat all information equally because they cannot distinguish between what is important and what is unimportant. They are slow in processing any large volume of information, since they have difficulty in seeing the relation between the parts and the whole.

2. *Reproduction directed learning style*

A student with a reproduction directed learning style simply reproduces the material to complete the task. No effort is made to understand the material. These students learn best by memorizing and rehearsing information.

3. Application directed learning style

Students with an application directed learning style try to gain more understanding of the material by applying the given information in concrete, real-life situations. They also try to apply the information they learn in other courses.

4. Meaning directed learning style

Students with this learning style try to gain critical understanding of the material by drawing information from existing and related materials. They search for information, are motivated to learn, and take pleasure in their studies.

A criticism of the Vermunt Inventory of Learning Styles is that participants tend to respond to the learning environment, rather than the learning style (Markham, 2004). This instrument could not be used for this study because of copyright restrictions.

3.3.8 Grasha Reichmann Student Learning Styles Scales (GRSLSS)

The Grasha Reichmann Student Learning Styles Scales (GRSLSS) were developed in 1974 to determine college and high school students' styles of involvement in classroom interaction (Heineman, 1995). It has its theoretical basis in experiential learning theory (Heineman, 1995), and focuses on students' attitudes towards learning, classroom activities, teachers, and peers (Grasha, 1996).

The GRSLSS comprises 60 items which consist of six scales, with ten items per scale (Grasha, 1984). Participants are required to assess themselves using a five-point rating scale; this ranges from a rating of one for 'strongly disagree', to a rating of five for 'strongly agree'. It identifies six social learning styles (Grasha, 1984, 1996).

1. *Avoidant learning style*

Students with this learning style do not participate with their peers or with their lecturers, and avoid taking part in the activities in the classroom. They do not want to attend classes and do not enjoy learning. Students with avoidant learning style need to be shown the importance and the benefits of learning in their lives.

2. *Participant learning style*

Students with a participant learning style are eager to learn, and willingly take part in classroom activities. They take responsibility for their learning, are motivated, and interact freely with peers and lecturers.

3. *Independent learning style*

Students with an independent learning style prefer to work alone. They students are inquisitive and confident of their learning abilities, going the extra mile when doing their work. They thrive when they are given guidelines and a structure within which to work, and learn best when they are given individual assignments and projects.

4. *Dependent learning style*

Students with this learning style only learn what is required. They want to be told what they must do, so they need more guidance from the lecturer. They thrive in learning situations where they are given outlines, clear deadlines and instructions for projects and assignments.

5. *Collaborative learning style*

Students with this learning style learn best by sharing their information and ideas with others. They work cooperatively with their peers and lecturers, and thrive in group activities such as group assignments, presentations and projects.

6. *Competitive learning style*

Students with a competitive learning style see the classroom as a win-lose situation in which they must win. They like to perform better than others, and thrive in learning situations where they are given the leadership positions.

3.3.9 The Center for Innovative Teaching Experiences (C.I.T.E) Learning Styles Instrument

The Center for Innovative Teaching Experiences (C.I.T.E.) learning style instrument was created by Babich, Burdine, Albright and Randol (1975) for teachers at Murdoch Teachers Center in Wichita, Kansas, to assist them in determining their students' preferred learning styles. The C.I.T.E is based on the perceptual theory which states that individuals use one or more senses to understand, organize, and retain experience (Reid, 1987). The instrument focuses on three main areas: information gathering, work conditions, and expressiveness (Babich et al., 1975).

Information Gathering

Information gathering focuses on the following learning styles:

1. *Auditory language*

Students with this learning style learn best from hearing the information presented to them. They thrive in lectures, discussions and oral presentations.

2. *Visual language*

Students with a visual language learning style learn best from seeing the information presented to them. They do best in learning situations in which they are given written materials to work with.

3. *Auditory numerical*

Students who possess an auditory numerical learning style learn best from hearing numbers and oral explanations. They remember numbers with ease and can explain mathematical equations to others.

4. Visual numerical

Students with a visual numerical learning style learn best by seeing numbers. They thrive in learning situations where they have to deal with mathematical problems presented to them in a written form.

5. Auditory-visual-kinaesthetic

These students learn best by being hands-on. They are stimulated through experience, by doing, and through self-involvement. They thrive in learning situations where they can touch and feel what they are working with.

Work Conditions

Work conditions focuses on whether students prefer working individually or in a group. The learning styles falling under this area are:

6. Social individual

Students with this learning style learn best when they work alone. They thrive when they do individual assignments, projects and presentations.

7. Social group

Students with social group as a learning style study best in a group. They like interacting with others, value the ideas of others, and thrive in learning situations where they do group assignments, projects and presentations.

Expressiveness

This area focuses on whether a student prefers oral or written communication. The learning styles falling under this area are:

8. Expressive oral

Students with this learning style are articulate, and good at expressing themselves orally. They talk comfortably and can express themselves clearly. They do well in learning situations where they have to do oral presentations, take oral tests, and are engaged in discussions.

9. Expressive written

Students with this learning style learn best when they express themselves in writing. Their thoughts are better organized when they are written down; thus they do well in situations where they are allowed to do written assignments or write reports.

The C.I.T.E. consists of 45 statements. These are divided into five sections measuring the nine learning styles: visual language, visual numerical, expressive written, expressive oral, social individual, social group, auditory language, auditory numerical, and kinaesthetic. Participants are required to assess themselves using a four-point rating scale; this ranges from a rating of 1 and 2 for 'least like me' to 3 and 4 for 'most like me'. The scoring on the Learning Style Inventory identifies three categories:

- *Major learning style:* A student who scores high in this category prefers to use this style of learning; however, this does not limit the student to one learning style;

- *Minor learning style:* The student with a minor learning style uses this learning style as a second choice or in conjunction with other learning styles; and
- *Negligible learning style:* The student prefers not to use this learning style

The C.I.T.E. has been used in various projects in the United States of America (Pyzdrowski, Butler, Walker & Pyzdrowski, 2007). It was used to explore the learning styles of students in large sectioned college algebra and to determine how the course components addressed the students' needs, as well as to find other components which could be developed and implemented to help the students (Pyzdrowski et al., 2007). The findings for the latter study revealed that students had a variety of learning styles, as stated in C.I.T.E learning styles instruments. The instrument has also been used to assist speakers of English (NSs) in identifying their preferred perceptual learning styles. The C.I.T.E. was used in a pilot project with non English-speaking students (NNS) in English as a Second Language (ESL) programme in Colorado (Reid, 1982). The C.I.T.E. was administered with several other ESL students involved in English language programmes across the United States of America (Reid, 1983). The results of this study showed that ESL students strongly preferred kinaesthetic and tactile learning styles.

A new instrument was adapted by Reid (1987) from the C.I.T.E. for ESL students (Babich & Randol, 1984). This consisted of six areas measuring 5 statements, giving a total of 30 statements. The six areas were visual, auditory, kinaesthetic, tactile, group and individual learning.

The C.I.T.E was found to be suitable for adoption in this study because it is a mixed domain; it identifies both perceptual (visual, auditory, kinaesthetic, expressiveness) and social domains

(social and individual group) (James & Maher, 2004). It is self-reporting, can be scored manually, and is relatively easy to complete. It is also freely available.

While the C.I.T.E. was used for this particular study, for the reasons outlined above, the focus of this research was not on proving that only this instrument could be useful in the South African context, but rather that there is value in an analysis of learning styles in the process of teaching and learning in higher education contexts.

3.4 TEACHING STYLES

Teaching and learning styles cannot be separated. Although this study is concerned with learning styles, learning styles interact with teaching styles. Teaching styles determine the way information is transmitted to the student (Van Rensburg, 2002). In order to understand teaching and learning processes fully, teaching styles need to be explored. Students respond in varied ways to different teaching styles. As with learning styles, there are different teaching styles.

There should be a relationship between learning styles and teaching styles (Felder & Henrique, 1995; Provitera & Esendal, 2008). Learners always bring some knowledge or experience to the learning situation; this needs to be recognized and acknowledged in order to bring out their desire to acquire new knowledge (Kostovich, Poradzisz, Wood & O'Brien, 2007). Lecturers therefore need to be aware of both learning styles and the teaching styles they are using and how effective they are. They need to vary their teaching styles according to students' needs and the purpose of the learning activity.

Matching teaching styles with learning styles can play an important role in promoting more effective learning. Evans and Waring (2006) concede that mismatch between learning styles and teaching styles is linked to dropout rates. However, in another study by Kolb (1984), mismatch between learning style and teaching styles was seen as a way of bringing out creativity, since the student has to find a way among learning styles with which he or she is not familiar. Bernades and Hanna (2009) suggest that if a student shows a certain learning style and the teaching style matches this learning style, the student will learn effectively and will succeed.

3.4.1 Grasha's Teaching Styles

There are different teaching styles (Grasha, 1996). Lecturers can use one of these or use a mixture of teaching styles (Grasha, 1996).

- *Expert:* This teaching style is based on the transmission of knowledge by the lecturer, who possesses the knowledge and expertise that the students require. The students are required to be prepared to learn and use the information.

- *Formal authority:* This type of teaching style focuses on the lecturer being responsible for providing and controlling the teaching material, and ensuring that the students receive the information. Students are therefore required to participate in class. Lecturers are not concerned with building relationships with the learners, nor is it important that the students build relationships.

- *Personal mode:* The lecturer acts as a role model who coaches, helps and guides students in developing and applying the skills and knowledge acquired in learning. Lecturers with this teaching style encourage and motivate students to learn.
- *Facilitator:* This type of teaching style focuses on student-centred learning. The lecturer places more responsibility on the students to take the initiative in meeting the demands of learning tasks. Students are encouraged to be independent learners who participate actively in their learning in collaboration with others.
- *Delegator*: Lecturers with this learning style tend to put control and responsibility for learning on the students themselves. The lecturer's role thus becomes that of a consultant. Students are encouraged to be independent learners. The lecturer with this teaching style encourages students to work in groups, and to build interpersonal relations with each other.

Students respond to teaching styles which are consistent with their learning styles (Robotham, 1995). Personal model, facilitator and delegator are the teaching styles which are suitable for adult learners in higher education. Adult learners need to take responsibility for their learning, developing and applying the knowledge gained in learning. Students use their strengths in learning because they are encouraged to become self-directed (Robotham, 1995). This requires that each student become aware of his or her learning styles. Students who are aware of their learning styles are empowered to choose the style that is suitable for a particular learning activity (Robotham, 1995).

3.4.2 Pratt's Teaching Styles

Pratt (1998) studied adult educators, asking questions about teaching, learning, motivation, the goals of education, and the influence of context on their teaching. Pratt (1998) identified five perspectives on teaching:

- *Transmission:* The teacher focuses on content and determines what and how students should learn.
- *Development*: Students' prior knowledge is valued and the teacher aims at developing their problem solving and reasoning skills.
- *Apprenticeship:* Genuine tasks in real work settings are presented.
- *Nurturing*: The teacher concentrates on the interpersonal aspects of student learning by responding to students' emotional and intellectual needs.
- *Social reform:* The teacher relates ideas to students' lives.

Pratt's (1998) teaching styles have implications for adult learning because of their recognition of the value of the prior knowledge which the adult learners possess. Students in higher education are required to possess problem solving and thinking skills; a nurturing teaching style respects and appreciates their individuality.

3.4.3 Henson and Borthwick's Teaching Styles

Sternberg (1997) identified six teaching styles developed by Henson and Borthwick in 1984.

- *Task oriented*: The lecturer uses planned tasks in conjunction with appropriate materials.
- *Cooperative planner:* In this style the lecturer and the students jointly plan the instructional venture, although the lecturer controls the overall structure.
- *Child centred*: The lecturer provides the task structure and the student chooses an option, depending on what is of interest to him or her.
- *Subject centred:* In this approach the lecturer plans and structures the content, while excluding the students from the process.
- *Learning centred:* The lecturer shows concern for both the students and the learning material.
- *Emotionally exciting:* In this teaching style, the lecturer attempts to make the teaching emotionally stimulating.

The Henson and Borthwick (1984) teaching styles are relevant to this study because adult learners are goal oriented, independent and prefer to control the learning environment (Mulalic, Shah & Ahmad, 2009). Task-oriented, cooperative, learning-centred, emotionally exciting and learner-centred teaching styles respond to the needs of the adult learner in the learning situation.

The relationship between learning styles and teaching styles is seen as an important factor in the success of students in institutions of higher learning (Dunn & Griggs, 2000; Hall & Moseley, 2005). Teaching styles and learning styles are interrelated. Lecturers should be able to use their teaching styles to address the students' learning needs. Just as students have dominant learning

styles, so teachers have dominant teaching styles. However, teachers need to use a mixture of teaching styles in order to address the learning needs of all their students.

3.5 MATCHING LEARNING STYLES AND TEACHING STYLES

Research suggests that matching learning styles with teaching styles can result in students' higher achievement (Bernades & Hanna, 2009; Mangino & Griggs, 2006). If lecturers know their students' learning styles, they can match their teaching styles to the students' learning styles, thus making their teaching more effective (Fritz, 2002; Gauss, 2002; Williamson & Watson, 2007). For example, a study by Dunn, Deckinger, Withers and Katzenstein (1990) found that teaching through students' learning styles enhanced students' achievement. This was also confirmed by Bowles (2004) who attested that educational processes informed by learning styles are more effective.

However, Williamson and Watson (2007) caution that the matching of learning styles and teaching styles over a long period of time could make both lecturers and students too comfortable and render the learning environment less challenging.

Intentional mismatch should therefore be encouraged, so that both the students and the lecturers can develop and explore the negligent learning styles; both students and lecturers can thus adjust to different learning environments (Williamson & Watson, 2007).

It is important, therefore, for lecturers to help students to understand the limitations of their preferred learning styles, assisting them to expand their learning styles in order to succeed in a variety of learning environments (Robotham, 1999).

Matching teaching styles with students' learning styles does not mean that the lecturer should adjust the teaching style to every individual student's learning style, nor that the lecturer should use an all-encompassing teaching style for all students. Rather, a more balanced teaching strategy, one that accommodates the different learning styles in the class, is appropriate (Felder & Brent, 2005; Reid, 1987). Felder and Brent (2005) assert that a teaching style which responds to one learning style would not address the needs of the rest of the students in the class. This was confirmed by the key informants of this doctoral study in their recommendations for criteria for a learning styles assessment instrument which would take into consideration that there is no "one size fits all" approach.

Kolb (1984) and Robotham (1999) argue that students come to a learning environment with a learning style already developed, and that if they find a mismatch between their own learning styles and the lecturer's teaching style, they are likely to reject the learning environment. Mismatch between teaching styles and learning styles could make students lose interest in class, leading to poor performance on tests and examinations, to failure of their courses, and ultimately to dropping out (Felder & Silverman, 1988; Williamson & Watson, 2007).

3.6 STRENGTHS AND WEAKNESSES OF THE LEARNING STYLES APPROACH

Although there is no clarity and consensus around the concept of learning styles, a vast amount of literature is devoted to the development of a number of instruments designed to measure individual learning styles (Robotham, 1999). Robotham (1999) suggests that in measuring learning styles, one should utilize the most distinguished instruments available.

There has been much debate about learning styles (Gould & Caswell, 2006). Such styles look at how individuals process information, taking into consideration the role of cognitive and affective processes (Vawda, 2005). There is also a belief that learning is enhanced when the learning material is designed so that it matches the different learning styles (Dunn, Deckinger, Withers & Katzenstein, 1990).

Research on learning styles has contributed to improving quality in higher education, especially among students from disadvantaged educational backgrounds.

Acknowledgement of these students' learning styles, recognizing their strengths and weaknesses, gives the lecturer important information. Research has shown that college students' knowledge of their own learning styles increases academic success and reduces the dropout rate (Rochford, 2004). Similarly, studies on learning styles conducted in South Africa in different faculties and departments have confirmed the relationship between learning styles and academic performances (Mokoena, 1997; Van Rensburg, 2002; Vawda, 2005).

Asimeng-Boahene and Klein (2004), Felder and Brent (2005), Manning and Baruth (2000), Rochford (2004), Sloane, Daane and Giesen (2004) and Stevenson and Dunn (2001) all argue that matching students' learning styles to the lecturers' teaching styles results in the students having a positive attitude towards their course, and positively affects increased academic performance and retention.

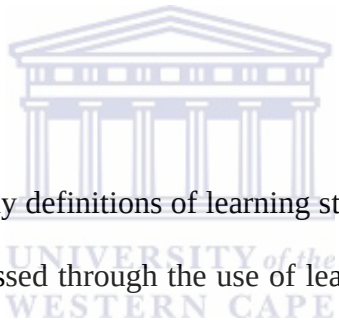
One criticism is that there are many definitions of learning styles, which causes confusion (Bowles, 2004; Gould & Caswell, 2006; Markham, 2004; Vawda, 2005). Learning styles have also been criticized for encouraging a division between those who fit the model and those who do not. Those who do not fit the model could be regarded as needing remedial work and treated differently (Asimeng-Boahene & Klein, 2004; Cassidy, 2004; Cuthberts, 2005). Cuthberts (2005) criticized the use of learning styles for encouraging an individualistic approach to learning and ignoring the context in which the learning takes.

Some studies caution against encouraging students to adopt a particular learning style on the grounds that the students could become "intellectually short-sighted" and tend to avoid learning situations which were not within their personal learning range (Robotham, 1999, p. 6).

Ladd and Ruby (1999) and Robotham (1999) argue that students change their learning styles depending on the task at hand, and it is therefore difficult to design a teaching style which responds to a particular learning style.

A study by Cassidy and Eachus (2000) provided evidence to show that students do change their learning styles in different learning environments under certain circumstances. Reid (1987) contends that a student should display the ability to select a suitable learning style from a variety on the basis of the demands of the learning situation and of his or her own learning capabilities.

Learning styles assessment instruments have been criticized for weakness in reliability and the validity of their measurements (Markham, 2004). Misuse of the learning styles assessment instruments could lead to stereotyping of students by categorizing them and denying them chances of developing fully (Reid, 1987).



In summary, although there are many definitions of learning styles, the existence of learning styles is acknowledged. They can be assessed through the use of learning styles assessment instruments to provide students and teachers or lecturers with information which could be valuable in the teaching and learning situation. Knowledge of students' learning styles by lecturers could assist the lecturers in planning their lessons, and theoretical knowledge about learning styles could help them to enrich their teaching and learning practices.

3.7 RELEVANCE FOR SOUTH AFRICA

Various studies on learning styles have been conducted in South Africa, including in different faculties and departments in the higher education context (Cekiso, 2000; Gauss, 2002; Mokoena, 1997; Motuang, 1998; Mzalisi, 1997; Van Rensburg, 2002; Vawda, 2005). Motuang (1998), Mzalisi (1997), and Van Rensburg (2002) conducted their studies in Health Sciences. Gauss's

(2002) study was conducted in psychology, while Vawda (2005) conducted research into higher education in general. Some of these studies have confirmed the positive relationship between learning styles and academic performance.

Mokoena (1997) undertook research to explore and describe the learning styles of first-year students from diverse educational backgrounds. In this study, the differences, preferences and influences associated with learning styles and orientation of learners were exposed. The conclusion was that first-year students' approaches to learning were ineffective. This ineffectiveness stemmed from negative attitudes towards learning, lack of foresight in their learning, and ineffective study methods. However, it emerged that early identification of these learners and their learning styles could improve their academic performance.

Motuang (1998) studied the learning styles of students at Nursing Colleges associated with Medunsa. The findings revealed that every student uses more than one learning style. It was found that students at the fourth year of study used an extra learning style as compared to students in the first year. This study called for a variety of teaching strategies in order to expand learning.

A study done by Cekiso (2000) on the relationship between student learning styles and performance on ESL tasks revealed that students have a variety of learning styles that they use on a variety of ESL tasks. The findings indicated that students performed well if the task at hand favoured their learning styles.

Gauss (2002) studied the personality, associated learning styles and academic performance of third year psychology students. In this study, the Myers-Briggs Type Indicator (MBTI) was used for data collection. The findings for this study revealed the predominance of type preferences for Extroversion, Sensing, Thinking and judging. Poor academic achievement was associated with type preference for Sensing and Perception.

Research conducted by Vawda (2005) described the learning styles of first-year students, and explored the relationship between the learning styles using Kolb Learning Style Indicator and academic performance for students in various faculties. This study found that the majority of learners were divergers and accommodators, but did not find a significant relationship between learning styles and academic performance.

A study conducted by Van Rensburg (2002) aimed to present an analysis and exploration of the concept of learning styles, and to develop a learning style instrument and a conceptual model which could address the implications of the concept of learning styles in higher education. It was conducted with students in Health Sciences at one institution of higher learning. This resulted in the development of a Learning Style Assessment Tool (LSAT); this is a user-friendly instrument which assesses learning styles for students in higher education. The LSAT was adapted from the Kolb Learning Style Indicator and the Marshall and Merritt Learning Styles Questionnaire.

The landscape of South African institutions of higher education shows an increase of racial and ethnic diversity within the student body (Biggs, 2003; Vawda, 2005). The South African education system is trying to address previous inequalities in education, and respond to failure and dropout rates among learners (Department of Education, 1997). In higher education there has been emphasis on access, diversity, retention and lifelong learning, and for this reason it is advised that the learning styles of learners and the teaching styles of educators be explored.

Tuition costs in institutions of higher learning are very high, and there is therefore a demand from both parents and the Department of Education to improve the quality of teaching and learning in the most effective way possible.

In order to address these challenges, the South African education system has undergone changes which have seen the introduction of a learner-centred, outcome-based system of education (Vawda, 2005). Outcome-based education seeks to acknowledge and accommodate the learning needs of students; especially those who were previously disadvantaged (Gauss, 2002).

Students from previously disadvantaged educational backgrounds are often under-prepared for tertiary learning. While this is the case, such learners also bring to the higher education institutions linguistic, cultural, historical, social, religious, gender, class and other identities, and ways of learning which need to be affirmed and validated (Goduka, 1998; Smith, 2002). Ramphele (1995) argued that South African higher education institutions need to provide access to the educationally

disadvantaged students. Institutions of higher learning in South Africa need to design learning environments that are a reflection of a multicultural society and acknowledge individual differences among students, so that they can be empowered to participate in a democratic society.

3.8 SUMMARY AND CONCLUSION

This chapter explored eight learning styles models and instruments. Theories underpinning the models and instruments were also briefly explained. The learning styles models and instruments explored were: Kolb LSI, Honey and Mumford LSQ, Gregorc GSD, Felder and Silverman ILS, MBTI, Dunn and Dunn Learning Style Model, Vermunt ILS, the GRSLSS and the C.I.T.E. These instruments were analysed for adoption in the South African Higher Education context. The criteria for analysis of the instruments included accessibility and availability, simplicity of the language used, and being user-friendly. Some of the instruments did not meet the criteria and therefore could not be used for this study.

The C.I.T.E. was selected for adoption for this study because it is a mixed domain consisting of both perceptual and social domains. It is easy to complete, is self-reporting, can be scored manually, and is freely available.

Learning and teaching go together and therefore learning styles interact with teaching styles. Lecturers can use a variety of teaching styles to meet their students' learning needs. Learning styles theory assumes that, once lecturers are aware of their students' learning styles, they can

match their teaching styles with those of the students. However, such matching does not provide solutions for all classroom needs. Other factors, such as classroom climate, previous background, motivation, gender and multicultural issues, will greatly influence the amount and quality of learning which takes place (McKeachie, 1995).

Research on learning styles has been conducted in higher education in South Africa (Cekiso, 2000; Gauss, 2002; Motuang, 1998; Mzalisi, 1997; Van Rensburg, 2002; Vawda, 2005). Van Rensburg (2002) developed a Learning Styles Assessment Tool (LSAT). This study led to the development of a learning styles assessment tool which included students having a voice and in which they were encouraged to think about their learning. The students were asked to reflect on their learning by recalling previous learning experiences, in the process identifying experiences which helped or hindered their learning success.

The next chapter will explain the research design, data collection, and data analysis methodology employed in this study.

CHAPTER FOUR

RESEARCH APPROACH AND METHODOLOGY

4.1 INTRODUCTION

The aim of this study was to develop and evaluate a learning styles assessment tool relevant for the South African higher education context. The quality of a research depends on the consistency between the research questions, research methods, methods and processes of data collection, and data analysis. The suitability of using both qualitative and quantitative research methodologies is therefore explained. The rationale for choosing the different data collection methods is also provided.

This chapter deals with the research design for this study, which includes the research approaches used. The participants and sampling procedures are explained. Data collection and data analysis methods are explored. The trustworthiness of the research is also justified.

4.2 RESEARCH DESIGN

Research design refers to the strategy to combine the different components of the research in a consistent and logical way (Babbie & Mouton, 2001). This study followed a mixed method approach, including both qualitative and quantitative research methods. Using such an approach affords the researcher an opportunity to utilize what is best from both qualitative and quantitative approaches (Creswell, 2003).

Mixed methods are used in triangulation, since every approach has its strengths and weaknesses, and a combination of both qualitative and quantitative approaches increases validity (Babbie & Mouton, 2001). Green, Caracelli, Valerie and Graham (1989) identified the following five advantages of using mixed methods.

- Triangulation: Tests the consistency of the findings obtained through different instruments. This study made use of interviews, questionnaires and focus group methods.

- Complementarity: Clarifies results from one method with the use of another. In this study, focus group discussions qualified scores on the questionnaires.

- Development: Results from one method shape subsequent methods or steps in the research process. Here, interviews with the key informants and their recommendations provided insight as to how to develop the learning styles assessment tool.

- Initiation: Stimulates new research questions or challenges results obtained through one method.

- Expansion: Provides richness and detail to the study, exploring specific features of each method. This study will encourage debate about the use of learning styles in higher education.

4.2.1 Qualitative Research Approach

Qualitative research methodology is descriptive and inductive, focusing on uncovering meaning from the perspective of the participants (Babbie & Mouton, 2001; Patton, 2002; Silverman, 2006; Struwig & Stead, 2001; Willis, 2007).

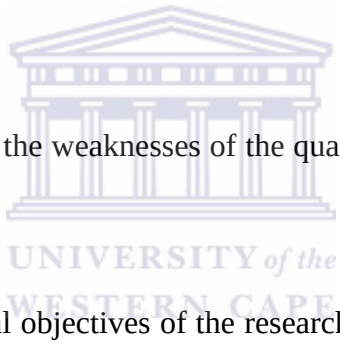
Such a methodology involves gaining an understanding of a particular phenomenon. It enables the researcher to explore the phenomenon in depth, putting emphasis on the process rather than on results, and allowing insights into change processes (Babbie & Mouton, 2001; Denzin & Lincoln, 2005; Silverman, 2006). While the focus in this research was on learning styles, other relevant issues which emerged were also noted. Qualitative research emphasizes both the macro- and micro-contexts (Struwig & Stead, 2001). Context plays an important role in such research, since individuals cannot be studied separately from the context and/or environment in which they are situated (Babbie & Mouton, 2001; Silverman, 2006; Struwig & Stead, 2001; Willis, 2007).

Matveev (2002, p. 2) identified the advantages of using qualitative research methodology as:

- Collection of the primary data in a flexible, non-structured way which allows new information and understanding to surface. (In this study, the researcher allowed other issues to emerge while collecting the data on learning styles; for example, the students in focus groups spoke about issues other than their learning styles.)
- Interaction with the participants in their own language. (In this study, the researcher interacted with those students whose mother tongue was isiXhosa, since she herself spoke the language; those whose mother tongue was Afrikaans could also be understood by the researcher.)
- Providing a holistic view of the phenomena under investigation. (In this study, it meant understanding learning styles and adult learning more broadly.)
- Experiencing the world more realistically and in a hands-on way. (Here, the researcher was involved in the research, gaining information at first hand.)

- Flexible ways to perform data collection, analysis, and interpretation of collected information. (In this study, different data collection methods, such as literature review, interviews, questionnaires and focus group discussions, were employed. The data collected through the various methods were also analysed.)

Qualitative research therefore focuses on the dynamic nature of social events, recognizing the importance of change and process, and examining interrelated events. In this study, the researcher used a qualitative research methodology to obtain an in-depth understanding of issues, particularly in the interviews.



According to Matveev (2002, p. 2), the weaknesses of the qualitative research methodology are as follows; the researcher can:

- Be diverted from the original objectives of the research in response to the changing nature of the context;
- Arrive at different conclusions based on the same information;
- Be unable to investigate causality between different research phenomena;
- Have difficulty in explaining the difference in the quality and quantity of information obtained from different respondents and arrive at different, non-consistent conclusions;
- Require a high level of experience to obtain the targeted information from the respondent; and
- Experience a lack of consistency and reliability when employing different probing techniques, allowing the respondent to choose to tell particular stories and ignore others.

In this study, the qualitative research method was used in the interviews with the initial key informants and in the focus group discussions with students. Through the interviews, the researcher was able to obtain the criteria for developing the learning styles assessment tool, and, through the focus group discussions, was able to obtain information about the usefulness of the learning assessment tool.

4.2.2 Quantitative Research Method

"Quantitative research method involves counting and measuring of events and performing the statistical analysis of a body of numerical data" (Matveev, 2002, p. 2). In this methodology, data are expressed in numbers. Matveev (2002, p. 2) identified the following advantages of using quantitative research methodology, as the researcher can:

- Clearly and precisely specify both the independent and the dependent variables under investigation;
- Follow firmly the original set of research goals, arriving at more objective conclusions, testing hypotheses, determining the issue of causality;
- Achieve high level of reliability of gathered data through controlled observations, laboratory experiments, mass surveys, or other forms of research manipulation;
- Decrease the subjectivity of judgement; and
- Allow for longitudinal measures of subsequent performance of research subjects.

In quantitative research, data are generally collected through the use of a questionnaire, which was a case in this study. Such a research instrument consists of a set of questions aimed at gathering

information from respondents. The advantages of using a questionnaire are that it has standardised answers from which respondents must choose, that it is inexpensive to administer; and that it is easy to administer confidentially when some of the participants want to remain anonymous (Matveev, 2002).

The disadvantages of using a quantitative research methodology (Matveev, 2002, p. 2) include:

- Failure to provide the researcher with information on the context of the situation in which the studied phenomenon occurs;
- Inability to control the environment where the respondents provide the answers to the questions in the survey;
- Outcomes are limited to only those outlined in the original research proposal, due to closed type questions and the structured format; and
- Not encouraging the evolving and continuous investigation of a research phenomenon.

This study used both qualitative and quantitative research methods. The qualitative methodology provided the holistic view of the phenomena under study, thereby making up for the disadvantages of the quantitative research method.

The quantitative data for this study were obtained through the use of questionnaires. In this study, a set of questions was compiled by the researcher in the form of a questionnaire in the evaluation phase. The rationale for using a questionnaire was to obtain the opinions of the students and the key informants about the learning styles assessment developed for this research. Two

questionnaires were designed to evaluate the instrument, one for the students (Appendix C), and the other for the key informants (Appendix D).

The students first had to complete the self–reporting learning styles assessment instrument and then evaluate the instrument using an evaluation questionnaire. The questionnaire consisted of closed-ended questions, but space was provided for additional comments from the participants. The students were required to determine whether they agreed, disagreed or were undecided about specific statements. At the end of the questionnaire, an opportunity was provided for the students to comment freely. Through this process, they were engaged in an interactive discussion with regard to the learning styles assessment tool.

The key informants also had to complete an evaluation questionnaire. Where there were issues which called for further explanation, the key informants were approached for further discussion, using interviews. At the end of the questionnaire, they were given the opportunity to make comments regarding the learning styles tool.

The table below show the research design for this study.

Table 4.1: Research Design

Phase	Activity	Method	Participants
1	Determining the criteria for developing a learning styles assessment tool	Interviews	Eight initial key informants from the four institutions of higher education in the Western Cape
2	Development of learning styles tool	Literature review	The researcher
3	Initial pilot of learning style tool	Questionnaire	20 participants including the eight initial key informants, three lecturers and six students from six different faculties at CPUT, the supervisor, a linguist and a statistician
4	Actual pilot with students from six faculties	Questionnaire	130 students from the six faculties at CPUT
5	Eliciting information about the usefulness of the tool	Focus group discussions	16 focus groups totalling 130 students
6	Evaluation of the tool by students	Questionnaire	130 students from the six faculties at CPUT
7	Evaluation of the tool by key informants	Questionnaire	Five lecturers, four academic development practitioners, two psychologists

4.2.3 Research Context

The Cape Peninsula University of Technology (CPUT) is an institution of higher education which was established as a result of a merger between two Technikons, the Cape Technikon and the Peninsula Technikon. The two institutions, before they became technikons, were called the Cape and the Peninsula Colleges for Advanced Technical Education which catered for apprentices in a variety of trades.

The two colleges were legally established as technikons in 1979: the Peninsula Technikon in Bellville and the Cape Technikon in Cape Town. During the apartheid era all educational institutions were compelled to serve a specific race group. The Cape Technikon catered for White students and the Peninsula Technikon catered for Coloured students.

In 1987, the Peninsula Technikon gave access to students of all races. In the same year the Cape Technikon was granted special permission to have the Government's regulation lifted on the quota for black students. In 1993 the techikons were granted permission to offer degrees: Bachelors, Masters and Doctoral degrees in Technology.

In 2001, the National Plan on Higher Education was formed to change the higher education landscape. Each higher education institution had to submit their programme, qualification mixes and niche areas. In 2005, the two institutions merged and formed the Cape Peninsula University of Technology.

CPUT comprises of six faculties: Education and Social Sciences, Applied Sciences, Health and Wellness, Engineering, informatics and Design, and Business. These faculties offer different courses which lead to qualifications such as Diplomas, Bachelors, Masters and Doctoral degrees in Technology. The following qualifications are offered in the different faculties:**Education and Social Sciences Faculty**: BEd: Further Education and Training (FET) Economic and Management Sciences, BEd General Education and Training Foundation Phase, BEd General Education and

Training (GET) Intermediate and Senior Phase; **Business Faculty**: Accounting (Cost and Management Accounting, Internal Auditing), Events Management, Financial Information Systems, Management, Marketing, Office Management and Technology, Printing Management, Public Management, Real Estate and Tourism Management, Human Resources, Retail Business Management, Hospitality Management and Sports Management; **Applied Sciences Faculty**: Analytical Chemistry, Food Technology, Horticulture, Mathematical Technology, Agricultural Management, Biotechnology, Consumer Sciences, Environmental Health, Environmental Management, Fisheries and Resource Management, Landscape Technology, Nature Conservation and Oceanography; **Engineering**: Chemical, Civil, Electrical, Industrial, Mechanical, Marine and Mechatronics Engineering, Construction Management, Quantity Surveying and Maritime Studies; **Health and Wellness Sciences Faculty**: Optical Dispensing, Somatology, Biomedical Technology, Dental Assisting, Dental Technology, Emergency Medical Care, Nursing (Basic qualification) and Radiography and **Informatics and Design Faculty**: Film and Video Technology, Graphic Design, Information Technology, Journalism, Multimedia Technology, Photography, Architectural Technology, Fashion, Graphic Design, Interior Design, Jewellery Design and Manufacture, Public Relations Management, Surface Design, Three Dimensional Design, Town and Regional Planning.

The relevance of CPUT for this study was that it is an institution of higher education and was chosen because the researcher was employed at the institution and could have easy access to conduct the research.

4.2.4 Participants

This study was conducted with 136 first year students (six students from the initial pilot and 130 students from the actual pilot). First year students registered at CPUT in 2009 were about 7000. These students come from diverse linguistic, educational and social backgrounds. There were also students coming from the African countries, such as Namibia, DRC, Zimbabwe, Angola, Gabon, Cameroon, Botswana, Lesotho, Nigeria and Congo. The first language of most students from the African countries is French. The ages of the students at CPUT ranged from 16 years of age to 50 years of age. The criteria for the selection of the students were that they were first-year students and that they were studying at an institution of higher learning. It is assumed that first year students drop out at institutions of higher education because they do not learn effectively. This study could provide solution to this problem by making students aware of how they learn and hence learn effectively. The first-year students in this study were from the six faculties (A, B, C, D, E and F) at one higher education institution in the Western Cape Province who were selected to pilot and evaluate the tool. They were coded according to the symbols of their respective faculties and to the number of them in each faculty, as follows:

Table 4.2: Faculty and Student Codes

Faculty Codes in Thesis	Students Codes in Thesis
A	SA1 – SA24
B	SB1 – SB18
C	SC1- SC17
D	SD1 – SD31
E	SE1 - SE 22
F	SF1 – SF 18

The participants in this study also included eight initial key informants (the experts in the field of teaching and learning in the higher education context). Eight key informants from the four institutions of higher education in the Western Cape Province were selected to find out whether they supported the idea of developing an instrument or alternative tool which could be used to assess students' learning styles in the South African higher education context. They were purposely selected because they deal with teaching and learning issues in their universities, some of them also engaging in teaching and learning issues nationally. These key informants are what Struwig and Stead (2001, p. 122) call "information-rich participants." This sampling was aimed at answering one of the research questions designed to elicit the views of the institutions of higher learning in the Western Cape on the potential relevance of a learning style assessment tool. The key informants gave the recommendations for criteria to develop the learning styles assessment tool.

Participants in the initial pilot included the supervisor, three lecturers, six students from the six faculties at the Cape Peninsula University of Technology, eight initial key informants, a linguist and a statistician. The purpose for selecting the lecturers was that they had to assess whether tool would be suitable for use by students, the statistician had to assess whether statements were evenly distributed evenly across the questionnaire and the accuracy of scoring, the supervisor who supervised the study wanted to follow the progress of the study and a linguist had to assess the suitability of the language used in the learning styles assessment tool.

The participants also comprised of a further key informants who included lecturers, academic development practitioners and psychologists. These participants evaluated the learning styles assessment tool. The academic development practitioners were selected because of their involvement in student learning, staff development, research and knowledge of learning styles. The psychologists were selected because of their involvement in research, knowledge of learning styles and relevant professional expertise.

Table 4.3: Number of participants and codes

Participants	**Number of participants**	**Code used in thesis**
Initial key informants	**8**	U1(A & B) U2 (C & D) U3 (E & F) U4 (G & H)
Initial pilot	**20 total**	
Supervisor	1	SP
Linguist	1	L
Statistician	1	ST
Initial key informants	8	U1 (A & B), U2 (C & D), U3 (E & F), U4 (G & H)
Lecturers	3	L1, L2, L3
Students	6	S1, S2, S3, S4, S5, S6
Actual pilot	**130 total**	
Students	24 18 17 31	Faculties A: SA1-SA Faculty B: SB1-SB Faculty C: SC1-SC Faculty D: SD1-SD

	22 18	Faculty E: SE1-SE Faculty: SF1-SF
Evaluation of the tool (key informants)	**11 total**	
Subject lecturer	5	SL1, SL2, SL3, SL4, SL5
Psychologist	2	P1 & P2
Staff development practitioner	2	SDP1, SDP2
Student development practitioner	2	SAP1, SAP2

4.2.5 Sampling

Sampling means studying a small, representative group of people, so as to draw conclusions about the whole population (De Vos, Strydom, Fouche & Delport, 2005; Struwig & Stead, 2001). In this study, the researcher used the convenient, non-probability sampling approach in selecting the participants. In non-probability sampling, selection of the participants depends on the discretion of the researcher (Struwig & Stead, 2001; De Vos et al., 2005).

The advantage of this kind of sampling is that it saves on costs, as it makes use of participants who are readily available; the disadvantage is that it does not allow for generalization of the results further than the selected sample (Babbie & Mouton, 2001). In this study, a convenient sampling, with participants chosen on the basis of their accessibility and availability, was used (De Vos, et al., 2005). The researcher used first-year students, psychologists, academic development

practitioners and lecturers at the Cape Peninsula University of Technology, because the researcher was employed at the university and had easy access to both students and lecturers.

The purposive sampling method was used to select the key informants in both instances. In this method, the researcher chooses the participants purposely because they are conversant with the topic under study (De Vos et al., 2005).

Theoretical sampling, which is another form of purposive sampling, was also used. Theoretical sampling involves the selection of data which have theoretical relevance to the topic under study (Patton, 2002). In this study, it was used to collect data on existing learning styles instruments (Van Rensburg, 2002). The advantage of using existing instruments is that it saves time and costs. In the process, the relevant learning styles instrument was selected from nine existing learning styles instruments.

4.3 AIM AND OBJECTIVES OF THE STUDY

The aim of this study was to develop and evaluate a learning styles assessment tool relevant to the higher education context.

The objectives of the study were to:

- Examine existing learning styles theories, models and instruments;

- Identify criteria for the development of a relevant learning style tool for the South African higher education context;
- Develop, implement and evaluate a learning style assessment tool in one higher education institution in the Western Cape in South Africa.

The study was guided by the following questions:

- What does the literature say about learning styles theories, models and instruments?
- What criteria can be used to develop a learning styles assessment tool relevant to the South African higher education context?
- How useful is the tool developed in this study in the context of promoting more effective teaching and learning in a higher education context?

4.4 DATA COLLECTION METHODS

Data collection refers to ways of collecting information for a study. It depends on the conceptual framework, research questions and sampling (Henning, Van Rensburg & Smit, 2004). In this study, the data collection process followed a "cyclical, non-linear process" (Maree, 2007, p. 81). This included data gathering, reflection, and identifying gaps in the data, before returning to collect further data to fill the gaps.

For the purpose of this study, which followed a mixed method design, a literature study was conducted, interviews were carried out, questionnaires were administered, and focus groups were held. This section explores the application of these data collection techniques. In Table 4.4 below (which is a duplicate of Table 4.1)the data collection methods used in this study are highlighted.

Table 4.4: Data collection methods

Phase	Activity	Method	Participants
1	Determining the criteria for developing a learning styles assessment tool	**Interviews**	Eight initial key informants from the four institutions of higher education in the Western Cape
2	Development of learning styles tool	**Literature review**	The researcher
3	Initial pilot	**Questionnaire**	20 participants including the eight initial key informants, three lecturers, six students from six different faculties at CPUT, the supervisor, linguist and a statistician
4	Actual pilot	**Questionnaire**	130 students from the six faculties at CPUT
5	Eliciting information about the usefulness of the tool	**Focus group discussions**	16 focus groups totalling to 130 students
6	Evaluation of the tool by students	**Questionnaire**	130 students from the six faculties at CPUT
7	Evaluation of the tool by key informants	**Questionnaire**	Five lecturers, four academic development practitioners, two psychologists

4.4.1 Literature Study

A literature study involves reviewing an existing available body of knowledge to see how other scholars have explored the topic under study (Mouton, 2001). Mouton (2001) stated the importance of a literature study:

- To avoid duplication of a previous study;

- To determine current theories about the topic under study; and
- To identify the available valid and reliable instruments.

For this thesis, the literature study involved identifying and analysing literature containing information relating to learning styles. This was reviewed in order to answer the research question: What does the literature say about learning styles theories, models and instruments?

Data were collected through a literature search which included exploring and analysing relevant documents. Those on learning styles theories and instruments included both primary and secondary sources, such as books, research reports, journal articles, and theses. The instruments analysed were:

- Kolb Learning Style Inventory
- Honey and Mumford Learning Style Questionnaire
- Gregorc Style Delineator
- Felder and Silverman Index of Learning Styles
- Myers-Briggs Type Indicator (MBTI)
- Dunn and Dunn Learning Styles Model
- Vermunt Inventory of Learning Styles
- Grasha Reichmann Student Learning Styles Scales
- The Center for Innovative Teaching Experience (C.I.T.E.)

The learning styles theories and instruments were discussed extensively in Chapter 3.

4.4.2 Identification of the Learning Styles Instrument

The Center for Innovative Teaching Experiences (C.I.T.E.) instrument was selected and adopted for this study. The C.I.T.E was selected because it was freely available, the language used was simple and understandable, its scores were easy to calculate manually, it offered understandable explanations for learning styles, and it was relatively easy to interpret.

The Center for Innovative Teaching Experience learning style instrument was created by Babich, Burdine, Albright and Randol (1975) to assist teachers at Murdoch Teachers Center in Wichita, Kansas, in determining their students' preferred learning styles. The C.I.T.E. instrument focuses on three main areas: information gathering, work conditions, and expressive preference. The scoring on the Learning Style Inventory identified three categories, namely:

- The *major learning style* – the student prefers to use this style of learning most of the time, but this does not limit him or her to one learning style,
- The *minor learning style* – the student uses this learning style, combining it with other learning styles, and
- The *negligible learning style* – one the student least prefers to use; he or she would rather make use of other learning styles.

The instrument is described fully in Section 4.4.4.

4.4.3 Interviews

An interview is a dialogue between the researcher and the interviewee, aimed at collecting information about the topic under study (Rossouw, 2005).

Semi-structured interviews, which are a combination of structured and unstructured interviews, were used with initial key informants in this study. The rationale for using semi-structured interviews was, firstly, to establish rapport with the participants; secondly, to allow some form of flexibility in which the interviewee could entertain other responses emerging from the interview; and, thirdly, to allow the researcher to be an active listener. Such an interview "provides a better access to interviewee's views, understanding and experiences" (Silverman, 2006, p. 114).

Interviews have both strengths and weaknesses. A major strength is that the researcher can obtain a large amount of data in a short space of time. Weaknesses include:

- Unwillingness of the participants to share information, and the researcher asking questions which do not provide the required answers. (This was not the case in this study, as the interviewees were willing to share the information.)
- Researcher's poor interviewing skills, an inability to phrase questions properly, or lack of understanding of the interviewee's culture or frame of reference, which may result in inadequate collection of data. (To avoid this, the researcher in this study had preset questions ready to ask the participants.)

A challenge encountered by the researcher in this research was that of coping with unexpected events. Because of the busy schedule of the key informants in the four institutions of higher learning in the Western Cape, the initial interviews did not take place at scheduled times.

Through the use of a tape recorder, the researcher obtained a large amount of data, which was later transcribed and analysed. The rationale for using a tape recorder was that it allowed for a fuller record than written notes. It also allowed the researcher to concentrate on other aspects of the interview, rather than taking notes. The disadvantage of using a tape recorder is that participants may feel uncomfortable with it; in this study, however, the subjects were comfortable with the researcher using a tape recorder during the interviews.

Semi-structured interviews were conducted with the eight key informants in the four institutions of higher learning in the Western Cape. During the interviews, preset questions (see Appendix B) were posed to the participants; they were, however, allowed to discuss issues beyond the confines of these questions. By making use of this technique, the researcher was able to get responses from the set questions, as well as explanations on issues which arose from these questions (Struwig & Stead, 2001; De Vos et al., 2005).

The aim of the interviews with the initial key informants was to obtain their understanding of the learning styles instruments, and their views on the development of a learning styles assessment tool or process that would be relevant to the South African higher education context.

Summaries of the interviews were given to the initial key informants for comments and validation. On the basis of their recommendations, a learning styles assessment tool was developed.

4.4.4 Development of a Learning Style Tool and Process

The Center for Innovative Teaching Experiences (C.I.T.E.) instrument, which was adapted for the purpose of this study, consists of 45 statements. The C.I.T.E evaluates three aspects: information gathering, work conditions, and expressiveness. Information gathering includes auditory language, visual language, auditory numerical, visual numerical, and kinaesthetic tactile.

The work conditions element is used to determine whether the student works best alone or in a group, while the expressiveness component helps to determine whether the student prefers oral or written communication.

The statements are divided into five sections measuring the nine learning styles: visual language, visual numerical, expressive written, expressive oral, social individual, social group, auditory language, auditory numerical, and kinaesthetic. Scores on the C.I.T.E. give feedback on the students' major, minor or negligible learning styles. Participants were required to assess themselves using a four-point rating scale; this ranged from ratings of 1 and 2 for `least like me' to 3 and 4 for `most like me'.

The C.I.T.E. has been used in various projects in the United States of America (Pyzdrowski, Butler, Walker and Pyzdrowski, 2007). For example, it was used to explore the learning styles of students in an algebra class (Pyzdrowski et al., 2007), in identifying the learning styles of non-English speakers in Colorado (Reid, 1990), in a pilot project for an English as a Second Language

programme in Colorado (Reid, 1982), and with several other ESL students across the United States (Reid, 1983). The instrument was adapted by Reid (1987) from the C.I.T.E. for ESL students.

In this study, the learning styles assessment questionnaire was adapted from the original version of the Center for Innovative Teaching Experience (Babich, et al., 1975). A revised learning style tool was then developed for the South African higher education context, based on the criteria suggested by the initial key informants.

The learning styles assessment tool which was developed for this study consisted of a writing exercise and a learning styles assessment questionnaire (Appendix E). The questionnaire in the revised tool consisted of the 27 statements, some of which were changed. The table below illustrates the changes made to the statements.

Table 4.5: Changes made to the statements in the learning styles questionnaire

Original statements	**Changed statements**
1. When I make things for my studies, I remember what I have learnt better.	1. When I am involved in practical work, I remember what I have learnt better.
2. Written assignments are easy for me.	2. I enjoy doing written assignments.
3. I learn better if someone reads a book to me than if I read silently to myself.	3. I learn better if I listen in a lecture than when I study on my own.
5. Having assignment directions written on the board makes them easier to understand.	5. Having clear instructions on how to do an assignment makes it easier to understand.
6. It's harder for me to do a written assignment than an oral one.	6. I would rather do an oral presentation than write an assignment.

7. When I do math problems in my head, I say the numbers to myself.	7. I can solve maths problems without writing them down.
9. I understand math problem that is written better than one I hear.	9. I understand maths better when I see the numbers written down.
10. I don't mind doing written assignments.	10. I would rather write an assignment than be involved in discussions.
13.Iwould rather read a story than listen to it read.	13. I would rather read a book than listen to somebody reading to me.
14. I feel like I talk smarter than I write.	14. I engage more in discussion than writing on my own.
15. If someone tells me three numbers to add I can usually get the right answer without writing them down.	15. I work better with numbers when they are given to me orally.
18. Writing a spelling word several times helps me remember it better.	18. Drawing something help me understand it better.
20. It is more fun to learn with classmates at first, but it is hard to study with them.	20. When I work on an assignment I like working alone.
21. I like written directions better than spoken ones.	21. I prefer written directions to spoken ones.
22. If homework were oral, I would do it all.	22. I prefer oral tests/examinations than written ones.
27. The things I write on paper sound better than when I say them.	27. I prefer written tests to oral tests.

The tool was developed on the basis of the recommendations of the key informants, who suggested that it should:

- Create awareness about learning styles: The tool could assist the students in identifying and thus creating awareness about their own learning styles.
- Support teaching and learning in higher education: Section A of the tool allows the students to write about their past learning experiences and identify their strengths and

weaknesses in learning. Lecturers can thus see how students learn and how to assist them to learn better and to succeed.

- Allow students to interrogate how they learn: Awareness of learning styles and the writing exercise could assist the students to reflect on their learning and identify their best ways of learning.

- Encourage interactive discussion among students and lecturers: Awareness of learning styles by both students and lecturers potentially could create a platform for interactive discussions which could improve both teaching and learning.

- Allow students to express themselves in their own words: The writing exercise could provide them with a voice, encouraging them to express themselves in their own words about how they learn.

The key informants provided valuable input as to the form and criteria for the development of the learning styles assessment tool.

The final learning styles assessment tool developed for this study consisted of three sections. Section A was the writing exercise, where the students had to write about their learning experiences and how these had helped them to succeed. Section B comprised a learning styles assessment questionnaire, while Section C consisted of a learning style profile in which the students could plot their learning styles.

The aim of the instrument was to describe how the students preferred to learn. The final learning styles tool contained 27 items. For each item, the user had to identify on the scale of 1-4 whether the item was 'least like them' or 'most like them' (1-2 being least like them and 3-4 being most like them). There were no wrong or right answers. The user could then identify his or her learning style using the scoring sheet developed for the Center for Innovative Teaching Experiences (Appendix E). The learning styles identified on this scoring sheet were: kinaesthetic tactile, visual language, visual numerical, auditory language, social individual, social group, expressiveness oral, and expressiveness written. The students could choose from the responses as depicted by the table below.

Table 4.6: Learning Styles

Learning Style	Statement
Visual language	• Having clear instructions on how to do an assignment makes it easier to understand. (statement 5) • I would rather read a book than listen to somebody reading to me. (statement 13) • I prefer written directions to spoken ones. (statement 21)
Visual numerical	• Written maths problems are easier for me to do than the ones given orally. (statement 17) • When I see numbers it makes it easier for me to work with them. (statement 25) • I understand maths better when I see the numbers written down. (statement 9)
Auditory numerical	• I work better with numbers when they are given to me orally. (statement 15) • I remember numbers for long without writing them down. (statement 23) • I can solve maths problems without writing

	them down. (statement 7)
Auditory language	• I learn better when I listen in the lecture than when I study on my own. (statement 3) • I remember things I heard better than those I have read. (statement 11) • It is easier for me to understand what I have read than what I have heard. (statement 19)
Kinaesthetic tactile	• When I am involved in practical work, I remember what I have learnt better. (statement 1) • Drawing something helps me understand it better. (statement 18) • I like projects where I have to make things with my hands. (statement 26)
Social group	• I like to work in a group because I learn from others in the group. (statement 16) • I get more work done when I work with others. (statement 24) • If I need help in the subject, I ask a classmate for help. (statement 8)
Social individual	• I learn best when I study alone. (statement 4) • I remember more of what I learn if I learn it when I am alone. (statement 12) • When I work on an assignment I like working alone. (statement 20)
Expressive oral	• I would rather do an oral presentation than write an assignment. (statement 6) • I engage more in discussions than writing on my own. (statement 14) • I prefer oral tests/examinations to written ones. (statement 22)

Expressive written	• I enjoy doing written assignments. (statement 2) • I would rather write an assignment than be involved in discussions. (statement 10) • I prefer written tests to oral tests. (Statement 27)

Instructions on how to use it were provided in the tool. Guidelines giving an explanation of the different learning styles were also given as an appendix. In order to complete the instrument, the users needed to indicate, by using the numerical values, whether the statements were least like them or most like them. The total score was obtained by adding the numerical values, and multiplying the result by 2. The total scores identified whether the students had major, minor or negligent learning styles relating to that area. The tool developed for this study is attached (Appendix E).

As mentioned in Chapter 3, several learning styles instruments were analysed in the process of trying to find a suitable instrument, either as it was, or adjusted or changed for the purpose of the study. Making use of an available learning styles assessment instrument is advantageous in the sense that it saves the time of creating such an instrument from scratch (Van Rensburg, 2002).

In selecting the instrument, the criteria from the key informants were taken into consideration:

- Create awareness about learning styles
- Support teaching and learning in higher education

- Allow students to interrogate how they learn
- Encourage interactive discussion among the students and lecturers
- Allow students to express themselves in their own words

The following criteria were also considered:

- *Availability and accessibility*: Most of the existing instruments could not be accessed because of copyright restrictions and their high cost. It was important that the instrument selected should be freely available and easily accessed.
- *User friendly*: It was important that the tool should be completed manually, without the need for sophisticated technology, since the majority of students did not have access to such technology.
- *Simplicity*: South Africa has eleven official languages, but the language of teaching and learning in most higher education institutions is English. This means that most students in such institutions learn in a language that is not their first language. It was therefore important that the tool should use a simple, understandable and easy-to-interpret language.

The C.I.T.E was therefore adapted and constructed for suitability in the higher education context. This adapted tool had to comply with the recommendations of the key informants. The adapted learning styles assessment tool also had to satisfy some psychometric characteristics, such as validity and reliability.

Validity

Validity refers to whether the tool measures what it claims to measure (Babbie & Mouton, 2001; De Vos et al., 2005; Henning, Van Rensburg & Smit, 2004; Struwig and Stead, 2001). There are different types of validity, such as face validity, content validity, construct validity, and criterion-related validity.

Face validity refers to whether the tool appears to measure what it claims to measure (De Vos et al., 2005). It is concerned with the outward appearance of the instrument. Face value is important because, without it, the participants will not see why they should complete the questionnaire. Content validity refers to "the extent to which the items reflect the theoretical content domain of the construct being measured" (Struwig & Stead, 2001, p. 139), and covers the entire meaning of the concept. Content validity depends on the judgement of experts to determine its validity.

Construct validity is "concerned with what the tool is measuring and the how and why the instrument functions the way it does" (De Vos et al., 2005, p. 162). It is concerned both with the instrument and with the underlying theory (De Vos et al., 2005).

Criterion-related validity examines the relationship between the results of the tool and the external criterion which measures the concept being studied (De Vos et al., 2005; Struwig & Stead, 2001).

In determining the validity of a tool, the following questions are usually posed (De Vos et al., 2005):

- Does the instrument appear to measure what it claims to measure?
- How well does the instrument measure what it is supposed to measure?
- How does the instrument compare with other external criteria which claim to measure the same thing?
- What does the instrument measure and how and why does the instrument function the way it does?

In developing the tool for this study, the researcher retained the nine areas from the original instrument; these were visual language, visual numerical, expressive written, expressive oral, social individual, social group, auditory language, auditory numerical, and kinaesthetic. From the review of literature on learning styles, and from the students' comments from the piloting process (refer below), the researcher decided on three statements for each of the nine areas, resulting in a total of 27. The statements asked the same thing but in different forms. Reid (1987, p. 325) contends that "a self-reporting instrument, in which questions are asked in different forms but measure the same idea, helps average out idiosyncrasies, thereby improving the validity of the measurement process".

The tool was presented to a linguist who looked at whether the statements were clear and unbiased and a statistician who looked at the even distribution of statements in the questionnaire and the accuracy of scoring.

Face, construct and content validity were obtained through consultation with the initial key informants and through piloting the tool to the higher-education students.

Reliability

Reliability refers to whether the tool would yield the same results if it were applied repeatedly to the same subjects under the same or similar conditions. It is therefore concerned with the consistency of the tool in measuring what it claims to measure. A reliable tool is one which yields the same results each time it is used.

To examine the reliability of the tool in this study, it was first piloted to 20 participants who included the eight initial informants, six students, three lecturers, a linguist, a statistician and the supervisor. All the participants were given the learning styles assessment tool. The students were required to complete the learning styles assessment tool in order to create awareness of and identify their learning styles. The initial key informants were given the learning styles assessment tool to validate whether the learning styles assessment tool was developed based on their recommendations. The linguist was given the learning styles assessment tool in order to check on the clarity of the language used in the tool. The statistician was given the learning styles assessment tool to ensure that the structure of the learning styles assessment tool was satisfactory, for example, the statements were evenly distributed and the accuracy of the scoring. The key informants, the lecturers, the statistician and the linguist suggested some changes which were subsequently affected before the actual piloting took place.

It was then piloted to 130 students from six different faculties (Faculties A, B, C, D, E, and F) at the Cape Peninsula University of Technology. Valuable information was gathered from the pilot study. A pilot study is a small study conducted to determine whether the research methodology and design are appropriate before the main research is done (De Vos et al., 2005).

To determine the appropriateness of the tool in this study, an initial pilot of the tool was conducted before the actual pilot was conducted. The findings from the pilot study cannot be generalized. The advantage of conducting such a study is that mistakes can be corrected at minimal cost.

This research involved such a process. The table below depicts the programme followed in piloting the tool to students.

Table 4.7: Programme for piloting the tool

Phase	Type of activity	Detail of activity	Responsibility	Purpose
1	Initial pilot	PART 1: Writing exercise Students wrote about their past learning experiences, and were asked to mention their learning strengths that helped them to succeed. PART 2: Completion of a questionnaire adapted from C.I.T.E. learning style instrument.	Initial key informants (8) Lecturers (3) Students (6) Statistician (1) Linguist (1) Supervisor (1)	To determine the appropriateness of the tool to assess learning styles.

2	Actual pilot Questionnaire	PART 1: Writing exercise Students wrote about their past learning experiences, and were asked to mention their learning strengths that helped them to succeed. PART 2: Completion of a questionnaire adapted from C.I.T.E. learning style instrument.	First year students (n=130), under the guidance of the researcher in the presence of the lecturers. Students completed the self-scoring learning styles questionnaire. (n=130)	To individually reflect on their past learning experiences to give them an opportunity to reflect on their learning behaviour. To assess the students' learning styles in order to identify their dominant learning styles.
3	Focus groups discussion	Students discuss their responses in groups.	Students, facilitated by researcher.	To interrogate and gain insight into how they learn so that they can identify their strengths in learning and use these strengths to improve their learning.

Table 4.7 explains what was done, how, when and by whom, when the tool was piloted. Once the tool was developed, an initial pilot was conducted with the eight initial key informants, three lecturers, a linguist, a statistician and six students from the six faculties (Faculties A, B, C, D, E, F) at the Cape Peninsula University of Technology (CPUT). Valuable information was obtained from the initial pilot.

The actual pilot was conducted with 130 first-year students in the six faculties at CPUT. The students had to write about their learning experiences, before completing the self-scoring learning styles assessment questionnaire. Both the writing exercise and the questionnaire were collected by the researcher.

This was followed by focus group discussions with the students, conducted by the researcher, about the usefulness and practicality of the tool.

4.4.5 Focus Group Discussions

A focus group is a form of qualitative research in which a group responds to questions. In such discussions, the interviewer asks group members specific questions about a topic, usually after a great deal of the research have been concluded (Denzin & Lincoln, 2005). The advantage of using focus group discussions is that they generate data and insights which would be less accessible without the interaction found in a group setting (Babbie & Mouton, 2001; Maree, 2007). In addition, they are inexpensive, provide immediate responses to questions raised, and are cumulative and elaborative (Maree, 2007). The disadvantages of such discussions are that the researcher has less control over a group and that time can be spent on issues which are irrelevant to the topic discussed (Patton, 2002). A further disadvantage of a focus group is that it can be dominated by outspoken individuals who make it difficult for the less outspoken members to participate.

In this study, the researcher gave the students chances to speak, and the less assertive students in particular were encouraged. Speaking in their first language was permitted and in cases where the researcher did not understand the language (for example, French); other students were asked to interpret. In this study, focus groups were used after the students completed the learning styles questionnaire. They were also used as a form of triangulation to validate the information obtained in the learning styles assessment tool.

The focus groups consisted of an average of 8-11 students per group. In the six faculties, the number of students who participated varied. In the Faculty of Health and Wellness, for example, there were 24 students, which meant that there were three focus groups of eight students. In the Faculty of Engineering there were 18 students, with two focus groups of nine students each.

In the Faculty of Informatics and Design, there were 17 students, which meant that there were two focus groups, one of eight students and the other of nine students. In the Faculty of Business, there were 31 students, with two groups of 10 students and one group of 11 students. In the Faculty of Education and Social Sciences, there were 22 students, with two groups of 11 students. And in the Faculty of Applied Sciences there were 18 students, which meant that there were two focus groups of nine students. Altogether there were 16 focus groups. The researcher facilitated these discussions, making notes, writing down important points emerging from the discussions with the groups.

In the focus groups, the discussion was guided by the following questions:

- How was the tool useful to them as students?
- Was the tool able to help them identify their learning styles?
- What can be done to improve the tool?

4.5 DATA ANALYSIS

Data analysis refers to interpretation and understanding of the raw data to respond to the aims of the study and the research questions (Henning, van Rensburg & Smit, 2004). A variety of methods, including interviews, questionnaires and focus group discussions, was used to collect data. In this study, for ethical purposes, the names of the participants and faculties were not used; instead, they were given codes.

4.5.1 Interview Analysis

A tape recorder was used to record the initial interviews, since it allowed for the collection of a large volume of data. Data from the interviews were transcribed and analysed to identify the criteria for a learning styles tool relevant to the South African higher education context. This was done through selection, identifying themes and putting together information, in an organized way, in order to identify patterns and measure how frequently they occurred. The transcripts were read repeatedly in order to establish the criteria to be used for the development of the learning styles assessment tool. The main criteria that emerged were:

- Create awareness about learning styles.
- Support teaching and learning in higher education.
- Allow students to interrogate how they learn.
- Encourage interactive discussion among the students and lecturers.

4.5.2 Analysis of Learning Styles Instruments

The existing instruments were analysed in order to explore the possibility either of using them as they were or of changing them. The suitability of each instrument was thus considered. Theoretical analysis of existing instruments was done to determine their uses, strengths, weaknesses, applicability, validity and reliability. Criteria recommended by the key informants were taken into account and the issues of simplicity, accessibility, and availability were also assessed. During analysis, the suitability of the instrument for the South African higher education context was considered centrally important.

4.5.3 Analysis of Writing Exercises (in learning styles tool)

In the writing exercise, preceding the completion of the questionnaire, the researcher looked for learning styles, without ignoring the impact of other issues on the students' learning experiences. The responses from the writing exercise were analysed, themes and patterns were identified. The learning styles created the main themes, while emergent sub-themes included those of language, the role of mature students and peer pressure. This type of data analysis is referred to as concept map or pattern map (Henning, et al., 2004). The concept technique puts the main concept (in this study, that of learning styles) at the centre, and then links the other concepts to this main concept (Henning, et al., 2004). Here, the other concepts were understood in relation to learning styles.

4.5.4 Analysis of the Pilot of the Learning Styles Assessment Tool

An initial pilot of the learning styles assessment tool was conducted with six students from the six faculties at CPUT. It was then piloted with 130 students in the six faculties at the Cape Peninsula University of Technology, and was analysed by the students themselves using the score sheet provided (Appendix E). After completing the questionnaire, the students had to calculate the

scores manually. In order to identify the learning styles, the calculations required that the numbers be added and the total then multiplied by two. With the calculations, students could make mistakes and therefore fail to identify their learning styles accurately. This is recognized by Reid (1987) as one of the weaknesses of learning style assessment. To avoid the students making mistakes with their self-reports for this study, the researcher checked their calculations for accuracy and reliability. A score of between 21 and 27 for a learning style meant that this was the student's major learning style. A major learning style is one that the student prefers to use and feels comfortable with using. A score of 12-18 meant a minor learning style; this is one that the student usually uses as a second choice, in conjunction with other learning styles. A score of between 6 and 9 meant a negligible learning style, one which the student preferred not to use.

4.5.5 Analysis of Focus Group Discussions

Discussions in focus groups were held with the students about the usefulness of learning style tools. Thematic analysis was employed for the analysis of the focus group discussions.

Transcripts were read repeatedly and themes were noted. Information gathered from the focus group discussions was analysed to establish the usefulness of the tool for typical higher education students. Most of the issues raised in the focus groups were more or less similar to those which emerged from the writing exercise.

4.5.6 Analysis of the Evaluation of the Tool

The learning styles instrument developed for this study was also evaluated by the students, lecturers and seven key informants, in order to determine its validity and reliability.

The evaluations from the students were analysed statistically by counting and adding up the number of students who agreed, disagreed or were undecided about each statement. The responses from the evaluation by lecturers and key informants were analysed qualitatively. The creation of an awareness of the usefulness of the tool for both lecturers and students was considered important during these analyses.

4.6 TRUSTWORTHINESS OF THE RESEARCH

Trustworthiness is the measure of how far the findings of a study can be trusted (Maree, 2007). The quality of any study is judged by its validity and reliability (Babbie & Mouton, 2001).

In order for research to be deemed good, it must have quality control; this is measured according to logical constructs, such as credibility, transferability, dependability and conformability (De Vos et al., 2005).

Dependability

Dependability refers to showing that the participants in a study are as reliable as the researcher maintains they are (Maree, 2007). In this research, the initial key informants were selected because of their expert knowledge on teaching and learning issues in higher education. The key informants, those who evaluated the tool, were selected because of their involvement in student learning. The students were selected because they had a vested interest in the tool. The linguist, the statistician and the supervisor were selected because of their expertise. All the participants were therefore considered to be dependable.

Credibility

Credibility refers to the degree to which the findings of a study can be trusted (Rossouw, 2005). In qualitative research, the researcher may become involved with emerging issues of bias in the data. In this study, the researcher devoted time to exploring literature through different sources, such as books, articles, research reports, journal articles, and theses. The researcher used different data collection methods to avoid bias, including interviews, questionnaires and focus group discussions. Furthermore, the research was constantly presented to the supervisor.

Transferability

Transferability refers to applicability of the findings of a research to other contexts (Maree, 2007). In this study, the instrument was evaluated for its usefulness by students, lecturers and professionals, who gave positive responses as to the practicality of the tool in the South African context. It was developed as a self-reporting tool, so users do not need the assistance of a researcher to complete it.

However, although the researcher took all the necessary precautions in the development of the tool, determining whether the findings can be transferred to other contexts lies with the users.

Confirmability

Confirmability refers to the strategy which ensures that findings are derived from the data analysis, and not from other sources (Denzin & Lincoln, 2005). The criteria recommending the development of a learning styles assessment tool relevant for the South African higher education context emerged from the data solicited from the initial key informants. The data from the

evaluation and piloting of the learning styles assessment tool provided for the finalisation of the tool. This shows that this study ensured confirmability of the findings.

Validity refers to the "degree to which the measuring instrument measures what it is supposed to measure" (Rossouw, 2005, p. 123). This study used a variety of data collection methods, such as interviews, questionnaires and focus group discussions to validate and cross-check findings (Patton, 2002; Babbie & Mouton, 2001). Triangulation tests the consistency of the findings obtained through different methods (Patton, 2002; Babbie & Mouton, 2001). Using combination of methods increases validity, since the methods can complement each other. To ensure validity in this study, summaries of the interviews were given to the key informants for comments.

Reliability refers to the consistency of the measure (Rossouw, 2005). A measure is deemed consistent if it yields the same results when administered to the same objects over and over again (Mouton, 2001). In this study, the reliability of the tool was not pursued.

4.7 ETHICAL CONSIDERATIONS

Babbie and Mouton (2001) stress the importance of grounding research in ethical practices. The procedures for all ethical practices were followed in this study. Respect for confidentiality and anonymity was maintained, as students who did not want to write their names on the questionnaires were allowed to remain anonymous.

Research agreement forms (Appendix A) for the study were made available, so the participants could determine whether or not they agreed to the terms and conditions of the research. All the participants signed the research agreement forms before commencing with this study. Those students who did not want to do so were excused. The participants were informed from the beginning of the aims and purposes of the study. Issues of confidentiality and privacy were clearly outlined to the students.

Transparency was maintained throughout. After the interviews with the initial eight key informants, summaries of the interviews were given to the participants for comments and validation. The students also saw their own scores.

4.8 SUMMARY AND CONCLUSION

This chapter examined the research methodology and techniques used in the study. A mixed method design, which included both qualitative and quantitative research methodology, was considered to be appropriate. The advantages and disadvantages of using the mixed methods approach were highlighted. Participants and sampling procedures were also mentioned.

The data collection methods used included interviews, questionnaires and focus groups. These methods were considered appropriate for collecting data relevant to the aims and objectives of the study. The data were collected by the researcher. During the data collection process, ethical considerations were observed. The data collected were analysed in relation to the aims and the

objectives of the research. The researcher tried in every possible way to ensure the trustworthiness of the study.

The following chapter presents the findings of the interviews conducted with the key informants to identify the criteria for a learning styles assessment instrument relevant for the South African higher education context.

CHAPTER FIVE

CRITERIA FOR DEVELOPING A LEARNING STYLES ASSESSMENT TOOL

5.1 INTRODUCTION

The aim of this study was to develop and evaluate a learning styles assessment tool relevant for the South African higher education context. This chapter responds to one of the research questions: What are the criteria for developing such a learning styles assessment tool?

Data were gathered through interviews with initial eight key informants, from the four institutions of higher learning in the Western Cape. These were University of the Western Cape, University of Cape Town, University of Stellenbosch, and the Cape Peninsula University of Technology. In this study, these were identified respectively by the codes U1, U2, U3 and U4. Two key informants were selected from each university, and were specifically chosen because they dealt with teaching and learning issues in their institutions; some were also engaged in teaching and learning issues nationally. The key informants were identified as U1 (A & B), U2 (C & D), U3 (E & F), U4 (G & H)

The purpose of the interview was to find out whether the key informants supported the idea of developing a tool which could be used to assess students' learning styles, so as to enhance both learning and teaching in the South African higher education context.

From the recommendations of the informants, a self-reporting learning styles assessment tool, adapted from the Center for Innovative Teaching Experience (C.I.T.E.), was developed.

The following is a summary of the responses of the key informants to the overall interview question: What criteria can be used to develop a learning styles assessment that would be relevant to the South African higher education context? Further specific questions guiding this process were:

- What do you understand about learning styles?
- Does your institution make use of any instruments or do you know of any instruments in use in South Africa that help lecturers identify their students' learning styles in a higher education context?
- Is there a place for using learning styles as a framework for teaching and learning in the higher education context?
- What kind of instrument would be useful in a higher education context?
- What form could this tool take?
- What would you expect from such a tool?
- What criteria do you think should be used when developing such an instrument or tool so that it is relevant to South Africa?
- General comments.

5.2 WHAT ARE LEARNING STYLES?

All the participants, U1 (A & B), U2 (C & D), U3 (E & F), and U4 (G & H), seemed to have some understanding of what learning styles were. Their responses included:

- *How students engage with knowledge (U2C)*
- *Different ways students deal with knowledge (U2D)*
- *How students approach learning (U1A)*
- *Students learn differently and there are many learning styles (U2D)*
- *What students bring into the learning environment (U3F)*
- *Students' identities they bring from school, how they see themselves approaching life (U3E)*
- *Predisposition and general approach a person adopts in a particular context (U4H)*
- *People have different learning styles (U1B)*
- *There are different types of learning styles and people learn differently (U3E)*

The key informants' understandings of learning styles responses included the following.

Students and knowledge, for example:

- *How students deal with knowledge*
- *How students engage with knowledge*

Students and learning, for example:

- *How students approach learning*

- *Students learning differently*

What students bring to the learning environment, for example:

- *Students' identities they bring from school*

Different learning styles, for example:

- *People have different learning styles*

- *There are different types of learning styles*

5.3 USE OF ANY LEARNING STYLES INSTRUMENTS IN SOUTH AFRICA

In all the institutions, the learning style instruments were mostly used for psychometric and career guidance purposes:

- *The psychology department uses learning styles instrument on an individual basis (U1B)*

- *The learning styles instrument is used by the psychology department for career guidance (U4F).*

There were some institutions that used learning styles instruments:

- *In my institution the CHS faculty uses a learning styles questionnaire for all their first year students (U2C).*

- *In our institution, the Engineering Faculty uses the Felder instrument on an ad hoc basis (U1A).*

- *We had one learning styles instrument we used before but did not like the questionnaire because it did not take into consideration what the students have been taught (U3F).*

One participant mentioned the use of a benchmark test: *We only use the benchmark tests (U4G).*

In one institution, one participant said that new lecturers were made aware of learning styles: *All newly appointed lecturers are required to attend a Higher Diploma where they are encouraged to make use of learning styles and teaching styles preferences as a basis for their teaching (U3E).*

Another participant was cynical about learning styles instruments: *I am sceptical about learning styles instruments; there is no evidence of them helping students in their learning (U4G).*

In summary, from the interviews it appeared that learning styles assessment instruments were used mostly by the psychology departments; this was understandable since learning styles originated in psychology. However, there was no evidence as to how the tools were used or what was done with the results. There was no follow-up after the learning styles assessment instruments had been administered. One participant commented: *More often students do not understand why they have to complete these learning styles assessment instruments and they do not even get a feedback about their learning styles (U4G).*

From the interviews, it seems that there is a need for a learning styles assessment tool which supports teaching and learning in higher education. This study could provide one solution for the current vagueness about such tools, and create more awareness of learning styles among both students and lecturers.

5.4 LEARNING STYLES AS A FRAMEWORK FOR TEACHING AND LEARNING IN THE HIGHER EDUCATION CONTEXT

All eight participants agreed that there was a place for the use of learning styles as a framework for teaching and learning in a higher education context. Five of the participants commented that knowledge of learning styles would assist lecturers to know their students:

- *Learning styles knowledge would help lecturers to put personality or substance to the learners, not just to judge or label learners (U3F)*
- *Unless the lecturers know how students learn, they cannot be able to teach them (U2D). If you know the students you can adapt your teaching styles to suit the dominant learning style (U2E)*
- *Knowledge of learning styles would assist lecturers to gain insight into who the students are, not just names on the register* (U3F)
- *Lecturers will look at students differently and will be aware of the rich potentials of learners (U2C)*

One participant cautioned about the use of learning styles instruments, citing that most instruments were not suitable for the South African context: *Learning styles need to be used cautiously because the Eurocentric instruments are dangerous to use in South Africa (U1A).*

Another caution from one of the participants was that learning styles should not be used to "box" students but to liberate them: *Yes, the learning styles can be used as a framework but cautiously because the learning styles instruments box people, but they need to open the boxes (U4G).*

From the interviews, it appeared that the key informants felt there was a place for using some kind of learning style tool in teaching and learning in higher education, and that the tool should be used by both lecturers and students. They saw the benefit of using learning styles as a framework for teaching and learning, and felt that the tool could assist lecturers in understanding their students. They added a caution, however, that Eurocentric instruments might not be relevant in the South African context.

5.5 A TOOL USEFUL FOR THE HIGHER EDUCATION CONTEXT

Different views were expressed about the kind of tool that would be useful for the higher education context. One participant felt that the questionnaire style could be useful: *A tool that is simple and not complicated (U2C).*

There were those who felt that a tick-box style was not suitable for the South African context. One participant commented that: *South Africa's culture is narrative; people need to tell stories of learning rather than a tick box (U1A).*

Four participants commented that the tool should encourage learners to be reflective:

- *The learning styles tool should make everybody in the learning context to be more reflective (U1B)*
- *The learning styles tool should reflect on learning histories and how these histories have shaped one's learning (U3F)*
- *The learning styles tool should make students to be reflective (U2D)*
- *A tool that forms basis for further discussion (U3E)*

Three participants commented that the tool should make students think about their own learning possibilities:

- *The tool must develop meta-cognitive awareness* (U4G)
- *The tool should allow students to use broad potentials of learning (U1B)*
- *The tool should educate students about various possibilities (U2D)*

In summary, the key informants argued for an uncomplicated learning styles tool. This would allow students to talk about their past learning experiences, to think about how they learn, as well as opening up other learning possibilities that they could explore. The informants also expected the tool to lay a foundation for further engagement in discussions by students and lecturers, so that more effective teaching and learning could take place.

5.6 THE FORM OF THE TOOL

Different views were offered as to what form the tool could take, and there were concerns which came out strongly from most of the participants. One felt that the tool should take cognizance of prior learning experiences: *The tool should take into consideration prior knowledge and prior learning practices (U4H).* Two of the interviewees felt that the tool should be simple and easy to complete: *Questionnaire works best and is easy complete (U2D), and a tool that uses simple language and is reflective (U1B).* One participant felt that a clear indication should be given about the use of the results from the instrument: *The learning styles tool should give a clear indication about what is going to happen with the results and that things will be done differently (U3F).*

Another participant felt that the tool should make learners think about their own learning behaviour: *The learning styles tool should enable students to think about their behaviour and how they can improve (U3E).*

Three participants commented that the tool should allow for discussion:

- *A learning styles tool that allows for an interactive discussion after the tool has been used (U2B)*
- *The tool to be followed by an interactive discussion (U4G)*
- *The tool must give allowance for a dialogue (U1B)*

Another comment was that the instrument should concentrate on students' strengths: *The tool should teach the intellectual strengths of learners rather than their weaknesses (U2C).* Another participant felt that it should give the students a challenge: *The tool must shift the learners out of their comfort zone (U3F).*

From the interviews, it appeared that the key informants were asking for a tool that was simple and easy to complete, and that also took into account prior learning and past learning experiences. They further suggested that the tool should provide for an interactive dialogue in which the students could talk about their learning behaviours and how they could improve them. Although they wanted the tool to be easy and simple, they also argued that it should challenge the students and take them out of their comfort zones, tapping into their intellectual strengths.

5.7 WHAT TO EXPECT FROM THE TOOL

The participants had varied expectations from the tool. One felt that it should indicate ways to meet the students' learning needs: *I expect the tool to gives an indication of effective ways to meet the learners' needs (U2C).* Some participants argued for a tool that looked at how students learnt:

- *I expect the tool to look at one's learning, how it is different, and be given time to think about one's learning (U1A).*
- *I expect the tool to assist students to interrogate their learning styles; the tool should help students interrogate their learning styles (U3E).*
- *I expect the tool to make students to be reflective of what maximizes their learning (U4G).*

One participant expected the tool to encourage the students to talk and listen to themselves: *The instrument should encourage internal conversations where learners think and listen to themselves rather than looking at themselves (U1A).*

Another participant expected the instrument to take into consideration the South African context: *I expect the instrument to take the cognizance of the cultural differences in South Africa because European countries are different to South Africa (U3E).*

In summary, the key informants expected the instrument to focus on how students learnt, giving them opportunities to engage in deep thought about their learning, and encouraging them to reflect on what would increase their learning. Once more, the key informants echoed that the tool should take into account the South African context.

5.8 CRITERIA FOR DEVELOPING A LEARNING STYLE INSTRUMENT OR TOOL RELEVANT TO SOUTH AFRICA

Two participants felt that the tool should be something from which both students and lecturers could benefit:

- *I would support something that would work for both students and lecturers (U2C)*
- *The tool should be learner-centred where learners become active participants in their learning* (*U2D*).

Two participants felt that the instrument should allow for the student's voice:

- *Student in her own voice to describe her learning (U1A)*
- *The tool should create space for student's voice (U4H).*

The tool should recognize and acknowledge what the students brought to the learning situation.

For example, five of the participants commented:

- *The tool to build on what students bring into learning (U1B)*
- *The tool should take into consideration that students come from different learning backgrounds (U2C)*
- *The tool to take into cognizance that students come from different backgrounds and the strengths that students bring into the learning environment (U3E)*
- *Lecturers to affirm students about what they have achieved and appreciate students for their strengths (U3F)*
- *The tool should recognize that students are working hard in other contexts which needs to be taken into consideration in the learning environment (U4G)*

One comment was that the tool should take into account the South African context: *The tool should take into account current realities of the South African context (U2D).*

From the interviews, it appeared that the key informants expected a tool to be beneficial for both students and lecturers, and to allow students to be active participants in their learning. They argued for a tool that allowed students to describe their learning experiences in their own words, and that affirmed and appreciated what the students brought to the learning environment. They further argued that the tool should acknowledge and integrate the strengths the students had in other contexts.

5.9 GENERAL COMMENTS

Other comments which emerged from the interviews were that the students should understand the purpose of the tool:

- *The instrument should give clarity on the purpose of the questionnaire (U4G)*
- *The students to get an understanding as to why the tool was developed (U2C)*
- *The instrument should tell people there is no one-fits-all learning style (U1B)*
- *The students should also understand that there are a variety of teaching methods (U1B)*
- *Students to understand teaching and learning is complex, dynamic and changing depending on the context or discipline (U2D)*
- *The instrument should make students understand what effective learning is about and what learners are doing in order to succeed (U2C)*

Other comments were that the tool should open up possibilities:

- *The instrument should open up possibilities that are outside what is expected in higher education (U3F)*
- *The instrument should encourage students' creativity (U1A)*
- *The learning styles tool should expose students to various possibilities (U2C)*

Other comments were that learning should not be boxed by theories, but rather that it should occur spontaneously:

- *Learning should not be boxed by theories* (U1A)
- *Students not to be shaped by the tool but to shape themselves (U4G).*

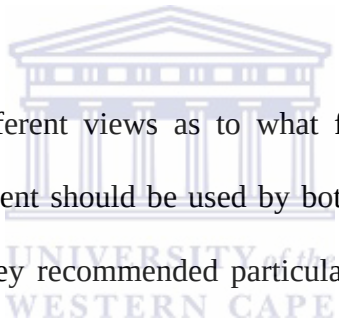
In summary, the key informants wanted a tool whose purpose would be clear to the students, and which would make them aware of the complexity of the teaching and learning situation, in which they would have to contend with a variety of learning styles. They argued for a tool which exposed students to various possibilities, especially those that would encourage creativity. As such, the tool would be shaped by the students, rather than the other way round.

5.10 SUMMARY AND CONCLUSION

The aim of this study was to develop and evaluate a learning styles assessment tool that would be relevant to the South African higher education context. In order to achieve this, criteria needed to

be determined. The key informants in four institutions of higher education were interviewed to determine the necessary criteria.

All the key informants had some understanding of what learning styles were. From the interviews, it appeared that the institutions of higher education did not have a framework for the use of learning styles, except in their counselling departments. However, most participants agreed that there was a place for learning styles as a framework for teaching and learning in higher education, in order to create awareness about learning styles.



The key informants expressed different views as to what form the tool should take. All the participants agreed that the instrument should be used by both lecturers and students in order to enhance teaching and learning. They recommended particular criteria for developing a relevant learning styles assessment tool.

With these criteria in mind, the researcher then selected a learning styles assessment tool from the existing instruments. The tool chosen was that of the Center for Innovative Teaching Experiences (C.I.T.E.), which was adapted to suit the criteria recommended by the key informants. The tool was then piloted to students in one of the institutions of higher education in the Western Cape.

The next chapter presents the findings from piloting the tool as it was developed for this study.

CHAPTER SIX

PILOTING OF THE TOOL

6.1 INTRODUCTION

The aim of this study was to develop and evaluate a learning styles assessment tool relevant for the South African higher education context. In order to create an awareness of learning styles for both students and lecturers, a learning styles assessment tool was developed for the study. To determine the value of using this tool in a higher education context, it was initially piloted with 20 participants including six students, eight initial informatics, three lecturers, a statistician, a linguist and the supervisor and then piloted with 130 students from the six faculties of the Cape Peninsula University of Technology.

The learning styles assessment tool, which was adapted from the C.I.T.E., was divided into three parts: *information gathering,* which consists of auditory language, visual language, auditory numerical, and visual numerical; *work conditions*, which focuses on whether students learn better alone or with one or more other students; and *expressiveness*, which identifies whether the student does better at oral or written communication. The learning styles assessment tool developed for this study was first piloted to a sample of 20 participants including three lecturers, six students, a statistician, linguist and the supervisor. It was then piloted to 130 students in the six faculties at the Cape Peninsula University of Technology. The learning styles assessment tool developed for this study consisted of 27 statements and a writing exercise.

This learning styles assessment tool took into consideration the criteria recommended by the initial key informants. The participants had first to write an exercise describing their previous learning experiences and how these had helped them to learn effectively, after which they went on to complete the questionnaire.

This chapter presents the students' scores from the learning styles questionnaire, and then outlines the findings from the writing exercise. The findings for this self-scoring learning styles assessment tool are presented in tables, arranged according to the different faculties.

6.2 SUMMARY OF THE INITIAL PILOT

Different learning styles emerged from the six students in the initial pilot. These learning styles were:

Table 6.1 Learning styles from the initial pilot

Student	Faculty	Dominant learning style	Less dominant learning style
S1	A	Kinesthetic tactile	Auditory numerical
S2	B	Social group	Social individual
S3	C	Kinesthetic tactile	Social group
S4	D	Social individual	Social group
S5	E	Social individual	Expressive oral
S6	F	Social group	Expressive oral

The dominant learning style for the student (S1) in Faculty A was the *kinesthetic tactile*.

The student with this learning style learns better when they play an active role and are directly involved in the learning process. The less dominant learning style was the *auditory numerical,* a students with an *auditory numerical* learning style learn best when they hear numbers explained orally. This means that the student (S1) in Faculty A does not like to hear number explained to him or her orally.

The dominant learning style for the student (S2) in Faculty B was the *social group,* a student with this learning style prefer to work with one or more people. The less dominant for the student is the *social individual,* a student with this learning style prefer not to learn with other people.

The dominant learning style for the student (S3) in Faculty C was the *kinesthetic tactile.* A student with this learning style learns better when they play an active role and are directly involved in the learning process. The less dominant learning style for the student in Faculty C was the *social group*; a student with this learning style prefers to learn with one or more people.

The dominant learning style for the student (S4) in Faculty D was the *social individual.* A student with such learning style prefers to learn alone. The less dominant learning style for the student in Faculty D is the *social group*. A student with this learning style prefers to learn with one or more people.

The dominant learning style for the student (S5) in Faculty E was the *social individual*; a student with this learning style prefers to learn alone. The less dominant learning style for the student in this faculty was the *expressive oral*. A student with this learning style likes to express him or herself orally, and feels comfortable in talking about their ideas.

The dominant learning style for the student (S6) in Faculty F was the *social group.* A student with this learning style prefers to learn with one or more people. The less dominant learning style of the student in Faculty F was the *expressive oral.* A student with this learning style likes to express him or herself orally, and feels comfortable sharing their ideas.

Comments from the writing exercise included:

- *I think better when I work alone (S5)*
- *Being part of a group has helped me understand work I did not understand before (S6)*
- *I remember practical better because I am involved (S1)*
- *I study better when I make things with my hands (S3)*
- *I get confused when I learn with other people (S4)*
- *Myself and other students have formed a study group where support each other academically and it is working very well for me (S2)*

Different learning styles used by the students emerged from the pilot of the learning styles assessment tool of which some were also confirmed by the writing exercise.

The tool was also piloted with the initial key informants U1 (A & B), U2 (C& D), U3 (E & F), U4 (G & H); lecturers (L1, L2, and L3); a statistician (ST) and the linguist (L); their comments included:

- *It looks good I would like to see the end-product(L3)*
- *It looks interesting(U4G)*
- *The wording seems absolutely fine (L)*
- *It seems fine (L1)*
- *I have changed the layout of the table slightly to force the 45 statements to be on two pages only (ST)*
- *It will help if you pilot it first (U2D)*
- *In the writing exercise, part 1 of the instrument, instead of saying "write a story" rather say "write an account" (U1A)*
- *Mention the length of the writing exercise if not so, it will yield a HUGE amount of data (depending on your sample)(U3F)*
- *I have inserted "more" in statements 44 and 6 since you used comparative "than" (L2)*

The participants suggested some changes to the tool. Some of these changes were made to the tool before the actual pilot took place.

6.3 SUMMARY OF THE STUDENTS' SCORES ON LEARNING STYLES ASSESSMENT QUESTIONNAIRE

The summary of scores from the learning styles assessment questionnaire shows the distribution of the different learning styles among the students. The scores confirmed that the tool had validity, since the participants were able to measure their learning styles and, as a result, assess these styles in the context of their experiences, as expressed in the writing exercise.

It is interesting to note that the responses to the learning styles tool showed that the majority of students had strong, moderate, or low preferences for the different learning styles, depending on the nature of their courses of study. Scores on the C.I.T.E categorize learning styles into major (when the student prefers to use one particular style), minor (where the student uses a learning style as a second choice or together with other styles), and negligible (when a learning style is hardly used or not used at all). Below is the summary of students' scores on the learning styles assessment tool, per faculty.

Table 6.2 Faculty A: Scores on the learning styles assessment tool (n=24)

Learning styles	Frequency/No. of students	Percentage of students
Kinesthetic tactile	**15**	**63%**
Social individual	8	33%
Social group	5	21%
Visual language	10	42%
Expressive oral	**2**	**8%**
Expressive written	3	13%
Visual numerical	4	17%
Auditory language	3	13%
Auditory numerical	**2**	**8%**

Note: the bolded items have been highlighted to show the significance of the findings.

The dominant learning style for students in Faculty A was the *kinesthetic tactile* (63%). These students learn best when they are involved directly; they want to be hands-on in the process of learning and understand the work better when they play an active role. They like to touch and feel the material. The minor learning styles in this faculty were the *auditory numerical* (8%), and *expressive oral* (8%). Students with an *auditory language* learning style learn better when they hear the information. When they learn, they read aloud and listen to themselves speaking. Students with an *auditory numerical* learning style learn best when they hear numbers explained orally. They are able to solve mathematics problems mentally.

Comments from the writing exercise on learning styles included:

- *I like to see demonstrations (SA2)*
- *Making short notes during lectures helps (SA9)*
- *I study better when things are written down (SA11)*
- *I learn from practically doing things (SA15)*
- *I read through my work so that I can understand (SA7)*
- *I learn better from doing experiments (SA23)*
- *I like practical application of theory (SA22)*

In both the questionnaire and the writing exercise, the same learning styles emerged.

Table 6.3 Faculty B: Scores on the learning styles assessment tool (n=17)

Learning styles	**Frequency / No. of students**	**Percentage of students**
Kinesthetic tactile	7	41%
Social individual	1	6%
Social group	**9**	**53%**
Visual language	1	6%
Expressive oral	**0**	**0%**
Expressive written	5	29%
Visual numerical	4	14%
Auditory language	6	35%
Auditory numerical	6	35%

Note: the bolded items have been highlighted to show the significance of the findings.

These learners tended to prefer one or two learning styles over others. For students in this faculty, the major learning style used was the *social group* (53%). Students with this learning style prefer to work with one or more people. Collaborative interaction increases their ability to learn. The *kinesthetic tactile (41%)* was also very prevalent. Students with this style learn best when they are able to touch and feel the material, being directly involved in the process of learning. The minor learning style in Faculty B was the *expressive oral (0%). S*tudents with this style like to express themselves orally, and feel comfortable in talking about their ideas.

Learning styles from the *writing exercise* were as follows:

- *When I do not understand my work I have a study group; we share problems and try to solve them together (SB5)*
- *I do not work on my own very well (SB13)*
- *We have a group, we relied on one another, helping, assisting, explaining concepts and discuss various issues (SB9)*

Similar learning styles were therefore revealed in both the questionnaire and the writing exercise.

Table 6.4 Faculty C: Scores on the learning styles assessment tool (n=18)

Learning styles	Frequency/No. of students	Percentage of students
Kinesthetic tactile	**12**	**67%**
Social individual	9	50%
Social group	**0**	**0**
Visual language	4	22%
Expressive oral	3	17%
Expressive written	7	39%
Visual numerical	4	22%
Auditory language	4	22%
Auditory numerical	4	22%

Note: the bolded items have been highlighted to show the significance of the findings.

The dominant learning style for Faculty C was the *kinesthetic tactile (67%).* These students learn best by experience, through self-involvement, and through touching and handling the material. They may not understand or be able to concentrate on work unless they are hands-on. The nature of the course they were taking supported students with this learning style. The other dominant learning style was the s*ocial individual (50%).* Students using this style are motivated when they learn on their own, and prefer not to work with other people. In this faculty, the *social group* scored the lowest (0%).

From the *writing exercise*, the following approaches to learning emerged:

- *I read out aloud (SA3)*
- *I prefer to study alone in a quiet place (SA5)*
- *I like to memorize (SA13)*
- *Learning with others makes us understand an issue better because we discuss it and listen to others' views (SA8)*
- *The best way to learn is by doing the work practically (SA21)*
- *I like drawing (SA7)*
- *I study by visualizing things (SA2)*
- *I underline important points (SA17)*

In this faculty, the *kinesthetic tactile* emerged as the major learning style as recorded in the tool. In the writing exercise, a similar learning style also emerged.

Table 6.5 Faculty D: Scores on the learning styles assessment tool

(n=31)

Learning styles	**Frequency/No. of students**	**Percentage of students**
Kinesthetic tactile	11	35%
Social individual	**13**	**42%**
Social group	3	10%
Visual language	8	26%
Expressive oral	**2**	**6%**
Expressive written	7	23%
Visual numerical	7	23%
Auditory language	5	16%
Auditory numerical	3	10%

Note: the bolded items have been highlighted to show the significance of the findings.

The major learning style for the students in Faculty D was the *social individual (42%),* with students using this learning style preferring to work alone. The *kinesthetic tactile (35%)* also scored highly in this faculty of business, with many students choosing a direct, hands-on involvement with their work and its material. The minor learning style was the *expressive oral (6%),* referring to students who like to express themselves orally and talk about their ideas.

From the *writing exercise,* the various learning styles were identified:

- *I like visual aids with lots of colour (SD3)*
- *I write down key words and build around them (SD6)*

- *I like studying alone and look at myself in the mirror (SD11)*
- *I am a very visual learner, if I can see what is being talked about then I tend to understand better (SD12)*
- *I talk to myself when I learn (SD9)*
- *I memorize and write down (SD10)*
- *I prefer to study alone and scatter everything on the floor (SD19)*
- *I study alone and hate it when people are around because I get distracted easily (SD25)*
- *I like making my own notes (SD24)*
- *I like repetition especially with maths (SD29)*

The *social individual* style, which emerged from the questionnaire as the major learning style, also emerged in the writing exercise. This involves learning through talking to oneself, studying alone, and making one's own notes.

Table 6.6 Faculty E: Scores on the learning styles assessment tool

(n=22)

Learning styles	**Frequency/No. of students**	**Percentage of students**
Kinesthetic tactile	10	45%
Social individual	**12**	**55%**
Social group	5	23%
Visual language	10	45%
Expressive oral	4	18%
Expressive written	3	14%
Visual numerical	6	27%
Auditory language	5	23%
Auditory numerical	**2**	**9%**

Note: the bolded items have been highlighted to show the significance of the findings.

The three major learning styles for the students in Faculty E were the *social individual (55%)* (students are motivated when they learn on their own); the *kinesthetic tactile (45%)* (students learn best when they are directly involved in a hands-on process of learning); and *visual language (45%)* (students learn best by writing down information given to them orally so that they can see it). The minor learning style for the students in Faculty E was the *auditory numerical* (9%). These kinds of students learn best when they hear numbers explained orally, and can solve mathematics problems mentally.

From the *writing exercise*, the following learning styles emerged:

- *After reading I write down what I have read (SE1)*

- *Sometimes I use mind maps where I put what I am reading in the middle and my questions about it (SE7)*
- *I learn best by actually seeing things myself (SE18)*
- *I want to learn alone, I do not like working in groups (SE17)*
- *I have to do something physically in order to learn it (SE9)*
- *I like to learn through experience (SE 11)*
- *I do not like working in groups, I like doing my work on my own (SE13)*
- *I like to make and touch things (SE21).*

The learning styles from the questionnaire were therefore confirmed by the writing exercise.

Table 6.7 Faculty F: Scores on the learning styles assessment tool

(n=18)

Learning styles	**Frequency /No. of students**	**Percentage of students**
Kinesthetic tactile	7	39%
Social individual	3	17%
Social group	**8**	**44%**
Visual language	2	11%
Expressive oral	**1**	**6%**
Expressive written	5	28%
Visual numerical	5	28%
Auditory language	3	17%
Auditory numerical	4	22%

Note: the bolded items have been highlighted to show the significance of the findings.

The two major learning styles in Faculty F were the *social group (44%)* (with students preferring to work with one or more people, the collaborative learning increasing their ability to learn), and *kinesthetic tactile (39%)* (in which students learn best when they are hands-on in the process of learning). The learning style least used by students in Faculty F was the *expressive oral (6%).* Students with this learning style like to express themselves orally and talk about their ideas. It was clear that in this faculty, students did not like to express themselves orally.

The issues which emerged from the writing exercise were as follows:

- *I am good with numbers (SF5)*
- *I study best when I talk to myself (SF11)*

- *I do not like oral presentations (SF9)*
- *I learn better when I see things written down (SF13)*
- *I like working with other students (SF12)*
- *I found that when I study in a group it makes it easier because each one have their own perception on something (SF15)*
- *I study by making mind maps (SF16)*
- *I study better when I write down notes (SF17)*
- *I am an international student and English is not my first language, it was difficult for me to understand what lecturers were saying in class. I would like them to write down some stuff (SF18)*

6.4 GENERAL ISSUES EMERGING FROM THE WRITING EXERCISE

Besides confirming existing learning styles, the writing exercise highlighted other issues as they emerged. Students commented that they could not learn effectively as they had difficulty understanding the English language. Their comments included:

- *The way the lecturer was speaking was not easy for me to get a picture, I did not hear well because I did not understand English (SC13)*

- *Some lecturers speak fast with an English accent, I am a foreign student and I speak French, so sometimes it is difficult for me for understanding some words and sentences and I cannot read or talk proper English (SC9).*

At school, they were taught through their mother tongue (isiXhosa, isiZulu, Afrikaans and French). Their comments were:

- *All my school life I was in Afrikaans medium school, I struggle to learn in English (SE11)*
- *I come from D.R.C., a French-speaking country, I did all my studies in French, it was difficult for me to study in English (SD5)*
- *Our teacher used to explain to us in isiZulu but now everything is in English (SA7)*

Some are still struggling, but others have overcome this challenge through interacting with students who speak English, attending English tutorials, and reading more English books. As one student said: *I have made friends who speak English, I try not to speak my language, I speak English all the time (SD5).*

Students commented about the negative effect peer pressure had on their learning. During their first year at university, they are for the first time outside parental control, so they often make bad choices, such as choosing peers over their studies, and this resulted in poor attendance of classes, leading to a risk of failure. Their comments were:

- *I spend more time with friends than my books (SF8)*
- *It was my first time away from home and I could do anything I wanted to, studying became second on my list of priorities, and as a result I failed (SB12)*

Some rectified their mistakes by making positive choices which helped them to learn more effectively, such as regular class attendance and making their studies a priority. One student said: *I spend more time in the library and I am trying not to spend that much time with friends because I realized that I was working on my future (SF8).*

Some of the students taking first year courses were mature students who had worked before. One comment was: *I left school in 2001; when I returned things were different (SE9).*

These students struggle to learn, not only because they have other responsibilities but also because a lot has changed in terms of learning since they were at school. One student said: *In the evenings I work at a restaurant, I do not have enough time to work on my assignments, in order to pay for my education I have to work till 2 in the morning and come back to class at 8h30, I have only a few hours to rest* (SA17). In order to overcome this, these students put more effort into their studies.

Some students commented that they were struggling at the university because their schools had not prepared them for tertiary learning. At school, teachers had been lenient with them, to the extent of explaining the work in their mother tongue if they did not understand it. Some said that:

- *At the university you are on your own, our teachers used to chase us to study and now nobody does that, we are on our own (SA8)*
- *At school the teachers would shout at you if you don't attend classes or you don't submit the work (SD15)*
- *At school they spoon fed us (SC3)*

- *At school I was doing well but now here in tertiary I'm struggling because all my lectures are in English, so I have to put more effort on my studies (SF8)*

6.5 SUMMARY AND CONCLUSION

The students completed the learning styles assessment tool, consisting of a questionnaire and an exercise in which they were asked to write about their past learning experiences and how these had helped them to learn effectively.

Both from the learning styles assessment tool and from the writing exercise it emerged that the students in the various faculties had dominant learning styles, which they employed in preference to the other styles. It appeared that the nature of their courses determined the learning styles the students used. In Faculties A, C and E, for example, the *kinesthetic tactile* was the major learning style. Taking into consideration the practical nature of these faculties, which require students to be hands-on; this was an appropriate style for these interviewees. In Faculties B and F, the *social group* appeared as the major learning style. In these faculties, students were required to work with others on projects and in the laboratories. In Faculties C, D and E, the *social individual* appeared as the major learning style. The reason for this could be that in these faculties the students work alone on individual projects and assignments. It is difficult to say which way the effect works. It could be that the area of focus of a particular faculty impacts on the students' learning styles, or that students choose these faculties or areas of focus because of their own learning styles.

It is also interesting to note that, of the six faculties, four scored the lowest in *expressive oral*. One reason for this could be that the students were not competent in the language of learning and were therefore not comfortable in expressing themselves orally.

In the writing exercise, a variety of learning styles emerged. Interestingly, the styles which emerged in the questionnaire were confirmed in the writing exercise. This was evident in both the initial and the actual pilot. In the writing exercise, however, other issues which had an impact on student learning also surfaced. These included problems with the language of tuition, under-preparedness of students for tertiary learning, the adjustments needed by mature students, and the

The learning styles assessment tool was also piloted to initial key informants, lecturers, a statistician and linguist. As a result of their input certain changes were made to the tool before the actual pilot took place.

In order to create awareness of the existence of learning styles, a tool which helps students to identify and assess their own learning styles seems to be appropriate.

Such assessment can bring out information about similarities and differences in how students learn. It can also open channels of communication between students and lecturers for more effective teaching and learning.

The results of this learning styles assessment tool investigation indicated how students take in and process information in the teaching and learning situation. These results are important in planning teaching and learning activities.

The following chapter deals with the evaluation of the tool by the key informants, including students, lecturers, academic development staff and psychologists.

CHAPTER SEVEN

EVALUATION OF THE LEARNING STYLES ASSESSMENT TOOL

7.1 INTRODUCTION

The aim of this study was to develop and evaluate a learning styles assessment tool relevant for the South African higher education context. This chapter responds to one of the research questions: What kind of a tool is suitable for the South African higher education context? The aim of the chapter is to present the evaluation feedback obtained from the students and the key informants.

The adapted learning styles assessment tool was presented to students and key informants for evaluation. The students comprised 130 participants, from six faculties at one institution of higher education. The key informants included four lecturers, two psychologists, four academic development practitioners. The researcher used a purposive sampling technique to select the participants. The key informants were selected because of their involvement in student learning, in research, knowledge of learning styles and other relevant professional expertise. The students were selected because they were the ones who used the tool. The aim of evaluating the tool was to identify gaps and discrepancies, and to assess its suitability for use in higher education.

Two questionnaires were compiled for the evaluation, one for the students, and the other for the key informants. Each participant received a learning styles tool and a questionnaire. Written permission was sought from each participant.

The students first had to complete the self–reporting learning styles assessment tool. This was followed by focus group discussions, after which the tool was evaluated using a questionnaire. The key informants were also given a copy of the tool and had to complete an evaluation questionnaire.

7.2 EVALUATION OF THE TOOL BY STUDENTS

The students were presented with a questionnaire to evaluate the learning styles (Appendix C). In this, they were required to indicate whether they agreed, were undecided, or disagreed with the statements. At the end of the questionnaire, they were given an opportunity to provide general comments.

After completing the questionnaire, the students were engaged in focus group discussions, during which they voiced their views about the learning styles assessment tool. Below are the responses of the students from these fruitful interactive discussions, presented per faculty.

Table 7.1 Faculty A: Evaluation of the learning styles assessment tool.

(n=24)

Statements	Agree	Undecided	Disagree
1. The instructions are clear.	18	4	2
2. The statements are clear and understandable.	19	5	
3. The language used is simple.	19	4	1
4. I could identify my learning styles without difficulty.	16	5	3
5. The questionnaire is not too long.	9	8	7
6. The questionnaire does not take too long to complete.	14	6	4
7. It is important for me to know my learning style.	19	4	1
8. The questionnaire has a variety of learning styles I can choose from.	20	2	2
9. I understand what a learning style is.	20	4	
10. The instrument is useful to students.	16	7	1
11. The instrument appears to be relevant to measuring learning styles.	16	7	1
12. Knowing my learning style will make me learn better.	17	6	
13. It is important for the lecturer to know the students' learning styles.	20	4	
14. I could understand the explanations of the learning styles clearly.	18	6	
15. The writing exercise made me interrogate how I learn.	15	9	
16. The writing exercise gave me an opportunity to express myself in my own words.	16	6	2
17. It is my first time completing a learning style questionnaire.	14	4	6

It seemed that most students in the Faculty of Health and Wellness agreed with most statements. However, some of them disagreed with the statement which said that the questionnaire was `not too long'. In the additional comments and focus group discussions, they repeated that the questionnaire was too long. Their comments included:

- *The survey should be shorter; students are not always patient (SA6)*
- *The survey is too long (SA14)*

However, it appeared that in general the students were positive about the questionnaire; their comments included:

- *It is nice to know that there are people who take time to research about how students should improve on their learning skills (SA2)*
- *It has been a good test on myself to learn on my own learning styles and I hope and wish next year I can do it again (SA3)*
- *I hope that this questionnaire will benefit us as students after these things are read; we hope to see improvement from our faculty (SA7)*
- *Well done, thank you (SA11)*
- *I think your research has made it clear in what students need to study and how we can improve our studying skills based on the time we spend studying (SA17)*
- *The questionnaire should be simple; this questionnaire was difficult to understand, especially the last section (SA23)*

Table 7.2 Faculty B: Evaluation of the learning styles assessment tool

(n=18)

Statements	Agree	Undecided	Disagree
1. The instructions are clear.	18		
2. The statements are clear and understandable.	16	1	1
3. The language used is simple.	15	1	1
4. I could identify my learning styles without difficulty.	18		
5. The questionnaire is not too long.	6	6	6
6. The questionnaire does not take too long to complete.	10	4	4
7. It is important for me to know my learning style.	15	1	1
8. The questionnaire has a variety of learning styles I can choose from.	15	3	
9. I understand what a learning style is.	18		
10. The instrument is useful to students.	17	1	
11. The instrument appears to be relevant to measuring learning styles.	16	2	
12. Knowing my learning style will make me learn better.	15	1	2
13. It is important for the lecturer to know the students' learning styles.	12	6	
14. I could understand the explanations of the learning styles clearly.	14	4	
15. The writing exercise made me interrogate how I learn.	15	2	1
16. The writing exercise gave me an opportunity to express myself in my own words.	17	1	
17. It is my first time completing a learning style questionnaire.	17	1	

It seemed that the students in this Faculty (Engineering) agreed with most of statements, indicating that the tool fulfilled the purpose for which it was intended. However, there was an equal distribution of points between ‘agree’, `undecided’ and ‘disagree’, with regard to the length of the questionnaire, suggesting that there was a concern about its length. The students in the Faculty of Engineering did not want to engage in discussion or write comments in the spaces provided. It was interesting to note that the students in this faculty are engaged in practical subjects, so they do not engage so often in discussions. Even in the learning styles questionnaire, the expressive oral was identified as the less frequently used learning style.

Table 7.3 Faculty C: Evaluation of the learning styles assessment tool

(n=17)

Statements	Agree	Undecided	Disagree
1. The instructions are clear.	16		1
2. The statements are clear and understandable.	13	2	2
3. The language used is simple.	16	1	
4. I could identify my learning styles without difficulty.	16	1	
5. The questionnaire is not too long.	11	4	2
6. The questionnaire does not take too long to complete.	12	5	
7. It is important for me to know my learning style.	13	3	1
8. The questionnaire has a variety of learning styles I can choose from.	17		
9. I understand what a learning style is.	17		
10. The instrument is useful to students.	13	4	
11. The instrument appears to be relevant to measuring learning styles.	13	4	
12. Knowing my learning style will make me learn better.	12	5	
13. It is important for the lecturer to know the students' learning styles.	13	2	2
14. I could understand the explanations of the learning styles clearly.	17		
15. The writing exercise made me interrogate how I learn.	13	3	1
16. The writing exercise gave me an opportunity to express myself in my own words.	13	2	2
17. It is my first time completing a learning style questionnaire.	8		9

From the table above, it was clear that the majority of the students in the Faculty of Informatics and Design agreed with the statements, with the exception of the one in which the students indicated that it was not their first time of completing the learning styles instrument.

On the spaces provided for comments, two students noted that the explanation of their learning styles really spoke to them:

- *The questionnaire was spot on and really spoke to them (SC13)*
- *I could see how I learn clearly (SC9)*

In the discussions, five out of 17 students commented about how good it was to know one's learning style. One student said that it would be helpful for lecturers to know their students' learning styles: *When lecturers know our learning styles it would make communication better between the students and the lecturers (SC16).*

Table 7.4 Faculty D: Evaluation of the learning styles assessment tool

(n=31)

Statements	Agree	Undecided	Disagree
1. The instructions are clear.	31		
2. The statements are clear and understandable.	29	2	
3. The language used is simple.	31		
4. I could identify my learning styles without difficulty.	26	5	
5. The questionnaire is not too long.	10	8	13
6. The questionnaire does not take too long to complete.	15	9	7
7. It is important for me to know my learning style.	28	2	
8. The questionnaire has a variety of learning styles I can choose from.	26	4	1
9. I understand what a learning style is.	29	2	
10. The instrument is useful to students.	29	2	
11. The instrument appears to be relevant to measuring learning styles.	25	6	
12. Knowing my learning style will make me learn better.	27	3	
13. It is important for the lecturer to know the students' learning styles.	28	3	
14. I could understand the explanations of the learning styles clearly.	28	3	
15. The writing exercise made me interrogate how I learn.	27	4	
16. The writing exercise gave me an opportunity to express myself in my own words.	27	3	1
17. It is my first time completing a learning style questionnaire.	26	4	1

From the table above, it appeared that the majority of the students in the Faculty of Business agreed with the statements, with the exception of a significant number who found the questionnaire to be long.

In the spaces provided, the students' comments were:

- *I like this operation because it is very important for myself and lecturers too must know about their teaching's kind and behaviour (SD5)*
- *The questionnaire was far too long, but good though (SD7)*
- *It helps a lot because you become to know what you must and where to put more effort (SD12)*
- *This questionnaire is well prepared and talks to me as a student (SD20)*
- *There should be a follow-up questionnaire (SD8)*
- *It helps a lot because you get to know what you must do and where you must put more effort (SD24)*
- *I would like these people to encourage other people too (SD24)*
- *It helps, thank you (SD27)*
- *This kind of initiative should be taken into consideration because it really helps us to know ourselves so that our studies can go smoothly (SD30)*

In the focus group discussions afterwards, the majority of the students felt that there should be a follow-up questionnaire to check on where they were in terms of learning, and to advise them on how best they could learn in order to succeed in their studies. One student commented that, *The instrument did help but not that much (SD9).*

Two students from French-speaking countries said that their limited understanding of English should be taken into consideration in teaching and learning:

- *If I could study in my own language which is French it would have been easier for me to understanding my studies or subject* (SD11)
- *These questionnaires can assist us foreign students in understanding ourselves when learning in another language (SD32).*

Table 7.5 Faculty E: Evaluation of the learning styles assessment tool

(n=22)

Statements	Agreed	Undecided	Disagree
1. The instructions are clear.	22		
2. The statements are clear and understandable.	19	3	
3. The language used is simple.	21	1	
4. I could identify my learning styles without difficulty.	18	4	
5. The questionnaire is not too long.	13	5	3
6. The questionnaire does not take too long to complete.	10	10	2
7. It is important for me to know my learning style.	17	5	
8. The questionnaire has a variety of learning styles I can choose from.	21	1	
9. I understand what a learning style is.	19	3	
10. The instrument is useful to students.	18	4	
11. The instrument appears to be relevant to measuring learning styles.	16	6	
12. Knowing my learning style will make me learn better.	16	6	
13. It is important for the lecturer to know the students' learning styles.	22		
14. I could understand the explanations of the learning styles clearly.	14	8	
15. The writing exercise made me interrogate how I learn.	19	1	2
16. The writing exercise gave me an opportunity to express myself in my own words.	20	2	
17. It is my first time completing a learning style questionnaire.	20	2	

From the table above, it is clear that the majority of the students in the Faculty of Education and Social Sciences agreed with the statements. However, where they had to comment on the length of time needed to complete the learning styles questionnaire, the same number of students ticked the 'undecided' and the 'agreed' columns.

In the spaces provided for students to comment, the remarks included:

- *Thank you very much (SE1)*
- *Thank you very much for making me realize what learning style suited me, it helped me a lot (SE6)*
- *It is interesting to see how a few questions can make your learning style more clear or known (SE9)*
- *Please check, some of the statements are not clear and some statements are repeated (SE21)*

In the focus group discussions, the students were grateful for being able to identify their learning styles and commented that it was their first time in completing the learning styles questionnaire. This was confirmed by 20 students in the questionnaire itself. One student expressed concern about the *clarity and repetition of some statements*.

Table 7.6 Faculty F: Evaluation of the learning styles assessment tool

(n=18)

Statements	Agree	Undecided	Disagree
1. The instructions are clear.	18		
2. The statements are clear and understandable.	17		1
3. The language used is simple.	18		
4. I could identify my learning styles without difficulty.	18		
5. The questionnaire is not too long.	14	3	1
6. The questionnaire does not take too long to complete.	12	4	2
7. It is important for me to know my learning style.	17		1
8. The questionnaire has a variety of learning styles I can choose from.	17	1	
9. I understand what a learning style is.	16	1	1
10. The instrument is useful to students.	16	1	1
11. The instrument appears to be relevant to measuring learning styles.	17	1	
12. Knowing my learning style will make me learn better.	16	2	
13. It is important for the lecturer to know the students' learning styles.	17	1	
14. I could understand the explanations of the learning styles clearly.	18		
15. The writing exercise made me interrogate how I learn.	17		
16. The writing exercise gave me an opportunity to express myself in my own words.	15		2
17. It is my first time completing a learning style questionnaire.	12	1	5

From the table above, it seemed that the students in the Faculty of Applied Sciences agreed with most of the statements. Comments in the spaces provided on the questionnaire included:

- *The questionnaire really showed me how I learn and how I study (SF3)*
- *Now I know learning styles better (SF7)*
- *This questionnaire shows me what kind of student I am and how can I improve my studying (SF12)*
- *This questionnaire helped me understand how I am and the way I study (SF13)*
- *This questionnaire improved my understanding of learning styles (SF16)*
- *The questionnaire is according to my learning (SF18)*

In the discussions, the students were positive about the instrument, saying that:

- *In general the learning styles questionnaire is good (SF9)*
- *The questionnaire helps us as students to understand and evaluate and do introspection on our learning techniques (SF11)*
- *This questionnaire helps us to determine which style we love using in order to help us study well (SF17)*

The students also felt that the lecturer should play a role: *It will be good if the lecturers assist students with accordance to their diverse learning styles (SF15)*

In the focus group discussion, the students unanimously felt that the instrument should be administered to first-year students, since they struggle at institutions of higher learning. Their comments included:

- *The learning styles we are using here are different to the ones they used at high school (SF5)*
- *The questionnaire can be very useful for a first-year student (SF2)*

The students were, however, divided as to when the instrument should be administered. Some felt it should be introduced at the beginning of the year, so that they could know from the outset what their learning styles were, their performance could be monitored, and they could obtain assistance in good time. Among their comments were:

- *It is better to use it exactly from the first start, so that it can assist students to assess and look at their performances and if they are doing well or not and also to be assisted with the style which suits them best (SF15)*
- *I wish that this learning style questionnaire would be given after the first month of the second semester so that I can know before starting with exams which my strong points are when it comes to studying (SF1)*
- *The questionnaire can be used after the first term because the students will have a clear experience of how they study* (SF4)

The learning styles from the writing exercise matched those from the questionnaire in this faculty. It was established that the new learning styles assessment tool could create awareness among the

students about their learning styles. It would also give the lecturers insights into how the students described their own learning processes, and into how the students approached learning.

7.3 SUMMARY OF THE FINDINGS

Below is the summary of the evaluation of the tool by students in all the faculties. Important and valuable information concerning the tool was gathered during the process of its evaluation.

Table 7.7: Summary of the evaluation of the tool by all the students in the six faculties

Statements	**Agree**		**Undecided**		**Disagree**		**Number of students**
	n	**%**	**n**	**%**	**n**	**%**	**n**
1. The instructions are clear.	123	95%	4	3%	3	2%	130
2. The statements are clear and understandable.	114	88%	13	10%	3	2%	130
3. The language used is simple.	120	92%	7	6%	3	2%	130
4. I could identify my learning styles without difficulty.	112	86%	15	12%	3	2%	130
5. The questionnaire is not too long.	69	53%	35	27%	26	20%	130
6. The questionnaire does not take too long to complete.	73	56%	38	29%	19	15%	130
7. It is important for me to know my learning style.	111	85%	15	12%	4	3%	130
8. The questionnaire has a variety of learning styles I can choose from.	116	89%	11	8%	3	2%	130
9. I understand what a learning style is.	119	91%	10	8%	1	1%	130
10. The instrument is useful to	109	83%	19	15%	2	2%	130

students.							
11. The instrument appears to be relevant to measuring learning styles.	103	79%	26	20%	1	1%	130
12. Knowing my learning style will make me learn better.	103	80%	23	18%	2	2%	128
13. It is important for the lecturer to know the students' learning styles.	112	86%	16	12%	2	2%	130
14. I could understand the explanations of the learning styles clearly.	109	84%	21	16%			130
15. The writing exercise made me interrogate how I learn.	106	82%	14	11%	7	5%	129
16. The writing exercise gave me an opportunity to express myself in my own words.	108	84%	14	11%	7	5%	129
17. It is my first time completing a learning style questionnaire.	97	75%	12	9%	21	16%	130

From the statistical analysis, the majority of the students agreed with the statements 1, 2 and 3, indicating that the composition of the questionnaire was clear, simple and understandable. These statements covered the clarity of the instructions, the clarity of the statements themselves, and the simplicity of the language used. The clarity of the statements was confirmed by the students in the written responses and focus group discussions.

Statements 5 and 6, which were concerned with the structure of the questionnaire, received the lowest scores. Students were concerned about the length of the tool, and the time it took to complete; the length of the tool was also a concern in the written responses and focus group discussions.

From the statistical analysis, it was clear that the majority of the students agreed on the content of the tool. The results for statements 8, 14 and 15 revealed that the tool gave them an understanding of learning styles, besides giving them a variety of learning styles from which to choose. In the written comments and discussion, the students said they were grateful for being given the opportunity to understand their learning styles, as a step towards succeeding in their studies.

The majority of the students agreed with statements 7, 10, 12, 13, and 17. These were concerned with the functionality of the tool, the benefits to the students of knowing their own learning styles, the usefulness of the tool to them, the importance of the lecturer knowing the learning styles, and their responses to completing the learning styles for the first time. From the statistical analysis, the majority of the students agreed that the tool was useful and that it helped them to understand their learning styles. From the written responses and the focus group discussions, it appeared that they were happy that the tool could identify their learning styles.

Statements 4, 9, 11 and 16 were concerned with the tool measuring what it was meant to measure, that is, the learning styles. These statements covered students being able to identify their learning styles without difficulty, understanding what a learning style was, and the relevance of the tool in measuring their learning styles. From the statistical analysis, the majority of students agreed that the tool did measure their learning styles. From the written responses and discussions, too, it was clear they were excited that the tool could help them understand their learning styles.

7.4 EVALUATION OF THE TOOL BY KEY INFORMANTS

Learning styles assessment tool and an evaluation questionnaire (Appendix C) were distributed to participants who were identified as key informants. They were identified as such because of their involvement in student learning, in staff development, and in research. They also had knowledge of learning styles, as well as other relevant professional expertise. These key informants included two psychologists, four academic development practitioners (two concerned with academic staff development and two with student development) and five subject lecturers.

All of them were or had been lecturers in higher education for some time, their experience ranging from three to thirty years. They included heads of department, psychologists, staff development practitioners, student development practitioners, and lecturers. The qualifications of the participants ranged from Honours to PhD. The key informants were represented with codes as follows:

Table 7.8: Participants (key informants) in the evaluation of the tool

Key informants	Number	Code
Psychologist	2	P1, P2
Staff development practitioner	2	SDP1, SDP2
Student development practitioner	2	SAP1, SAP2
Subject lecturers	5	SL1, SL2, SL3, SL4, SL5

7.4.1 Involvement in Higher Education

The key informants were asked about their involvement in higher education; their responses were:

- The psychologists were involved in student counselling
- The staff development practitioner was involved in academic staff development and training
- The student development practitioner was involved in student academic support
- The subject lecturers were involved in lecturing various subjects

7.4.2 Knowledge of Learning Styles

For this study, it was important to ascertain the key informants' knowledge of learning styles. They were asked about this knowledge, and it appeared that all had some knowledge of such learning styles; their responses are outlined below:

- *I have researched learning styles as part of my work (P1)*
- *Learning theories and teaching and learning is my area of expertise and interest (P2)*
- *We use learning styles to help academic staff understand ways of learning (SDP1)*
- *I am trained to appreciate learning styles so that I can better assist students (SAP2)*
- *I did learning styles as part of teacher training (SDP2)*

7.4.3 Suitability of the Tool to assess Students in Higher Education Contexts

The key informants were asked whether the tool was suitable to assess the learning styles of students in higher education contexts. They agreed that it was, commenting:

- *The statements in the tool are intelligently designed to solicit responses from a diverse group of students (SAP2)*

- *This tool is not only going to access information from students with varied cultural, racial, academic and social background, but is also useful and adaptable to different departments in a university setting (P2)*
- *The tool covers the various learning styles that students use (P1)*

7.4.4 Influence of the Tool on Teaching and Learning in Higher Education

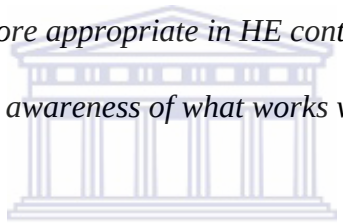
A further question posed to the key informants was whether they thought the tool could have a positive influence in teaching and learning in higher education. All the participants saw the tool as having a positive influence, their comments including:

- *Most definitely*; *I believe the tool has the potential to have a positive influence on learning and teaching in HE institutions and consequently student achievement (P2)*
- *It will create awareness among students of the different approaches they can employ to maximize learning; it will lead to improved teaching and learning; it will help students to cope with tertiary learning (SL2)*
- *Both students and lecturers would be aware of different types of learning (SDP2)*
- *It will help students to draw on their strengths in learning as well as develop weak areas (P1)*
- *The tool could solve the challenges faced by South African higher education context of seeking remedial measures in order to improve the quality of graduates (SDP1)*

7.4.5 Importance of Knowledge of Learning Styles to Students

The key informants had to give their views on the importance of students knowing their learning styles. All the participants agreed that it was important, commenting:

- *It is important because students are at the stage where they are interested in issues around identities (P1)*
- *This tool will help students understand their learning patterns (SL5)*
- *The current learning styles may be totally ineffective and I suspect that is the case with many students and they are not aware of it (SL 4)*
- *It will help students optimize their learning (SDP1)*
- *It is important because it allows them to fast-track and facilitate their own learning more effectively (P2)*
- *Knowing students' learning styles will allow lecturers to fill gaps and work on developing other styles which may be more appropriate in HE context (SL4)*
- *It will heighten the students' awareness of what works well for them (SL3)*



7.4.6 Importance of Knowledge of Students' Learning Styles to Lecturers

The key informants were asked to give their views on the lecturers knowing the students' learning styles. All agreed that it was important, for the following reasons:

- *Knowing the students' learning styles will allow the lecturer to facilitate learning and thinking in the class (SAP2)*
- *Knowing learning styles of students assists the lecturers in selection of teaching strategies that can optimize learning and academic performance (SDP1)*
- *Lecturers could adapt their teaching styles to suit their students' learning styles and therefore make teaching and learning more effective (SDP2)*

- *Lecturers would see their students as individuals with specific needs so that the lecturers could reach out to students and motivate students and also have a sense of what they are dealing with (SA1)*
- *Knowing students' learning styles will help inform teaching and learning (SL1)*
- *Knowing learning style is important for both students and lecturers to understand that learning styles are not static (P2)*
- *It is important so that the lecturers could align their teaching style with the most effective learning styles (SDP2)*

7.4.7 Knowledge of the Students' Learning Styles could assist Lecturers in adapting Teaching Styles to accommodate the Students' Learning Styles

The key informants had to decide whether knowing the students' learning styles could assist the lecturers in adapting their teaching styles to accommodate the students' styles. There were different views relating to this question. Some participants commented that:

- *Adapting teaching styles will depend on the commitment of the lecturers in supporting students* (SDP1)
- *Knowing students' learning styles will provide the lecturers with basic tools for understanding learning (P2)*

One informant mentioned that `*this could be a bit difficult because of other variables in the higher education sector such as student numbers, time, venues etc' (P1).*

Another said that knowledge of students' learning styles `*could create an awareness of using different teaching and learning methods in order to accommodate different learning styles'* (SL4).

A further comment was that `*the lecturers should do the learning styles questionnaire and think about what kind of teachers they are' (P1)*

7.4.8 Clarity of the Language used in the Tool for First-year Students

Two participants agreed that the language used in the tool was simple, observing that:

- *The language is not too difficult and seems to be clear generally (SL4)*
- *The statements are well-phrased and easy to understand (SAP1)*

However, one participant, while agreeing that the language was clear and simple, voiced the reservation that `*students whose mother tongue is not English will struggle because some of the statements do not only require gut response which students may be keen to offer' (*P2).

Another participant commented that `*before completing the tool the students required some explanation before they could complete the tool'* (SL2).

Another pointed out the similarities in some of the statements (9 and 17, 26 and 34). Some suggested changes to the tool, particularly with regard to the writing exercise, because the students struggled to write: *Our students are struggling to write, the writing exercise will pose a problem* (SL3). Another participant suggested that the phrase `past learning experiences' in the writing exercise be explained further, since the students might not understand it (P1).

7.4.9 Recommendation of this Tool to all First year Students in South African universities

The key informants were asked whether they would recommend this tool to be used by all South African universities for first-year students. Most participants agreed, their comments including:

- *I think at all universities could benefit from becoming aware of their learning styles as a way of reflecting on their learning (P1)*
- *I would support the use of the tool especially for first year and foundation programme students (SD1)*
- *If used effectively it can help lecturers to be more effective teachers and students to be more effective and efficient as learners and hence contribute to higher standards in the relevant fields in South Africa (SA2)*

One participant raised the need to translate the tool into other South African languages, depending on the context.

7.5 SUGGESTIONS FOR IMPROVEMENT

The response to this question was that the language on the tool should be s*implified a bit to enable easy access for all students using the tool (SL5).* Another comment was that *the tool should be well introduced and be accessible to all students (P1).* There was also a suggestion that the tool should *be used as part of an overall skills development programme and includes things like time management and how to utilize the students' strengths effectively (P2).*

7.6 MODIFICATION OF THE TOOL

Valuable information was gathered from the evaluation of the tool by both students and key informants and was used to make changes to the final tool. After the evaluation questionnaires have been analyzed, changes were made to the tool. These changes were incorporated into the final tool (Appendix E).

The length of the tool was reduced from 45 statements to 27 statements. Reduction of the statements also limited the repetition of some statements. Minor language errors were also corrected.

7.7 CONCLUSION

The aim of this chapter was to present the information obtained from the key informants. The tool was presented for evaluation both by the students and key informants, and valuable information was obtained.

The key informants seemed to have some understanding of learning style. From the responses, the participants found the tool to be simple, valid, acceptable and practical for use in a higher education context.

They key informants also found the language used in the tool to be simple and clear, but there were concerns about students' inability to write and the lack of competency in English. Some suggestions were offered for corrections to the tool.

In the following chapter, the findings are discussed in more detail, with a particular focus on the research questions linking them to the literature.

CHAPTER EIGHT

DISCUSSION

8.1 INTRODUCTION

The aim of this study was to develop and evaluate a learning styles assessment tool relevant to the higher education context. The objectives of the study were to:

- Examine existing learning styles theories, models and instruments;
- Identify criteria for the development of a relevant learning style assessment tool for the South African higher education context;
- Develop, implement and evaluate a learning style assessment tool in one higher education institution in the Western Cape in South Africa.

This study was guided by the following questions:

- What does the literature say about learning styles theories, models and instruments?
- What criteria could be used to develop a learning styles assessment tool relevant to the South African higher education context?
- How useful is the tool developed in this study in promoting more effective teaching and learning in a higher education context?

In the previous chapter, the findings of the research attempted to answer the research questions for this study.

This chapter critically discusses the findings, linking them to the relevant literature. The discussion is presented around the specific research questions. The criteria for developing the learning styles assessment tool and other issues which emerged from the findings are discussed in detail in this chapter.

8.2 LEARNING STYLES THEORIES, MODELS AND INSTRUMENTS

Research on learning styles revealed the existence of a variety of learning styles instruments and models. These instruments had a theoretical basis, even if this was not always overtly evident. Learning styles theories hold that individuals perceive and process information differently. The following learning styles instruments were accessed through the literature search:

- Kolb Learning Style Inventory
- Honey and Mumford Learning Styles Questionnaire
- Gregorc Style Delineator
- Felder and Silverman Index of Learning Styles
- Myers-Briggs Type Indicator
- Dunn and Dunn Learning Style Model
- Vermunt Inventory of Learning Styles
- Grasha Reichmann Student Learning Styles Scales
- Center for Innovative Teaching Experiences.

Analysis of the existing learning styles assessment instruments revealed different definitions of learning styles. However, certain assumptions about the learning styles were drawn. One of these was that *learning styles are personal and different.* The findings from both the initial and the actual piloting the learning styles assessment tool with 136 (six from the initial pilot and 130 from

the actual pilot) students revealed that the students had individual and different learning styles. This supports the view that learning styles acknowledge the uniqueness of students in the learning process. Learning styles are neither right nor wrong, and no one learning style is better than another (Van Rensburg, 2009). Adult learning theory embraces the learner-centred approach, which focuses on the student's personal experiences in learning (Merriam, 2001; Vawda, 2005). The adult learner has accumulated a wealth of experience which can assist him or her in understanding new knowledge.

Furthermore, adult learning theory encourages an interpersonal relationship between the lecturer and the student, as this relationship can facilitate the promotion of effective teaching and learning. Russell (2006) also argues that the joint effort of lecturer and student can maximize success.

As revealed by both the learning styles questionnaire and the focus group discussions, some students found their learning styles to be similar to their learning strengths. A study conducted with post-secondary students in Colorado to identify their learning styles preferences, using a self-reporting questionnaire, revealed that the students' preferred learning styles that were directly related to their learning strengths (Reid, 1987).

Identifying learning styles is important in the learning process (Van Rensburg, 2009). Students should therefore have the opportunity to assess their own learning styles and be encouraged to *expand* these preferences.

Lecturers should motivate students to use their preferred learning styles for more effective learning. Teaching and learning should thus assist the students in identifying and assessing their individual learning styles.

In this study, after the administration of the self-reporting learning style tool, various learning styles emerged (Table 8.1):

Table 8.1: Learning styles and explanations

Learning styles	Explanation
Auditory language	These students learn best from hearing information presented to them.
Visual language	These students learn best seeing the information presented to them.
Auditory numerical	These students learn best from hearing numbers.
Visual numerical	These students learn best by seeing numbers.
Kinaesthetic tactile	These students learn best by being involved.
Social individual	These students like to study alone.
Social group	These students learn best when in a group.
Expressive oral	These students learn best when they can express themselves orally.
Expressive written	These students learn best when they express themselves in written form.

It was interesting to note that students in different faculties tended to reveal distinct learning styles. For example, the *kinaesthetic tactile* learning style was the major style for most of the students in Faculty A (Faculty of Health and Wellness Sciences); this was revealed when the students completed the learning styles questionnaire, supported by the exercise written in their own words. It was interesting to note that the kinaesthetic tactile also emerged as a major learning style for the student in Faculty A in the initial pilot of the learning styles assessment instrument. The less frequently used learning styles were the *auditory numerical* and *expressive oral*. This suggested that most students in this faculty liked to be hands-on in the learning experience, and that most

wanted to see the numbers written down. They did not like to express themselves orally. The auditory numerical also emerged as the less frequently used learning style in the initial pilot. The teaching styles used in this faculty could be a combination of an *expert teaching style*, where the lecturer provides the students with the knowledge they need in order to learn, a *personal mode teaching learning style*, in which the lecturer supports, guides and motivates the students in applying the knowledge required to learn, and *a facilitator and a delegator teaching style*, in which the lecturer puts the responsibility for learning on the students themselves. Because the major learning style was the *kinaesthetic tactile*, where the students wanted to be hands-on, *the apprenticeship, development and cooperative planner teaching* could work well in this faculty. This would allow the lecturer, together with the students, to use real situations applicable in real work settings in their projects and assignments. Working on practical projects could promote the building of *interpersonal relationships* and the bringing in of the kind of *prior learning experiences* which are important for the adult learner.

In Faculty B (Faculty of Engineering) the major learning style was the *social group*. The social group also emerged as a major learning style and the social individual as less frequently used learning style in the initial pilot of the learning styles assessment instrument. The less frequent learning style for the students in this faculty was the *expressive oral*. This suggests that most of the students liked working with others, and did not like expressing themselves orally. Students in Faculty B work in pairs or groups in the laboratories, doing projects or testing out machines, so this could be one reason why the *social group* was emphasized by these students. The teaching styles which could best be used in this faculty are *expert, personal mode,* and *child-centred*. In these, the lecturer provides the students with the information they are supposed to learn and then

guides, supports and motivates them to apply this knowledge in their learning. The major learning style in this faculty was the *social group*, in which students like to work with others. The teaching styles that could work well in this faculty were *apprenticeship, facilitator, delegator* and *cooperative*, in which the lecturer allows students to take responsibility for their learning and become independent learners, the lecturer serving as a facilitator. These teaching styles encourage *building of relationships* and making use of *prior learning experiences*, the latter an important aspect of adult learning. Working with others could make up for the less frequently used learning style, the *expressive oral*, since students could gain confidence through speaking and interacting with others.

The major learning style for Faculty C (Faculty of Informatics and Design) was the *kinaesthetic tactile*. The kinaesthetic learning style also emerged a major learning style in the initial pilot of the learning styles assessment instrument. The less frequent learning style in this faculty was the *social group*. The social group also emerged as the less frequently used learning style in the initial pilot of the learning styles assessment tool. Most students in this group liked to be involved in the learning process and liked working alone. One reason why the kinaesthetic tactile was emphasized in this faculty could be because the course is hands-on; the students design, draw up patterns and make garments, which requires that they work alone.

Given the predominance of the *kinaesthetic tactile*, in which students learn best when they are hands-on, *the apprenticeship, development and cooperative planner teaching* style could work well in this faculty, since it allows the lecturer, together with the students, to use real situations applicable in real work settings in their projects and assignments.

The *expert, facilitator, delegator* and *child-centred teaching styles* could also work well with this group, because the lecturer could let the students take the responsibility for becoming independent learners. However, the less frequent learning style in this faculty, the *social group*, stood in the way of building interpersonal relationships.

In Faculty D (Faculty of Business), the major learning style was the *social individual*, while the less frequent learning style was the *expressive oral*. Also, in the initial pilot of the learning styles assessment instrument the social individual emerged as the major learning style and the social group as the less frequently used learning style. Most students in Faculty D therefore liked to study alone, and did not like to express themselves orally. Some of the courses in this faculty require that students work alone on assignments and projects, which could explain why the dominant learning style is the *social individual*. The teaching styles which could be matched with this learning style are the *expert, personal mode, facilitator, development, apprenticeship* and *child-centred*. These teaching styles involve the lecturer providing students with the knowledge they require. The lecturer coaches, supports and guides the students in acquiring skills and knowledge so the students can take control and become responsible for their own learning. It is important that the lecturers use other teaching styles, such as the *nurturing* and the *delegator,* which encourage students to work in groups and build interpersonal relations with each other. This could also help them to develop the less frequently used learning style, the *expressive oral*.

According to the responses to the questionnaire, the major learning style in Faculty E (Faculty of Education and Social Sciences) was the *social individual*, while the less frequent style was the *auditory numerical*. The same major learning style (social individual) emerged from the initial

pilot of the learning styles assessment instrument, whereas the expressive oral emerged as a less frequently used learning style in the initial pilot. From the writing exercise, in contrast, a variety of learning styles emerged, including the *social individual* and the *auditory numerical*. Students in this group liked to learn alone and also liked to see numbers written down. In Faculty E, the students are required to do individual assignments, develop teaching materials, plan their teaching activities, prepare lesson plans and engage in teaching practice individually. The major learning style in this faculty was *social individual*, which implied that the students learn best alone. The teaching styles which could be used in this faculty are the *expert, personal mode, facilitator, development, apprenticeship* and *child-centred*. These styles involve the lecturer providing students with the knowledge they require for learning; the lecturer coaches, supports and guides them in acquiring skills and knowledge so that the students can take control and responsibility for their learning.

Most students in Faculty F (Applied Sciences) had *social group* as a major learning style, while the *expressive oral* learning style was less evident. The same learning styles (both major and less frequently used) emerged in the initial pilot of the learning styles assessment instrument. In this faculty, students were encouraged to do group projects and assignments, and to work together on group projects in the laboratories, so the *social group* was an appropriate learning style for them. The teaching styles which could be used to match the learning styles were *expert*, *personal mode*, and *child-centred*; in these, the lecturer provides students with the information they are supposed to learn and then guides, supports and motivate them to apply this knowledge in their learning.

The major learning style in this faculty was the *social group*, in which students liked to work with others. The teaching styles that could work well in this faculty were *apprenticeship, facilitator*,

delegator and *cooperative*, in which the lecturer allows students to take responsibility for becoming independent learners. These teaching styles, matched to the *social group* learning style, encourage *building of relationships* and making use of *prior learning experiences*, an important aspect of adult learning.

In general, the findings from the study showed that, although *individual* students in faculties had their own major learning styles, there were also certain learning styles evident in *faculties*. Kolb (1984) pointed out that the use of distinct learning styles is often the result of selection and socialization processes in the learning context. Kolb's experiential learning theory argues that the structure of knowledge in different disciplines requires certain learning demands from the learner which "reflect a particular view of reality and the methods of inquiry used to create knowledge" (Kolb, 1984, p. 88). Kolb (1984) states that a student is drawn into certain disciplines because of similarities between the learning demands of the discipline and his or her learning style. He further asserts that when there is a mismatch between the individual's learning styles and the learning style dominant in the discipline, the learner either changes his or her learning style or leaves the discipline. Thus learning in a discipline shapes the development of matching learning styles.

The findings of this study are also supported by a study done by Reid (1987) on learning style preferences of English Second Language (ESL) students in six fields of study in Colorado.
Reid (1987) found that in the humanities faculty, the major learning style was *visual learning*; in computer sciences, business, applied sciences and medicine the preferred learning style was *auditory learning*; while in engineering the *kinaesthetic tactile* was the major learning style. This correlates with the findings in this study.

A further interesting finding in this study was that students in three of the six faculties had an *expressive oral* learning style as their less frequently used style. This could be attributed to the fact that the language of learning in South African higher education institutions is English, and that most students in these institutions have English as their second or third language. They find it difficult to express themselves orally because they lack competency in English. This problem was reiterated by students in this study in their comments.

Students' success in higher education is portrayed as dependent on the relationship between the learning styles and teaching styles (Hall & Moseley, 2005). Matching learning and teaching styles could make teaching more effective (Fritz, 2002; Williamson & Watson, 2007). However, students have different learning styles, as revealed by the findings of this study, and the lecturer cannot match all these styles. The lecturer therefore needs to develop a more balanced teaching strategy, one which accommodates the different learning styles in the class (Felder & Brent, 2005). This study also revealed that students have learning styles which they less frequently use; an intentional mismatch should therefore be promoted, so students could be encouraged to develop their less frequently used learning styles. Intentional mismatch can assist both students and lecturers to adjust to different learning environments (Williamson & Watson, 2007). Lecturers therefore need to assist students in understanding the limits of their dominant learning styles, helping them to develop their learning styles so they will thrive in different learning environments (Robotham, 1999).

Another assumption was that *learning styles involve interacting with the new and difficult information.*

Some students in this study did not fully understand the new information because of their lack of competency in the language of learning. Learning involves absorbing, thinking, processing, discovering and making meaning of new information. Awareness of learning styles can make all this possible. Learning for the adult learner is intentional, planned, structured and organized (Fasokun, et al., 2005). Adult students are independent learners who want to apply what they have learnt from their own experiences. Learning style awareness could facilitate metacognition, which in turn encourages the student to interrogate his or her learning processes. Metacognition, which is defined as 'thinking about thinking', is only achieved when students are aware of how they learn. In this study, the participants were provided with the opportunity to interrogate how they learnt in the form of a writing exercise in which they had to reflect about their previous learning experiences. In this exercise, they described how they learnt, and identified both their current learning strengths and their less effective ways of learning. They even devised ways of improving their methods of learning. This study therefore promoted self-directed learning, by encouraging students to reflect on their previous learning experiences, and by identifying those experiences which helped or hindered the effectiveness of their own learning (Robotham, 1995).

A further assumption of this study was that *learning styles involve attitudes towards learning and the learning environment.* The students mentioned problems of adapting to the higher education learning environment, which was different from what they had been used to in high school. They said that the teachers at high school had cared for them, unlike at the institution of higher education, where they were on their own. This prompted them to change their ways of doing things to fit the way things were done in their new situation. Thus their attitudes towards learning and the learning environment changed. They engaged more with their studies; those who were

struggling in English sought support; and those who had taken learning at an institution of higher learning for granted realized the importance of their studies. Merriam (2001) also contends that adult learners need to feel accepted, respected, and supported in the learning situation.

Many theories of learning concentrate on what makes students want to learn. The *behaviourist theory* promotes a focus on learning styles since it encourages the reinforcement of certain positive behavioural patterns (Mulalic, Shah & Ahmad, 2009). The positive behaviour is reinforced in the form of rewards; these could be merit marks, academic approval, or special privileges. In the learning process, the behaviourist approach facilitates the development of new behaviour through association between the stimulus and response. Lecturers should therefore use positive reinforcements to motivate their students to work towards better academic achievement. The adult learners in the higher education context could benefit from the reward system. They are goal directed, want to see immediate results, and want to apply the information gained in learning. These rewards could assist the adult learners in achieving their goals.

The *humanistic theory* promotes learning styles because it encourages the students to take actions which will help them realize their full potentials (Fasokun, et al., 2005). The learning process is driven by what the students want to learn and how they want to learn (Mwamwenda, 2004). Central to the humanistic approach is the importance of interpersonal relationships and how these contribute to the achievement of academic goals. Students play an active role in their own learning and become self-actualized learners. Merriam (2001) asserts that, because adult learners manage other responsibilities in their lives, they are better able to plan their own learning. Thus, the

humanistic theory supports adult learning because the adult student is self-driven and goal directed.

The *cognitive theory* supports learning styles because it is concerned with how the students learn. *Discovery learning, reception learning* and *condition of learning* acknowledge the individual differences in the learning process (Mwamwenda, 2004). *Discovery learning* promote problem-solving, in which the students construct knowledge on the basis of their existing knowledge. The lecturer needs to create a learning environment which allows the students to solve problems using what they have already learnt, and to build on these solutions. *Reception learning* is concerned with knowledge being acquired through reflection and sifting for information appropriate to the learning process.

The *conditions of learning* support the student through the learning process. The *cognitive theory* supports adult learning in higher education; it takes into account the existing knowledge that adult learners possess and allows them to utilize it in constructing new knowledge.

The *social learning theory* supports the learning styles by giving clarity to the learning context, to how learning happens and how it is improved or inhibited. Social learning theory emphasizes the importance of social interaction in learning. The context in which the student grows and develops has an impact on his or her learning (Felder & Spurlin, 2005). Through the social context, the students contribute to learning by drawing on their own experiences and interaction with others (Osman & Castle, 2006). Learning in higher education should encourage social interaction in which the adult learner can learn collaboratively with peers and the lecturer. Collaborative learning

encourages the exchange of knowledge, allowing the student to share experiences with peers, thus developing metacognition.

Learning theories assist students with understanding how to learn and thus to be successful. They encourage the use of innovative strategies in teaching and learning which promote learning. Students in higher education should be encouraged to reflect on the learning process, including their own preferences for a specific learning style.

8.3 WHAT CRITERIA CAN BE USED TO DEVELOP A LEARNING STYLES ASSESSMENT TOOL RELEVANT FOR THE SOUTH AFRICAN HIGHER EDUCATION CONTEXT?

In determining the criteria for the development of a learning styles assessment tool relevant for the South African higher education context, interviews were held with eight key informants in the four institutions of higher education in the Western Cape. The key informants were chosen because of their involvement with teaching and learning in their institutions, both locally and nationally. They gave recommendations on the criteria for the development of the learning assessment instrument. Their recommendations are summarized and examined in the light of the other data in the discussion below:

8.3.1 The Learning Style Assessment Tool should create awareness about Learning Styles of Students

In this study, students' awareness of their learning styles was created when they completed the learning styles assessment instrument. This instrument consisted of a writing exercise and a questionnaire. In the writing exercise, the students had to describe their past learning experiences

and the processes that made them learn effectively. In the questionnaire, they identified their major, minor and negligible learning styles.

The findings of the questionnaire confirmed that students do learn differently (refer to Chapter 6: 6.1, 6.2, 6.3, 6.4, 6.5 & 6.6). Teaching and learning in higher education should address these different learning needs by creating awareness of the different learning styles. The learning styles assessment instrument developed for this study could create an awareness of learning styles, which in turn could assist in addressing the learning needs of students. This could then promote effective learning.

Awareness of learning styles could help students to understand how they learn. This was confirmed by the students in this study when they said that completing the questionnaire had made them realize what they must do and where to put more effort. This point is confirmed by Vawda (2005) who argues that when students know their learning styles, they can take responsibility for making use of their learning strengths. Mulalic, Shah and Ahmad (2009) also argue that students' awareness of their learning styles may encourage them to realize the significance of such learning styles and the vital role they play in their learning.

Rochford (2004) argues that students who are taught through their learning styles become motivated; their learning improves and they achieve better academically. Research has shown that college students' knowledge of their own learning styles increases academic success in their courses and reduces the dropout rate. Learners can take ownership of their learning once they are made aware of the factors which promote learning (Robotham, 1999).

Studies on learning styles conducted in South Africa in different faculties and departments have also confirmed the relationship between learning styles and academic performances (Cekiso, 2000; Mokoena, 1997; Vawda, 2005). Interestingly, most research on learning styles in South Africa has been conducted in Faculties of Health Sciences (Van Rensburg, 2002; Vawda, 2005).

Students who are aware of their learning styles can identify their own strengths and weaknesses in learning (Robotham, 1999). Learning styles can give an indication about both learning strengths and about areas which need attention. In this study, the students were able to identify their dominant and less dominant learning styles.

Teaching and learning in higher education has taken a learner-centred approach, one which demands an awareness of students' learning styles (Machemer & Crawford, 2007; Vawda, 2005). A learner-centred approach encompasses students taking responsibility for their learning. In the learning environment, the students no longer receive information passively but instead play an active role (Robotham, 1999; Van Rensburg, 2009; Vawda, 2005). Research has proved that active learning yields positive results in terms of academic success (Machemer & Crawford, 2007; Robotham, 1999; Vawda, 2005). The new learning styles assessment tool developed in this study therefore gives the students an opportunity to take ownership of their learning through being reflective and interrogating how they learn. Through reflection, the students can identify their strengths and weaknesses in learning.

8.3.2 The Learning Styles Assessment Tool should allow Students to interrogate how they learn

This study assumed that the development of a learning styles assessment tool would assist students in identifying their learning styles and lead them to interrogate their learning. The tool developed for this research allowed for the identification of learning styles of students in higher education.

It is often assumed that a learning styles instrument can measure how students learn through a questionnaire alone (Smith, 2002), but the key informants raised concerns about relying only on a questionnaire, recommending that students be allowed a 'voice' regarding their learning experiences. They should therefore be able to talk about their learning experiences and practices. This is supported by Robotham (1999) who argues that existing learning styles instruments do not allow the learners to describe or reflect on their own learning processes.

The tool developed for this study deliberately allowed students to reflect and to express themselves, by starting with a writing exercise in which they could give an account of their learning experiences. They wrote about how they learned, what hindered their learning, their perceived strengths and weaknesses in learning, and how they felt they could improve their learning. In this way, they were given a 'voice'.

In some cases, they not only wrote about their learning experiences but also reflected on other challenges which had had an impact on their learning. It was important for both students and lecturers to understand and address the challenges, such as learning through a second or third language. Robotham (1995) also contends that it is vital for students to think about their learning,

since through reflection they can identify areas which have either assisted or hindered the effectiveness of their learning.

Cuthbert (2005) argues that students' prior learning experiences could have an impact on how they learn. These experiences are particularly relevant for the learning process, particularly for the adult learner. The mature student has a wealth of prior knowledge that can be put to good use in the teaching and learning situation, especially in integrating new information.

8.3.3 The Learning Styles Assessment Tool should Support Teaching in Higher Education

The new learning styles assessment tool was constructed to create awareness of learning styles in higher education, with the aim of improving teaching and learning. Knowledge of students' learning styles is important for the lecturers, in order for them to adjust their teaching styles to match the students' learning styles (Robotham, 1995). Matching teaching styles with students' learning styles allows the lecturer to use a more balanced teaching strategy, one which accommodates the different learning styles in the class (Felder & Brent, 2005; Litzinger, Lee, Wise & Felder, 2007). It is important that the lecturers understand the students' learning processes and consider a variety of approaches for each learning experience (Litzinger, Lee, Wise & Felder, 2007).

This approach was confirmed by the 11 key informants who evaluated the tool when they said that lecturers would be able to use different teaching strategies to accommodate different learning

styles. In their evaluation of the assessment tool, the majority of the students also agreed on the importance of lecturers knowing the students' learning styles.

The learning styles assessment tool was aimed at supporting students in the learning process and assisting lecturers in understanding how the students learnt. A learner-centred approach requires a shift in the role of the lecturer, from that of an instructor to that of a facilitator (Robotham, 1999; Van Rensburg, 2009; Vawda, 2005). Lecturers therefore need to allow the students to devise the learning strategies that suit them best. The lecturer should serve simply as a guide.

8.3.4 The Learning Styles Assessment Tool should encourage Interactive Discussion and Dialogue amongst Students and Lecturers

After the instrument was administered to the students, a discussion was held with them so that they could talk freely about their learning. The discussion focused on their strengths and weaknesses in learning, on how they thought they could overcome their weaknesses and use their strengths effectively. Both in the discussions and in the writing exercise (where the students reflected on their learning processes), they identified what was not working and speculated on how they could learn differently in the future.

Kolb and Kolb (2005) recognize the importance of making meaning from experiences through conversation. Creating opportunities for conversation in the learning process allows students to reflect on and make meaning about experiences which improve learning (Kolb & Kolb, 2005).

Van Rensburg (2002) argues that the use of learning style instruments can improve interaction for both students and lecturers. Adult learners are regarded as responsible individuals who know what

they want to achieve in the learning environment. Using a learning styles assessment tool would create awareness about how they learn, which in turn would open conversation with the lecturers about which teaching styles would match the students' learning styles and expedite the learning process in general.

Encouragement of interactive discussion and dialogue has also been supported by Felder and Spurlin (2005). They contend that identifying and sharing the outcomes of students' learning styles gives the students an opportunity to know their strengths and weaknesses in learning, and to work on how they can improve their performance.

Other possible criteria for the development of a learning styles tool include *availability and accessibility of the tool*. The tool for this study did comply with these criteria. It is a self-reporting tool, and the only cost involved was for photocopying. It is also *user friendly*. It would require minimal training in terms of understanding the learning styles and for basic calculation of the scores. It has 27 statements for which a response is needed, and a writing exercise of about a page. Thus operating the tool does not require sophisticated technology or expertise.

8.4 HOW USEFUL IS THE TOOL DEVELOPED IN THIS STUDY IN THE CONTEXT OF PROMOTING MORE EFFECTIVE TEACHING AND LEARNING IN A HIGHER EDUCATION CONTEXT?

The learning styles assessment tool was evaluated by 130 students, and 11 key informants, including psychologists, academic development staff and lecturers. The reason for evaluating the instrument was to assess its suitability for use in higher education. Most key informants agreed

that the tool was *suitable for use in higher education.* Positive feedback about its suitability was received from evaluation by both students and lecturers.

The key informants and students agreed on the *importance of knowing students' learning styles by both students and lecturers.* Students have different ways of approaching learning, so lecturers need to have different teaching strategies to accommodate these learning differences. Knowledge of learning styles in higher education is needed to add value to quality teaching and learning. This also increases the students' chances of academic achievement. Knowledge of learning styles could assist in enhancing their learning experiences and in promoting learning.

The key informants *agreed that the language used in the tool was clear and could be understood by the first-year students.* The language used in learning styles assessment instruments is sometimes not easy to understand (Reid, 1987), and as a result poses a problem for South African students. Understanding English was highlighted as a concern by both students and key informants, since most students in South Africa study in a second language. However, the key informants, the linguist and the majority of the students affirmed that the language used in the tool was simple and easy to understand.

The key informants felt that the tool *could be recommended to all first-year students in South African universities.* The tool was piloted to first-year students in six different faculties in an institution of higher education, suggesting that it was flexible enough to be adapted in different educational contexts. Despite these positive findings, other issues, such as learning in a second language, the problems confronting mature students, and the effects of peer pressure, emerged from the study. These issues play a contingent role in the learning process.

8.5 LEARNING THROUGH A SECOND LANGUAGE

Language is central to teaching and learning (Donald et al., 2010). The majority of students in higher education institutions in South Africa are *learning in a second language*. The students often lack competence in the second language, and as a result feel inadequate as learners (Donald et al., 2010). Both scholastic performance and self-worth are affected. In this study, the students commented that they could not learn effectively because they were struggling to learn in English. Some also commented that if they learnt in their mother tongue, they would use different learning styles.

Thinking and language go together (Vygotsky, 1978), so students who are learning in a second language are at a disadvantage, because they think in their first language but learn in a second language. This results in poor academic performance, frequently leading to failure. These students are subjected to subtractive bilingualism when they learn in a second language (Donald et al., 2010; Nomlomo, 2007). As a result of subtractive bilingualism, the students are competent neither in the second language nor in their first (Nomlomo, 2007). This poses a challenge in both teaching and learning. This study assumes that knowledge of learning styles could assist students to overcome their lack of competency in a second language, since they could choose learning activities which enhanced their learning strengths, despite the language challenges.

Donald et al. (2010) argue that when the teachers themselves are not competent in the second language, this also negatively affects the quality of teaching and learning. In this study, students commented that at high school teachers explained to them in their first language; as a result they became passive learners who relied on memorizing as a learning style.

At higher education institutions, however, the medium of instruction was strictly English and the students were expected to engage in discussions in English. They had to discard the learning styles used in high school and adopt those relevant to higher education learning.

8.6 MATURE STUDENTS

Higher education policy has broadened access for mature students (people older than 23) (Department of Education, 2001). Adults learn for particular reasons, to retain or build social relationships, for personal interest, or to advance their careers (Fasokun et al., 2005). Many adults engage in learning because they want to acquire new qualifications or improve their existing qualifications (Fasokun et al., 2005).

In this context, an adult is somebody who has other responsibilities, such as being a parent or an employee. Such students often come to institutions of higher education to upgrade their qualifications.

This study included many mature students who had been out of the education system for almost five years. They talked about having other responsibilities, such as those of family, including paying for their children and their education. Many indicated that they had worked in the field in which they were studying. Fasokun et al. (2005) argue that adult learners often want to learn something which is related to their work, and that they have a wealth of experience they have accumulated in their workplaces. Smith (2002) also argues that adult students have an advantage in being able to draw on their experiences to support them in their studies. Lecturers in higher education should affirm the experiences which mature students bring to the learning environment,

and should encourage them to have confidence in themselves, treating their experiences as a resource which could help them engage in discussions about the learning process.

8.7 PEER PRESSURE

Arnett (1995) defines peer pressure as the force to do something because everyone else is doing it. Another definition of peer pressure, by Borsari and Carey (2001), is the influence that peers have on each other. The students at institutions of higher education are young adults who strive to build relationships with others (Donald et al., 2010), and seek to create peer networks which can serve as a source of support. Peers provide the student with role models and social opportunities, especially in higher education where there is a shift from parental influence to that of peers (Arnett, 1995).

Peers therefore play an important role in the lives of students in higher education contexts. Peers model behaviour which can lead to social acceptance (Borsari & Carey, 2001), but social acceptance may also include engaging in bad behaviour. Drinking and clubbing, for example, can be part of the university student's new identity, marking an increased independence from parents (Arnett, 1995).

For some of the students in this study, it was their first time outside parental control. They therefore relied on their peers for support. The findings revealed that, in the process of building relationships, the students often sacrificed their studies. They reported that, because of peer pressure, they had adopted friends' bad behaviours, did not concentrate on their work, and as a result failed their studies.

On the other hand, peers can also provide students in higher education with a learning support structure, by forming study groups where they encourage each other to achieve better academic performance.

8.8 SUMMARY AND CONCLUSION

Teaching and learning in higher education institutions prepare students for occupations and pave the way for lifelong learning. It is therefore vital to provide them with the best possible educational experience (Van Rensburg, 2009; Vawda, 2005). Part of this experience is to understand and accommodate their own learning styles so as to improve their learning; in turn, this will increase the throughput rate in institutions of higher education (Gauss, 2002). Studies done by Watkins and Mboya (1997) and Zeegers (2001) confirm that a learning experience informed by learning styles is effective. The aim of this study was to develop a learning styles assessment tool for the South African higher education context for the purpose of promoting more effective teaching and learning.

South African institutions of higher education are faced with high failure and dropout rates. Such institutions place emphasis on access, retention and lifelong learning, and thus it has become important that students' learning styles be explored. This study, by developing a learning styles assessment tool relevant for the South African higher education context, could assist in improving the quality both of learning and teaching in higher education and therefore alleviate the predicament of high failure and dropout rates. The tool could help students to understand how they learn, and help lecturers to respond with more effective teaching. It could empower students to

take ownership of their learning, so that they persevere and succeed in the institutions of higher education.

This study enabled 136 first-year students (six from the initial pilot and 130 from the actual pilot) in six faculties, in one university in the Western Cape, to become aware of and identify their learning styles. These students should therefore be supported in their preferred way of learning and be further challenged to expand these styles.

Knowledge of one's own learning styles can be used to increase self-awareness about one's strengths and weaknesses as a learner. In this study, the students who completed the self-reporting questionnaire showed that their learning styles preferences were directly related to their learning strengths. In most cases, the learning styles which emerged from the self-reporting questionnaire were similar to those identified in the writing exercise.

The findings of this study showed that students have major, minor and negligible learning styles. It is important for lecturers to understand these styles and therefore how their students learn. This understanding can promote effective learning. Failure to take learning styles into consideration could retard learning.

Learning in a second language, the challenges facing mature students, and peer pressure also emerged in this study as issues which need to be addressed because of their impact on student learning in higher education. These issues will affect learning styles, and lecturers need to be aware of and address them through appropriate structures.

CHAPTER NINE

SUMMARY AND RECOMMENDATIONS

9.1 INTRODUCTION

This study has been informed by the assumption that students' learning needs should be addressed in higher education in order that they may learn effectively. Students have different learning needs, which they express in their own learning styles. It is important that the learning environment accept and support these differences, since learning styles reflect the way students take in and process information. Knowing students' learning styles preferences can help lecturers to design a broad range of learning activities which will reinforce the students' learning strengths, and address their weaknesses by expanding their learning competencies. Assessing learning styles will thus help students to understand how they learn, and conversely will assist lecturers in understanding how the students approach the learning process.

Assessment of learning styles can be done by using a learning styles assessment instrument. This study supports the view that there is a need for such an assessment tool, one relevant to the South African higher education context. To address this need, a learning styles assessment tool was developed, implemented and evaluated in this study.

This chapter provides the summary and conclusions of the study. It sums up the key findings, and offers a way forward in terms of recommendations. The limitations of the study are also explored and suggestions are offered for further research in this field.

9.2 SUMMARY OF AIMS AND RESEARCH DESIGN

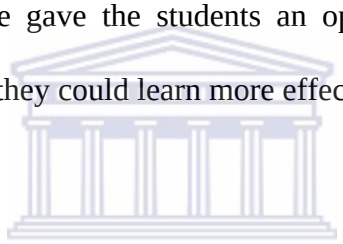
The aim of this study was to develop and evaluate a learning styles assessment tool relevant for the South African higher education context. The development of this instrument was pursued in five phases.

Phase one included exploring learning styles theories, instruments and models. A theoretical analysis of existing instruments was conducted in order to establish their uses, strengths, weaknesses, and their applicability in the higher education context. The instruments examined were the Kolb Learning Style Index (LSI), Honey and Mumford Learning Styles Questionnaire (LSQ), Center for Innovative Teaching Experience (C.I.T.E.), Vermunt Inventory of Learning Styles (VILS), Grasha Reichmann Learning Style Scale (GRLSS), Dunn and Dunn Learning Style Model, Gregorc Style Delineator (GSD), Felder and Silverman Index of Learning Styles (ILS), and Myers-Briggs Type Indicator (MBTI).

Phase two of the study was to interview key informants. The purpose of the interviews was to find out whether the informants supported the idea of developing an instrument or alternative tool, one which could be used to assess students' learning styles so as to enhance teaching and learning in

the South African higher education context. The recommendations by the key informants were used to develop a learning styles assessment tool.

Phase three of the study was to develop the assessment tool, which was adapted from the C.I.T.E. model. South African students require a learning styles assessment tool which is simple, easy to complete, accessible and user-friendly (Van Rensburg, 2009). To accommodate these criteria, a self-reporting learning styles assessment tool was constructed. This consisted of a writing exercise, in which the students could reflect on their past learning experiences and processes, and a questionnaire. The writing exercise gave the students an opportunity to interrogate how they learnt, making them reflect on how they could learn more effectively.



Phase four was to pilot the adapted learning styles assessment instrument to 136 first year students (six from the initial pilot and 130 from the actual pilot), in the six faculties at the Cape Peninsula University of Technology. The purpose of piloting the tool was to evaluate its effectiveness in creating awareness of learning styles, and for the students to identify their individual major, minor and negligible learning styles. A relationship was identified between the students' individual styles and the learning styles dominant in the different faculties.

Phase five included an evaluation of the tool by the students, lecturers and key informants. This was done to assess the instrument's worth, its practicability, value and possible contribution to higher education.

9.3 SUMMARY OF FINDINGS

The key findings which emerged are highlighted below. They are summarized under the headings of the different research questions for the study.

9.3.1 What does the Literature say about Learning Styles?

In this study, nine learning styles models and instruments were analyzed for adaptation in the South African higher education context. These were the Kolb Learning Style Index (LSI), Honey and Mumford Learning Styles Questionnaire (LSQ), Center for Innovative Teaching Experience (C.I.T.E.), Vermunt Inventory of Learning Styles (VILS), the Grasha Reichmann Learning Style Scale (GRLSS), Dunn and Dunn Learning Style Model, Gregorc Style Delineator (GSD), Felder and Silverman Index of Learning Styles (ILS), and the Myers-Briggs Type Indicator (MBTI).

The C.I.T.E was chosen for this research because it met the criteria determined by the initial key informants: it identified both perceptual and social domains, it was available free, and it was self-reporting, easy to complete and could be scored manually.

Using this learning styles assessment tool, awareness about learning styles was created, and different styles were identified and assessed. The research reinforced the importance of identifying learning styles and of assessing these in the context of the learning process.

The study revealed that students had individual and different learning styles. It emerged that not only did they have their own individual learning styles but that certain learning styles were prevalent in the different faculties studied.

Just as there are learning styles, so there are teaching styles, the learning styles interacting with the teaching styles. Lecturers need to be aware of their students' learning styles in order to meet the students' learning needs. When they are aware of the students' learning styles, they can use a variety of teaching styles in order to meet these learning needs. In particular, they can match their teaching styles with the students' learning styles; however, mismatch can also be used, since it encourages the students to use their less dominant learning styles.

Knowledge of learning theories, such as behaviourist, humanistic, cognitive and social learning, could also assist lecturers in understanding how students learn.

Adult learning theories see learning as intentional and purposeful. The adult learner is a self-reliant and self-motivated individual, who has a wealth of experience and who generally shows a willingness to learn.

Theoretical knowledge of learning as well as of learning styles can be used by lecturers in order to enhance teaching and learning practices.

Recognition and acceptance of differences among students can empower both lecturers and students to create a learning environment which promotes creative and innovative ways both of teaching and learning.

9.3.2 What Criteria can be used to develop a Learning Styles Assessment Instrument that is relevant to the South African Higher Education Context?

The criteria recommended for such a learning styles assessment tool included:

- Creating awareness about learning styles

The study revealed that students benefited from using a learning style assessment tool. Completing the tool, the students commented that it had helped them to identify and become aware of their own learning styles.

- Supporting teaching in higher education

Once they were aware of how students learnt, the lecturers indicated that they could design teaching styles which matched the students' learning styles. They could plan their teaching by taking into consideration the students' learning differences. In particular, they could employ different teaching styles in order to encourage students to use their less frequently used learning styles, in order that they could cope more effectively in different learning environments.

- Allowing students to interrogate how they learn

In this study, the learning styles questionnaire and the writing exercise allowed the students to interrogate how they learnt. Discussing the results from the learning styles assessment tool helped them to interrogate and reflect on how they learn; in turn, this encouraged metacognition.

- Encouraging interactive discussion among the students and lecturers

After completing the assessment tool, the students and lecturers could hold interactive discussions about the students' learning needs, their strengths and weaknesses. They could also discuss how the lecturers' teaching styles could respond to the students' learning needs.

- Allowing students to express themselves in their own words

The writing exercise gave the students the opportunity to express themselves in their own words. They wrote about their past learning experiences and how these had made them successful in their learning. They wrote about their strengths and weaknesses in learning and how they could overcome their weaknesses; they also described other issues which had an impact on their learning.

In addition to the above criteria, it was established that the kind of tool that would be suitable for the South African higher education context should be readily available, accessible, affordable, user-friendly, and should use a simple language.

The particular learning style assessment tool used in this research is *freely available and easily accessible;* it is not copyrighted and can be used by first-year students at institutions of higher education. It is *affordable*, since it does not require a fee, the only cost involved being for photocopying.

It is *user-friendly,* since it is self-reporting, and its use does not call for sophisticated technology. The students need possess only basic calculation skills in order to work out their scores on the tool.

Finally, the *language* used in the tool is *simple*; it was important that it should be in understandable and easy-to-interpret language because many students in South African institutions of higher education learn in a language that is not their mother tongue. The key informants, the linguist, the lecturers and the majority of the students all agreed that the *language* used in the tool was easy and simple and could be understood by first-year students at institutions of higher education.

9.3.3 How useful is the Tool developed in this Study in the Context of promoting more effective Teaching and Learning in Higher Education Context?

The learning styles assessment tool was presented to lecturers, academic staff development lecturers, academic student development lecturers and psychologists for evaluation, to determine its usefulness and worth. A purposive sampling technique was employed in selecting these participants.

The key informants appeared to have an understanding of learning styles. Some had researched learning styles, while others already used such styles as a basis for their teaching. This background information was important for this study, since it assisted the participants in evaluating the tool.

The key informants found the tool to be suitable for assessing students in higher education because of the way it was designed, and because of its ability to assess different learning styles.

The key informants saw the tool as having a positive influence on teaching and learning in higher education. It could draw on the strengths of the students and create awareness among them of the different approaches they could employ to maximize learning. The key informants agreed that knowledge of learning styles by students was important, since this knowledge would assist them in understanding their own learning patterns and facilitate more effective learning.

Knowledge of learning styles by lecturers was also regarded as important by the key informants, since it would help inform both teaching and learning, and also provide the lecturers with basic tools for understanding the learning process.

The key informants found the tool to be useful and appropriate for implementation in a higher education context, especially for first year and foundation programme students.

9.4 LIMITATIONS OF THE RESEARCH

During the process of this study, some limitations were identified. Some of these limitations could form the basis for further research.

- Not all existing instruments are readily available, as they are prohibited by copyright; this study was therefore limited to the available instruments.

- The rates of payment for some instruments are high, and this study could only use those instruments which were freely available.

- The relationship between learning styles and culture could not be explored due to the scope of this research.

- The results of this research cannot be generalized beyond the sample group, since the study made use of a convenience sample.

- Although the medium of instruction at CPUT is English, most of the students in this study had English as their second or third language. This might have had an impact on their identification of their learning styles. However, the researcher could speak isiXhosa and could understand Afrikaans (both languages are regional languages of the Western Cape Province), so where students needed explanations, the researcher was able to provide these, allowing all the students to speak in their language of choice.

9.5 FURTHER RESEARCH

This study could not address some of the issues which emerged. The following recommendations for further research are offered:

- A study could be carried out with a bigger group to find out whether similar results could be obtained, thereby developing reliability coefficients.
- A longitudinal study could be carried out with the same students to second and third year, to ascertain the stability of the learning styles.
- A study could be carried out with second- and third-year students to create awareness of their learning styles.
- Further research could be conducted to explore the value of matching teaching styles and learning styles.
- Research could be conducted to further explore whether students' knowledge of their learning styles enhances learning.
- Further research could be conducted to investigate the influence of culture on learning styles.
- Further research could be conducted to explore the influence of the language of learning on learning styles.

9.6 CONCLUSIONS

The purpose of this study was to develop and evaluate a learning styles assessment tool that is relevant for the South African higher education context. The optimizing of teaching and learning has taken a centre stage in higher education institutions. Measures should be taken to promote effective teaching and learning through the use of learning styles.

Awareness of learning styles provides a basis for effective learning. This includes knowing one's strengths and weaknesses in learning. Awareness through learning style assessment empowers students to understand how they learn and therefore to maximize their learning. Students need to assess and identify their learning differences in order to cope with the demands of higher education and to learn effectively. The learning styles assessment instrument developed for this study was able to assist the students in reflecting on how they learnt, and to identify their learning styles.

With the changes taking place in South African higher education institutions, increasing demands are being placed on learners for enhanced academic performance. The individual qualities of students, their concepts of themselves and their sense of self-worth, need to be acknowledged and encouraged. To this end, the institutions of higher education need to stress the importance of learning styles in teaching and learning.

Lecturers need to move away from traditional ways of teaching which render students passive in the teaching situation. They need to engage in dialogue with their students, to make teaching and learning effective and meaningful both for themselves and for the students. Higher education institutions prepare students for a career and to meet the demands of society. Knowledge of learning styles could empower students to take charge of their learning and ultimately to serve their society.

It is hoped that the findings of this study will empower students to understand how they learn, and to become effective and independent learners. It is also hoped that the findings will help lecturers to understand their students' learning styles and devise strategies which will support them in their studies.

9.7 RECOMMENDATIONS

From the findings of the study, the following recommendations are offered for application in higher education, and for further research.

1. The learning styles assessment tool developed for this study could be used to promote more effective teaching and learning in a higher education context.

2. Students should be encouraged to reflect on and question their learning practices.

3. Lecturers should assist students in understanding their role in the learning process and students be made aware of their learning styles through the use of a learning styles assessment tool.

4. Lecturers could use students' learning differences and strengths as a basis for preparing their lectures.

5. Lecturers should also encourage students to use their non-dominant learning styles by varying their teaching strategies, and providing learning support.

6. To facilitate language accessibility, the tool could be translated into all official languages of South Africa.

7. The learning styles assessment tool developed for this study could be amended so that it can suit a particular field of study or course.

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APPENDICES

APPENDIX A: Letter of Participation and Research Interview Agreement

RESEARCH ON LEARNING STYLE ASSESSMENT INSTRUMENT RELEVANT FOR THE SOUTH AFRICAN HIGHER EDUCATION CONTEXT

I am Nosisana Mkonto a PhD student at the University of the Western Cape. I am conducting research to find out how students learn. The first part of the research is for the students to write a short account of their past learning experiences, mentioning strengths and weaknesses and how these made them learn effectively. The second part of the research is to complete a questionnaire where the student can identify their learning styles. The third part will be discussion with students on how best they can use their strengths in learning in order to be successful.

Research Interview Agreement

1. The interviewee agrees to participate voluntarily in this research.
2. If the interviewee so wishes s/he will be protected through anonymity.
3. The interviewee has the right to withdraw from the study at any time, including having his or her contribution withdrawn from the study.
4. The interviewee may choose at any time not to answer a particular question.
5. Interviews will be recorded unless specified otherwise by the interviewee.
6. If required and requested, the researcher will provide interviewees with copies of the interview notes and or transcription for validation and allow them time to respond.
7. The interviewee to agree to the findings of the research being shared in relevant public forums, e.g. conferences and scientific journals.
8. We commit ourselves to mutual respect of one another throughout the interviewing process. This respect includes fulfilling the various aspects of this agreement.

I have understood the above agreement and I am willing to participate in this research

Date ----------

Interviewee ----------

Researcher ----------

APPENDIX B: Interview Schedule for key informant in HE in the Western Cape

The purpose of the interview is to find out whether the key informants support the idea of developing an instrument or alternative tool that could be used to assess students' learning styles so as to enhance teaching and learning in South African Higher Education contexts.

- What do you understand about learning styles? (To create a common understanding of learning styles)
- Does your institution make use of any instrument or do you know of any instruments in use in South Africa that help lecturers identify their students' learning styles in a Higher Education context? Yes / No – Explain.
- Is there a place for using learning styles as a framework for teaching and learning in higher education context? Yes / No – Explain.
- What kind of instrument would be useful in a Higher Education context?
- What form could this tool take?
- What would you expect from such a tool?
- What criteria do you think should be used when developing such an instrument or tool so that it is relevant to South Africa?
- Other

APPENDIX C: Questionnaire: Evaluation of the Learning Styles Assessment Tool by Lecturers and Key informants

Position in your faculty / Department ……..

Highest qualification ……

Courses taught…….

Experience of teaching in higher education……

1. What is your involvement in the higher education context?

2. What is your knowledge of learning styles? Yes / No. Explain.

3. Do you think the instrument is suitable to assess learning styles of students in higher education (HE) context? Yes / No. Explain

4. Do you think the instrument can have a positive influence in teaching and learning in HE? Explain.

5. Is it important for students to know their learning styles? Yes / No. Explain.

6. Is it important for lecturers to know their students' learning style? Yes / No. Explain

7. Will knowing the students learning styles assist the lecturers in adapting their teaching styles to accommodate the students' learning styles? Yes / No. Explain.

8. Is the language used in the instrument simple and clear enough to be understood by first-year students? Yes / No. Explain.

9. Is the time-frame for completing this exercise realistic in a first-teaching programme? Yes / No. Explain.

10. Would you recommend that lecturers at all universities in South Africa use this instrument with first-year students? Yes / No. Explain.

11. Do you have any suggestions for improvement on this process? Explain.

12. Overall comments.

APPENDIX D: Questionnaire: Evaluation of the Learning Styles Tool by Key Informants

Year of study: ----------

Course: ----------

Instructions: Complete the following by making a tick (✓) in the appropriate block.

Statements	Agree	Undecided	Disagree
1. The instructions are clear.			
2. The statements are clear and understandable.			
3. The language used is simple.			
4. I could identify my learning styles without difficulty.			
5. The questionnaire is not too long.			
6. The questionnaire does not take too long to complete.			
7. It is important for me to know my learning style.			
8. The questionnaire has a variety of learning styles I can choose from.			
9. I understand what a learning style is.			
10. The instrument is useful to students.			
11. The instrument appears to be relevant to			

measuring learning styles.			
12. Knowing my learning style will make me learn better.			
13. It is important for the lecturer to know the students' learning styles.			
14. I could understand the explanations of the learning styles clearly.			
15. The writing exercise made me interrogate how I learn.			
16. The writing exercise gave me an opportunity to express myself in my own words.			
17. It is my first time completing a learning style questionnaire.			

Use the space below if you have any additional comments

APPENDIX E: Learning Styles Assessment Tool

The learning styles assessment instrument consists of three parts:

Part 1: the writing activity

Part 2: the learning styles questionnaire and scoring sheet

Part 3: Learning styles profile

Duration: 20 minutes

PART 1

NAME ……..…….

COURSE ……..…….

YEAR OF STUDY ……..……

DATE ……..……

Write a short account of your past learning experiences, mentioning strengths and weaknesses in learning and how these have made you learn effectively.

PART 2

NAME ……..…….

CLASS ……..……..

DATE ……..……

Instructions: There are four responses for each statement. Each response has a numerical value. Read the each statement and decide which of the four responses are least like you or are most like. Put an X on the number of your response.

Statements	Most like me		Least like me	
1. When I am involved in practical work, I remember what I have learnt better.	4	3	2	1
2. I enjoy doing written assignments	4	3	2	1
3. I learn better when I listen in a lecture than when I study on my own.	4	3	2	1
4. I learn best when I study alone.	4	3	2	1
5. Having clear instructions on how to do an assignment makes it easier to understand.	4	3	2	1
6. I would rather do an oral presentation than write an assignment	4	3	2	1

7. I can solve maths problems without writing them down.	4	3	2	1
8. If I need help in the subject, I ask a classmate for help.	4	3	2	1
9. I understand maths better when I see the numbers written down.	4	3	2	1
10. I would rather write an assignment than be involved in discussion.	4	3	2	1
11. I remember things I heard better than those I have read.	4	3	2	1
12. I remember more of what I learn if I learn it when I am alone.	4	3	2	1
13. I would rather read a book than listen to somebody reading to me.	4	3	2	1
14. I engage more in discussions than writing on my own.	4	3	2	1
15. I work better with numbers when they are given to me orally.	4	3	2	1
16. I like to work in a group because I learn from others in the group.	4	3	2	1
17. Written maths problems are easier for me to do than the ones given orally.	4	3	2	1
18. Drawing something help me understand it better.	4	3	2	1
19. It is easier for me to	4	3	2	1

understand what I have read than what I have heard.				
20. When I work on an assignment I like working alone.				
21. I prefer written directions spoken ones.	4	3	2	1
22. I prefer oral tests/ examination to written ones.	4	3	2	1
23. I remember numbers for long without writing them down.	4	3	2	1
24. I get more work done when I work with others.	4	3	2	1
25. When I see numbers it makes it easier for me to work with them.	4	3	2	1
26. I like projects where I have to make things with my hands.	4	3	2	1
27. I prefer written tests to oral tests.				

SCORE SHEET

Directions: Find the statement number on the Learning Style Inventory and write the number (1-4) on the blank spaces. Total the numbers under each heading. Multiply the heading by two. Look at the scores to decide on the dominant learning style.

Visual Language	Auditory Numerical	Social Group
5----------	7--------	8------
13--------	15------	16-----
21--------	23------	24-----
Total …….x2=	Total ……..x2 =	Total …….x2

Visual Numerical	Kinesthetic- Tactile	Expressiveness Oral
9 ------	1------	6--------
17-----	18-----	14------
25-----	26-----	22------
Total ……x2 =------	Total ……x2 =------	Total …….x2 =-------

Auditory Language	Social Individual	Expressiveness-Written
3 -------	4------	2-----
11------	12-----	10----
19------	20-----	27-----
Total……x2 =-------	Total…..x2 =------	Total ……x2 =--------

Score: 21-27= Major Learning Style – You prefer this learning style and feel comfortable using it.

Score: 12-18= Minor Learning Style – You use this style of learning, but usually as a second choice or in conjunction with other learning styles.

Score: 6-9= Negligible use – You prefer not to use this learning style.

LEARNING STYLES EXPLANATIONS

LEARNING STYLES	EXPLANATIONS
Visual Language	These students learn from seeing words. They may write down words that are given to them orally so as to see them.
Visual Numerical	These students want to see numbers on the board, in a book, in a paper in order to work with them. They remember and understand mathematics facts if they have seen them.
Auditory Language	These students learn from hearing words spoken. One may hear them vocalizing or see lips or throat move as they read particularly when striving to understand.
Social Group	These students strive to study with at least with one another person. Group interaction increases their learning and recognition of facts.
Kinesthetic Tactile	These students learn best by experience, being hands-on and self involvement. They may not seem to understand or able to concentrate on work unless they are totally involved. They want to touch and feel material.
Expressiveness Oral	These students talk fluently, comfortably and seem to be able to say what they mean. They feel comfortable talking than writing.
Social Individual	These students get work done alone. They remember more when they learn by themselves. They care more for their opinion than for ideas of others.
Expressive Written	These students write fluent essays and good answers on tests and assignments. They feel uncomfortable to give oral answers.
Auditory Numerical	These students learn from hearing numbers explained orally. They can work problems

	mentally.

PART 3

Learning Style Profile

Name ----------

Date ----------

Minor (12- 18) Major (21-27)

	3	6	9	12	15	18	21	24	27
Visual Language									
Visual Numerical									
Auditory Language									
Auditory Numerical									
Kinaesthetic Tactile									
Social Individual									
Expressiveness Oral									
Expressiveness Written									