THE LEARNING STYLES

OF

FIRST YEAR UNIVERSITY STUDENTS

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SUMMARY

There has been a shift in the South African education system from a purely grade-oriented system to that of a learner-centred outcome-based system of education which challenges higher educational institutions and their faculties to adjust their goals to this system. In South Africa there is evidence of poor academic performance at higher education institutions. Among other things, noncognitive factors may be important mediators of academic success. With the expansion of higher education and the increased emphasis on access, retention and life-long learning, it is a good reason to explore the nature of different learning styles (Healey & Jenkins, 2000). Learning styles and personality types has been identified as significant predictors of academic performance.

The present study aimed to contribute to this body of research in general and to Kolb's (1981) theory of experiential learning and his conceptualisation of learning styles in particular. The aims of the study were to explore and describe the learning styles of first year university students (Aim 1), to explore and describe the learning styles of first year university students per faculty (Aim 2), and to explore the relationship between learning styles and academic performance for students in the various faculties (Aim 3).

The study used an explorative descriptive and correlational research method and was conducted within a quantitative framework. Participants were selected using a non-probability convenience sampling technique. The sample was comprised of 391 first year university students to whom Kolb's Learning Style Indicator was administered as part of the Explore programme

during orientation week. Descriptive statistics were used in order to explore and describe the learning style of the learners for the sample as a whole and per faculty. Data for the learning styles and academic performance categories were cross tabulated so as to comment on the relationship between learning styles and academic performance per faculty. Small cell sizes made it impossible to analyse the latter data statistically.

Across the six faculties the Accommodator learning style was the most represented, followed by the Diverger learning style. No significant relationship was found between learning styles and academic performance. The implications of the findings for counselling and teaching students are highlighted and suggestions to expand the research through using larger samples are also made.

Key words: learning styles, academic performance, first year university students

CHAPTER ONE

INTRODUCTION

General Background

The Department of Education (1996) has re-affirmed the importance of higher education in current society as it creates a context that provides learners with the opportunity to realise their creative and intellectual potential. Key roles fulfilled by higher education are: a) to equip learners with the necessary skills, knowledge and values in order to prepare them for their diverse social roles as effective citizens; and b) to pursue intellectual inquiry and research that will enable them to contribute to the advancement and innovation of society. The significance of the roles played by higher education is evidenced in the high correlation between the levels of higher education in society and the overall national achievements in the domains of development, growth and welfare (Department of Education, 1996).

For decades access to schooling and post-secondary education in South Africa was determined according to cultural groupings with a separate and unequal education system implemented for each of the four groups, namely black, coloured, indian and white (Griesel, 1999, Skuy, Zolezzi, Mentis. & Fridjhon, 1996). The education system was marked with extreme inequalities with black and coloured learners in particular being exposed to low quality curricula, unqualified teachers, unmanageable teacher-pupil ratios, substandard facilities and resources (Nel, 1997, Strydom & Noruwana, 1993), rising learner numbers and a backlog in the education sector (Pickworth, 1997).

Higher education institutions are the providers of high-level manpower in South Africa and thus face telling challenges in the light of the past inequalities in education provision. South African higher education institutions need to provide access to the educationally disadvantaged groups and redefine the values, norms and policies of social institutions (Rampele, 1995). The school-leavers demand for access is compounded by the socio-economic demand for highly trained graduates with a broad range of skills and competencies (National Commission of Higher Education, 1996) creating flexible, lifelong learners that are able to meet the needs of the changing labour market (Pickworth, 1997). According to Chickering and Reisser (1993),

> Institutions that impart transferable skills and relevant knowledge, bolster confidence and creativity, and engender social responsibility and self-directed learning are needed more than ever. (p44)

The Minister of Education in a draft White Paper (1997), stated that higher education needs to be

> encouraging new learning and teaching strategies, in particular, modifying traditional methods of discipline-based and sequential courses and qualifications with a flexible credit-based system, with multiple delivery and exit points and a range of delivery mechanisms, including distance education and resource-based learning. (p16)

Problem Formulation

Higher education is usually part of the preparation for an occupation therefore it is important to provide learners with optimal learning experiences. These experiences should accommodate the diversity within the learner

population, as higher education institutions in South Africa strive to be more representative of the broader population by recruiting from the different cultural groups and social classes (Dawes, Yeld & Smith, 1999). Due to the promotion of the learner-centred approach, one aspect of good undergraduate practice in higher education institutions is to acknowledge and make provision for the different learning styles of learners (Pickworth, 1997). The recognition of and adaptation to learners' diverse learning styles, in conjunction with improving the process of predicting academic achievement, could prove invaluable to the development of the potential of individuals preparing for a career. This is particularly relevant to first year university learners with diverse socio-cultural backgrounds, personal characteristics, academic and career interests. Mokoena (1997) found a trend amongst first year learners that rendered their approach to learning ineffective. Their learning behaviour was characterised by disorganised study methods, a negative attitude to learning tasks and they tended to lack foresight in their learning. It follows that early identification of these learners and their learning styles could improve their academic achievement. In addition, raising the awareness of lecturers regarding the diverse learning styles of their learners would enable staff to be versatile and adaptable in their teaching methods. The participants in this study were all first year students from diverse educational backgrounds and the study aimed to explore and describe the learning styles of a multicultural sample of first year university students.

Aims of the study

The specific aims of the study were as follows:

1. To explore and describe the learning styles of first year university students in general.

2. To explore and describe the learning styles of first year university students per faculty.

3. To explore and describe the relationship between learning styles and academic performance of first year university students per faculty.

Organization of the research report

Chapter 2 provides a literature study of the educational context of South Africa and the needs of higher education institutions. An exploration of noncognitive factors that play a role in academic performance, with particular reference to learning styles will be discussed. Some of the research that has been conducted on learning styles will be provided.

In chapter 3 an overview of the various learning style theories and models will be provided. In particular, David Kolb's theory of experiential learning and learning styles will be described in greater depth. Characteristics of experiential learning, learning abilities and learning styles as expounded by Kolb are described. Some practical uses of the theory are highlighted and criticisms of the theory are provided.

In chapter 4 the research problem and the methodology used to investigate it will be provided.

In chapter 5, the results of empirical study are presented and discussed.

In chapter 6 a summary of the study is provided, limitations of the study are highlighted and recommendations based on the findings of the study are

made. Recommendations are also made in terms of the application of learning styles in counselling practice.

CHAPTER TWO

OVERVIEW OF NONCOGNITIVE FACTORS IN ACADEMIC

PERFORMANCE

Introduction

This chapter attempts to conceptualise the importance of the present study. Firstly, it is important to understand the South African educational context and the needs of higher education institutions. Secondly, the noncognitive factors that play a role in academic performance will be discussed. One of these factors is learning styles. Research related to learning styles will be surveyed. It should be noted that the specific theory of learning styles that is of importance to this study, will be expounded on in the next chapter.

South African Educational Context

The field of education at primary, secondary and tertiary levels has undergone major transformation in an attempt to unify the previously fragmented educational provision and qualification criteria as facilitated by the National Qualifications Framework (NQF, 2000). The goal of the education legislation is to transform South Africa's national education system from a previously trainer-centred, content-based system of education to a more learner-centred, outcome-based system (Gauss, 2002). Education that is learning based and takes into account the nature of the subject, could provide students with the opportunity to better their academic achievement since this

approach places emphasis on students' strengths rather than on their weaknesses (Erasmus, 1994). Furthermore, the learner-centred, outcome-based system measures academic performance more in terms of learners' ability to meet the national academic outcomes as stipulated by the NQF (Manganyi, 1997)

A diverse learner population characterises educational provision in South Africa across all educational levels. Learners from a previously disadvantaged background in particular, are often under-prepared and at risk of failing or dropping out. Educators in higher education have found themselves ill equipped to educate learners with these varying degrees of academic readiness and educational backgrounds (Gauss, 2002). Fontana (1988) found that learners from previously disadvantaged backgrounds have had fewer educational opportunities, less parental support and encouragement and tended to have an increase of emotional stressors which led to learners struggling to meet the stipulated academic requirements for their current educational level (Dreyer, 1996). Consequently, optimising learning and teaching has become a priority of higher education institutions as the traditional system excluded many learners and denied them the opportunity to reach their full academic potential (Cilliers & Sternberg, 2001).

According to Manganyi (1997), one of the most difficult challenges facing educators in the South African higher education system is the high drop out and failure rates. Despite the fact that the retention of learners is a problem internationally (Boddy, 1996; Braxton, 1995), South Africa has significantly lower graduation rates than other countries and, therefore, the need to address the issue of dropouts and high failure rates has become a

priority in recent years (Department of Education, 2001; Dreyer, 1996, Erasmus, 1994, Manganyi, 1997, Roberts, 1995). There is a 20% drop out rate of undergraduates at universities every year and this results in a total of 120 000 uncompleted studies annually (Dawes, Yeld & Smith, 1999; Gultig, 2000). The government subsidy loss per annum amounts to R1.3 billion (Department of Education, 2001). Due to South Africa's limited financial resources it cannot afford to spend large amounts of money on students who do not succeed at higher education institutions (Gultig, 2000; Janse van Rensburg, 1999). Not only is the government economically affected, but learners are also affected by the high cost of tertiary education and the high unemployment rate (Gerwel, 1995). Learners who register and pay for courses, but fail to graduate, add to the institution's financial pressures.

Since 1994, attempts to widen access and to ensure equity at historically white higher institutions, has seen a significant increase of black students on these campuses (Gultig, 2000, Huysamen, 2000, Zaaiman, Van der Flier & Thjis, 1998). However, poor academic performance, evident at universities (Phungula, 2000; Simelane, 1993), technikons (Erasmus, 1994), and across various faculties and study fields, underlines the importance of understanding the link between retention and persistence. It is largely the learners' educational backgrounds that fail to prepare them for success, and it is therefore important that higher education institutions identify (i) learners who could succeed academically; and (ii) the learner's development needs in order to increase success rates (Admissions and Placement Assessment Programme, 2001, Watson, Van Lingen & De Jager, 1997). To improve retention rates they need to know what type of learner will be successful in

passing their first year, passing year three, and graduating within the expected time frame of their respective degrees or even passing after an interruption in their studies. Understanding persistence is therefore important. Cattel and Butcher (1968) state that an obvious difference between achievement at school and university is the fact that tertiary learners receive minimal guidance and are required to think independently, consequently achievement at school cannot be directly translated to achievement at university. According to Cattel and Butcher (1968) the following factors can be used to explain why students do not perform as well as they should:

1. In the foundation years at school they are not taught to use all their cognitive processes, in particular high-level processes.

2. They do not use one or more processes due to a cognitive disability.

3. Irrespective of the requirements of a task, they continuously choose one mode of information processing.

The trend towards lifelong learning, which leads to an emphasis on learning to learn, and the need to accommodate different learning styles, customisation and alternative learning routes, or the need to build on experiences and background of learners (Arko-Cobbah, 2002), attempts to foster persistence. The learner-centred approach sees knowledge as something that needs to be constructed rather than merely absorbed passively by the learner. This approach capitulates Piaget's (1952) and Vygotsky's (1978) developmental theories. In the learner-centred approach there is shift in paradigm in that the teacher's role becomes one of facilitator and guide. As a result, the learners find the goals of the lesson to be more

meaningful to them, as the instructor models the teaching technique to the learners (Nkoane & Letlala, 2002).

Various studies have been conducted in order to identify and remedy factors contributing towards high failure and dropout rates in South African universities (Dreyer, 1996; Simelane, 1993). There are many factors that contribute to poor pass rates and these include; incorrect admission decisions, incorrect degree choice, lack of critical literacy and numeracy skills required (i.e., under- and unprepared students), lack of learner support and development programmes, poor motivation and socio-economic factors (APAP, 2001). These will be elaborated below.

Factors that play a role in academic performance

Understanding and prediction of academic performance of learners is important for the learners themselves, their parents, educators and the educational policy makers. Mathews (1991) states that it is beneficial to the learner to understand the factors that may impact on academic performance as such an understanding can increase their motivation, assist them to develop positive attitudes towards learning, and decrease their achievement-related anxiety. Through understanding and increased self-awareness the learners are empowered having gained a sense of control over their academic performance derived from insight gained. This enables them to identify the areas that they need to address in order to achieve their academic goals (Murray-Harvey, 1997).

Educators and educational policy makers can utilise their understanding and insight to adjust and individualise the content and method of instruction to

accommodate the most common learning needs of their learners. Briggs Myers and McCaulley (1992) state that the goal of matching teaching and learning methods is to optimise the learner's learning and academic performance.

Many factors play a role in predicting academic performance, progress and persistence. These factors can be grouped into two categories namely, cognitive and noncognitive factors. From a cognitive perspective, factors such as language proficiency, numerical proficiency, mathematical proficiency, critical thinking skills, scientific understanding and problem solving and reasoning skills have repeatedly been found to predict academic performance both nationally (Dawes, et al., 1999; Huysamen, 1999; Miller, 1992; Skuy et al., 1996) and internationally (Cole, 1997).

When assessing cognitive variables Van Eeden, De Beer and Coetzee (2001), caution that cognitive measures, while reflecting the individual's current level of functioning, relies mainly on previous learning experience. In South Africa, standardised cognitive tests may not be accurate predictors of future performance, particularly for learners from a previously disadvantaged educational background (Dawes et al., 1999; Huysamen, 1999; Miller, 1992; Skuy, et al., 1996). To address the inequalities of the past, Taylor (1994) stresses that students with the potential for development need to be identified despite their abilities being limited due to educational background. Therefore, more emphasis should be placed on potential rather than on skills or specific abilities and learners with high potential should be provided with the opportunity to develop specific skills through training programmes.

According to Sternberg (1985), intelligence can be categorised into three areas namely; analytical intelligence, experiential or synthetic intelligence and contextual or systematic intelligence. The ability to be creative or adaptive is experiential intelligence. The individual's ability to understand and negotiate a "system" to his or her advantage is contextual intelligence. Experiential and contextual abilities seem to be measured by noncognitive variables which may be important mediators of success in higher education institutions. Noncognitive factors include psychological, cultural, and social aspects of an individual. With outcome-based education, the subjective experience of the learning process and the value of creating equitable and genuine opportunities to learn should be part of measuring academic performance (Howe, 1995). Noncognitive variables have also been found to play a role in predicting academic success (Riordan, 2002, Sedlacek, 1996). Many personal and environmental factors have been found to impact on academic performance (Dixon & Woolhouse, 1996; Murray-Harvey, 1997).

There is evidence that noncognitive variables might more accurately predict the academic performance of groups with non-traditional educational background experiences than cognitive variables would (Riordan, 2002, Sedlacek, 1996). Research on noncognitive variables indicates that African-Americans tend to score higher on instruments measuring experiential and contextual intelligence in comparison to instruments measuring analytical intelligence (Sedlacek, 1996). Hendrich (2001) found that noncognitive variables play a significant role in academic success.

The research on noncognitive variables has revealed that:

- Learners' performance can be accurately predicted.

- Learners with different learning styles are better able to demonstrate their potential.

- Valuable information is provided that can be used by academic advisors (http://oregonstate.edu/admissions/2004req/).

Environmental factors that play a role in academic performance of university learners such as teaching styles (Bodi, 1990; Dixon & Woolhouse, 1996; Entwistle, 1990), curricular and subject choice (Dyne, Taylor & Boulon-lewis, 1994) and institutional aims (Entwistle, 1981) have been the focus of international studies. Entwistle (1990) states that universities need to obtain information about the diverse factors that may help or hinder their learners from reaching their optimal academic achievement.

The following noncognitive variables among others have been found to be predictors of academic persistence, namely, having goals and sub-goals (Riordan, 2002, Sedlacek, 1996), perceived self-efficacy (Pickering, Calliotte & McAuliffe, 1992), coping strategies and study skills (Abatso, 1982), personality types (Gauss, 2002), and thinking and learning styles (Cillers & Sternberg, 2001, De Klerk, 1993; Deller 1997; Dreyer, 1996, Erasmus, 1994; Mokoena, 1997). Hendrich (2001) found that learning strategies had good predictive power in terms of predicting academic success. For learners from culturally diverse backgrounds, contrasting interests, personalities and learning styles this has become particularly important (Murray-Harvey, 1997; Van Ryneveld-Grove, 1993). With the shift to learner-centred education, the relationship between educator and learner styles as an environmental factor has been emphasised in international research (Dixon & Woolhouse, 1996).

Of particular importance to the focus of the present study, is the fact that Sternberg argues that learning and thinking styles are as important as levels of ability for optimal performance (Cillers & Sternberg, 2001). Furthermore, learning styles can play an important role in the improvement of curricula and teaching in higher education (Claxton & Murrell, 1987). Not understanding the learning process can serve as a substantial impediment to student learning and faculty teaching (Sims & Sims, 1995). Conversely, knowledge and understanding of the learning process, particularly about how individuals learn, enables educators to redesign their teaching styles to enhance their students' ability to learn (Sims & Sims, 1995). As the learning styles of students will be focused on in the present study, a brief review of the literature related to learning styles will be presented in the next section while theories related to learning styles will be presented in the next chapter. Research related more specifically to the theory of learning styles on which the present study was based will be discussed in the next chapter.

Research Related to Learning Styles

Fritz (2002) states that with the results of learning style inventories, personal learning profiles can be created to empower learners to become active and successful participants in their education. Educational research has found that active learning has a significantly positive effect on learner success (Bonwell & Eison, 1991; Cook, 1997). Due to the growing concern regarding graduation and retention rates, active learning has gained attention in the academic world. Identifying the learners learning styles can assist educators to utilise active learning strategies. The process of identifying

learning styles and creating profiles, results in learners becoming more active in the learning process, and therefore, positively impacts on retention and graduation rates (Fritz, 2002).

Seeler, Turnwald and Bull (1994) defined active learning as a learner being actively involved in the learning process. Active learners are not passively receiving information but interact with the information in a meaningful way (Robothom, 1999). Felder (1996) states that learning styles represent the learners' way of learning that results from social, psychological and organizational thinking patterns. Felder and Solomon (1996) state that while people tend to use all learning styles occasionally, they have preferences that may be strong, moderate or mild.

Increased academic performance has been linked to institutions that are more learner focused (Dixon & Woolhouse, 1996) due to the fact that they have focused on the individual learners needs in order to facilitate optimal academic development (Campbell & Davis, 1990; Fairhurst & Fairhurst, 1995). Research has shown that an environment that takes into account the variety of learning styles can indeed improve student performance (Learning styles, Sept, 2003). According to Briggs Myers and McCaulley (1992), learners with subject compatible learning styles will have a natural inclination for applying the thinking strategies that are required for a particular subject, and are therefore easier to educate. A positive relationship has been found between curricula and subjects that are compatible with the learners learning style (Briggs Myers & McCaulley 1992, Dixon & Woolhouse 1996).

Deller (1997) asserts that among the many factors that contribute to academic performance, learning styles and personality types have been

identified as significant predictors of academic performance. Gauss (2002) recommends that different faculties compare learning styles and personality types to enable them to facilitate a more unified approach towards learner-centred education. Briggs Myers and McCaulley (1992) found that there are three aspects of academic performance that are influenced by personality type and learning style, namely, aptitude, interest and application.

Learning styles have been found to be one of the most salient personality-related variables when investigating academic performance. Strack (1999) found that most of the studies investigating the role of personality type on academic performance have included a description of learning styles associated with the different personality types. The effectiveness of the specific learning style used by the learner influences academic performance (Gauss, 2002).

Studies have revealed that training programmes that are customised to the unique personality types and learning styles of the learners are more likely to lead to academic success (Briggs Myers & McCaulley, 1992; Deller, 1997; Fairhurst & Fairhurst, 1995), personal development (De Beer, 1997; South African Association for Psychological Type, SAAPT, 1998; Tieger & Baron-Tieger, 1992) and a more meaningful and positive learning experience. An important step in adjusting training programmes and training styles is having the knowledge about the unique personality types and learning styles of the learners (Gauss, 2002). Research focusing on higher education internationally (Murray-Harvey, 1997) and nationally (Mokoena, 1997) have emphasised the need to make provision for the diversity of learners by acknowledging and

making provision for different personality types and learning styles (Gauss, 2002).

Studies have found a link between the teaching styles of tertiary educators and the academic performance of learners since teaching styles can be adjusted to suit learners needs and personality types. This would result in educators benefiting from gaining insight into their learners' personality characteristics (Mokoena, 1997; SAAPT, 1998).

Learning styles may account for more variance in academic performance than traditional criterion variables such as personality, attitudes, cognitive style and ability (Albaili 1994). It has been found that certain learning processes correlate significantly with academic performance. De Beer (1996) states that learning styles play an important role in the learners' academic success.

Erasmus (1994) found that the prominence of particular learning styles for a specific group of learners has important implications for discipline-specific teaching as it enables the lecturer to accommodate specific learning styles by using various teaching strategies. There is also an indirect implication for teaching in terms of teaching development, potential development, counselling and teacher training (Erasmus, 1994). Felder (1993) states that problems could be minimised and quality could be enhanced if educators modify their teaching styles to accommodate the learning styles of all the learners in their classes by addressing the different learning style dimensions at least some of the time. By doing this, education would promote effective learning and a positive attitude, which could compel learners to exercise and strengthen their less developed abilities (Felder,

1993). Rutz (2003) found that the content of educational programmes that predominantly accommodate a single style fails to meet the expectations of many of the learners.

Various South African studies have confirmed the relationship between learning styles and academic performance. Some studies have focused on learners in higher education in general (De Klerk, 1993; Dreyer, 1996; Mokoena, 1997), while others have investigated the learning styles of learners in specific higher education faculties. Mokoena (1997) revealed that there were prominent differences, preferences and influences with regard to the learning styles, approaches, and orientation of learners. Faculties or departments investigated include Nursing Science (Motuang, 1998; Mzalisi, 1997), Science (Felder, 1993), Commerce (Phungula, 2000) and Psychology (Gauss, 2002). Motuang (1998) found that learners at a fourth year level used different or additional learning styles to those used by first year learners and therefore a range of teaching strategies should be employed in order to enhance learning. Learning styles adopted by learners in the first third of their studies were similar to each other, irrespective of their main disciplines (Nulty and Barrett, 1996). However, in the final third of their studies, the learners' learning styles of revealed a tendency to be related to the discipline that had formed the primary focus of their studies (Nulty and Barrett, 1996). Mzalisi (1997) found that that there was a significant statistical association between questioning skills and learning styles. These results revealed that theory-centred and fact-oriented learning styles (Assimilators and Convergers) had a tendency to participate moderately to maximally in questioning and action-centred and people-oriented learning styles (Divergers and Accommodators)

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participated only minimally in questioning. Gauss (2002) highlighted that both learning and teaching styles can contribute to improving academic performance. De Beer (1996) explored the learning styles of learners in bridging programmes in order to accommodate them and assist them in maximizing their potential. He complied a profile and it indicated that these learners preferred learning through active participation and experience. Taljaard (1995) found that learners from different academic fields differed in their preferred way of learning.

Summary

The educational context in South Africa was briefly explored in this chapter to firstly, provide a background against the shift to outcome-based, learner-centred education and secondly, to provide a rationale for the consideration of various factors that play a role in predicting academic performance. Learning styles was identified as one of these factors that play a role in predicting academic performance. Some of the broad research conducted in the field of learning styles and academic performance was mentioned.

An overview of various learning style models and theories that have emerged over the years will be provided in Chapter 3. Particular emphasis will be placed on specific research conducted regarding the operationalisation and application of the theory utilised in this study.

CHAPTER 3

LEARNING STYLES: THEORECTICAL PERSPECTIVES

There are many learning style theories and models. This chapter mentions the various theories briefly and then attempts to conceptualise Kolb's experiential theory more fully. Kolb's experiential learning theory and learning styles are explained in order to provide an understanding of its use in the field of learning as it pertains, specifically to this study. An overview of the practical use of Kolb's theory as well as criticisms of the theory will also be provided.

Learning Style Models

The concept "learning styles" has many dimensions and can be defined as a learner's consistent way of responding to, and using stimuli in the context of learning (Learning styles, 2000). Learning styles have been investigated from psychological, social, physiological and educational perspectives. Due to these diverse perspectives many learning and cognitive styles inventories have been produced (Fritz, 2002). There are many theoretical models explaining the diverse styles of learning and these can be categorised into four areas, namely, instructional and environmental models, social interaction models, cognitive/information processing models and personality models (Anderson & Bucher, 1994). Some of these models can be used in the counselling of individual learners or tailoring instruction to a homogenous group, while others tend to be more useful in the design of curricula, units, modules and single presentations or lessons (Anderson & Bucher, 1994).

Claxton and Murrell (1987) conceptualise these different models using the analogy of an onion. At the core is personality, which focuses on stable individual characteristics. These models emphasise how the role of personal tendencies such as introversion versus extroversion, and thinking and feeling influence the learner's preferred style of learning (Anderson & Bucher, 1994). The second layer is the information-processing model, which describes how people receive and process information. This model focuses on the individual's preferences in the acquisition of experience and the subsequent restructuring of that experience as knowledge on an active versus reflective continuum (Anderson & Bucher, 1994). The third layer, the social interaction model, deals with how students tend to interact and behave in the classroom, and it considers the collaborative learning styles and the dimensions of dependence and independence. The outer fourth layer is the instructional preference model, which focuses on the sensory channel most important to the learner (Anderson & Bucher, 1994), and identifies various characteristics such as light and temperature; motivation and persistence; individual or group preference, perception and intake and right brain or left brain preference (Fritz, 2002). The traits of these models are not discrete and have an influence on each other. At the core, the traits are most stable and least subject to change. As one moves outward the traits are less stable and more susceptible to change (Claxton & Murrell, 1987).

Some of the strengths of a learning style model are as follows: a) the focus is on how different individuals process information across many content areas; b) the role of cognitive and affective processes are recognised, therefore it can significantly deepen our insights into the issues that relate to

motivation; and c) thought is emphasised as an essential component of learning and thus avoiding reliance on basic and lower-level learning activities.

Teaching and learning at tertiary level has taken on a learner-centred approach and therefore demands an awareness of learner's needs. Thus, for the purposes of the present study, a theory and a learning style inventory based on the information-processing model described above (the second layer of the onion) have been selected. Consequently, the theory that has been selected, namely, David Kolb's theory of experiential learning, will be expounded in the next section. His theory is one of the best known educational theories in higher education. His theory provides a theoretical base which other writers lack in their work.

In higher education there has been an increase in emphasis on access, diversity, retention and life-long learning and for this reason it is advised that the learning styles of learners be explored. Anderson and Adams (1992) state that Kolb's theory is relevant as it affirms all the major aspects of active learning and the theory provides a rationale for a variety of learning methods.

Kolb's Theory of Experiential Learning

Kolb's theory builds on the work of three theorists namely Piaget, Dewey and Lewin. Piaget's theory emphasised that intelligence is the result of the interaction of the person and the environment (Pickworth, 1997). Piaget describes intelligence as being shaped through experience. His theory explores the stages of cognitive development which ends at adolescence. However, subsequent research extended the concept of development into

adult learning for lifelong development and this accounts for the use of experiential learning in higher education. The applicability of the theory led to the introduction of experience-based learning programmes in schools where children were encouraged to learn through discovery, rather than utilising memorisation (Pickworth, 1997).

Dewey (1938) placed emphasis on the need for learning to be grounded in experience. His experiential learning ideas have been used in traditional educational programmes. His ideas were developed to address challenges of coping with change and lifelong learning (Pickworth, 1997), which have remained highly relevant. Dewey (1938) stated that genuine education was attained through experience, however this does not assume that all experiences are genuine or equally educational. In his view, experience could be seen as a cycle of trying, including the following four steps: 1) a person senses a concern, 2) gets an idea, 3) applies the idea, which 4) leads to an experience with particular consequences and this will confirm or reinterpret the theory (idea) applied in the light of those consequences. In some situations the process will result in the reconstruction or re-codifying of habits and an ongoing active questioning through further experimentation.

Lastly, Kurt Lewin's influence in the fields of social psychology and organisational behaviour contributed to Kolb's theory of experiential learning. Kurt Lewin stressed the importance of being active in the learning process, as well as the value of subjective personal experience (Pickworth, 1997).

Kolb's theory of experiential learning integrates the similarities of the three above-mentioned theorists, resulting in a unique perspective on learning

and development (Kolb, 1984). According to Kolb (1981), the learning process is conceptualised in such a way that it identifies individual learning styles and corresponding learning environments. This model is dialectical (Kolb, 1981). According to Kolb (1981) high-level integration and the expression of nondominant modes in dealing with the world leads to development.

Kolb's model is rooted in a theory of learning that reinforces the key components of active learning which accounts for the array of individual differences (Anderson & Adams, 1992; Kolb, 1981, 1984; Smith & Kolb, 1986). Kolb's model is derived from the social learning model that connects the variability of an individual's learning style, to the flexibility in the learning context (Anderson & Adams, 1992).

<u>Experiential Learning Theory</u>

One of the reasons Kolb's theory is called "experiential learning" is because it emphasises the importance of experience in the learning process. This emphasis differentiates it from other cognitive and behavioural learning approaches to the learning process. Cognitive approaches tend to emphasise cognition over affect, and behavioural learning approaches tend to deny the role of subjective experience in the learning process (Kolb, Boyatzis & Mainemelis, 1999). Experiential learning is a cyclical pattern of learning from experience through reflection and conceptualising to action and on to further experience. (Kolb, 1981) Experiential learning draws on the participants' experience and their reflection. It is therefore learner-centred as it starts with the premise that one learns best by experience (learn-by-doing). It is a holistic approach as it addresses cognitive, emotional and physical aspects of learners. Craig (1997) defines experiential learning as the knowledge, skills

and/or abilities attained through observation, simulation, and/or participation that provides depth and meaning to learning by engaging the mind and/or body through activity, reflection, and application (http://people.uleth.ca/~steve.craig/whatis.htm).

Experiential learning is characterised by the following:

- It recognises that people learn best from their own experiences and their own reviews.

- It subscribes to the notion that what people do is more important than what they know.

- It moves beyond knowledge and into skill by generating a learning experience.

- It understands that to be remembered over a long period of time the learning process should be enjoyable, motivating and rewarding.

- It respects the individuals' ideas and choices.

- It provides opportunity to take on challenges in an atmosphere of support.

- It generates space and time to stand back and reflect when pressures or doubts become too strong.

- It cultivates a realisation that the attempt at doing something new or different is more significant than the result.

- It produces an awareness that effective learning requires small controlled steps outside the comfort zones (Learning Styles, 2002).

According to Kolb's theory, there are two fundamental dimensions, namely, the apprehension dimension and the transformation dimension, each of which is comprised of two opposing orientations. The apprehension dimension (vertical axis) is comprised of an orientation towards Concrete Experience (CE, apprehension) as opposed to the Abstract Conceptualization (AC, comprehension) orientation. Apprehension describes the act of learning and grasping understanding with intellect (Webb, n.d.). It involves a perception that is simple, direct and immediate (Webb, n.d.).

<div align="center">

Concrete Experience

A
P
P
R
E
H
E
N
S
I
O
N

Abstract Conceptualization

</div>
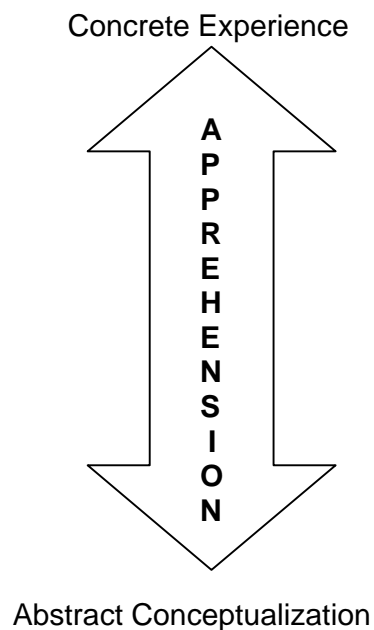
In the transformation dimension (horizontal axis), an orientation towards Active Experimentation (AE, intention) is the opposite of a Reflective Observation (RO, extension) orientation (Dos Santos & Vendramini, 2002). The transformation dimension is best described by Carl Jung's concepts of introversion (intention) and extroversion (extension) (Kolb, 1984). These dimensions are theoretically unitary so that high punctuation in one orientation would automatically imply a punctuation in its opposite, but that they are dialectically opposite (Dos Santos & Vendramini, 2002).

TRANSFORMATION

Active

Reflective

Experimentation

Observation
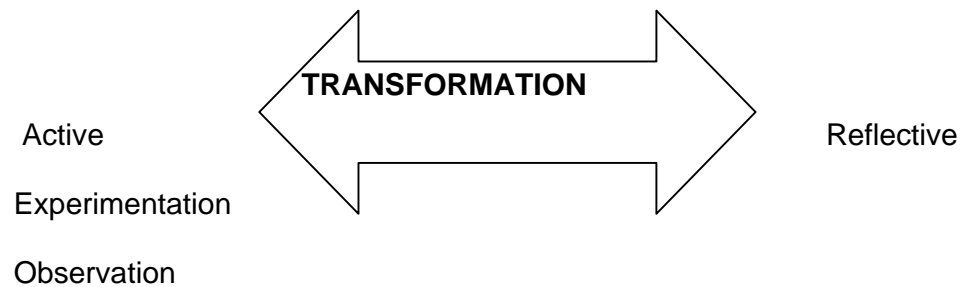
Kolb (1984) states that experiential learning involves the transaction between internal characteristics and external circumstances, between personal knowledge and social knowledge that basically means it involves transactions between the person and the environment. One needs to understand the nature of knowledge and the processes whereby knowledge is created to fully understand learning. This results from a conflict between involvement in new experiences versus conceptualising, between active learning versus reflecting and the way it is resolved, plus the resolution of these conflicts result in the level of learning that takes place.

The vertical axis (the concrete to abstract continuum) represents how we take in or perceive information and the horizontal axis (the reflective observation - active experimentation continuum) represents how we process or transform what we take in. These intersecting dimensions are bipolar. The cyclical pattern of interaction also represents the interaction between two intersecting dimensions of the learning process and lies at the end of two intersecting axes. The four aspects (AC, AE, CE, RO) are essential to learning, but can also be understood individually, which represents a preferred learning style. (Anderson & Adams, 1992)

Kolb's theory of experiential learning can be described as a four stage learning cycle. The theory states that one learns best by going through the CE, RO, AC, AE sequence of the cycle and that one can learn more effectively if one develops one's learning abilities in one's area of weakness. It starts with concrete experience, which is the basis for observation and reflection, this is then used to build an idea, generalisation, or "theory" from which new implications for action can be deduced. These implications provide guidelines for actions that create new experiences. The learning cycle involves four learning abilities namely:

1. Concrete Experience (CE) (feeling).

2. Abstract Conceptualization/Generalization (AC) (thinking).

3. Active Experimentation (AE) (doing).

4. Reflective Observation (RO) (watching) (Kolb, 1981).

The experiential learning theory is comprised of four modes representing aspects with specific structures and behaviours. CE and AC fall on the continuum of knowing. CE represents the apprehension of immediate experience. AC represents the comprehension of experience through the creation of concepts. RO and AE fall on the continuum of transformation. RO involves intention (internal reflection) and AE involves extension (active external manipulation of the external world). Webb (n.d.) described the specific structures and behaviours of each of the modes as follows; CE represents the affective structures and behaviours, AC represents the symbolic structures and behaviours, RO represents the perceptual structures and behaviours and AE represents the behavioural structures and behaviours.

The learning cycle can be explained as follows: When learners involve themselves fully, openly and without bias in new experiences, they learn through Concrete Experience (CE). A learner learns through Reflective Observation (RO) by observing and reflecting on these experiences from many perspectives on a personal basis and in so doing, experience is given form and meaning. RO involves intention which means that the person turns inward to generate meaning.

Active Conceptualization (AC) is when the learner creates concepts that integrate their observation into sound logical theories. AC involves a series of transformation and figure formations that have the capacity to raise the level of cognition (Webb, n.d.). This takes us to the next step when a learner is able to use theories to make decisions and solve problems. In other words, the learner constructs ways to modify the occurrence of the next experience; he/she is involved in Active Experimentation (AE). AE involves extension, the opposite to AC, in which the experience is turned outward toward the environment to test for implications (Gish, 1979). This in turn leads to another Concrete Experience. According to Kolb, Rubin and McIntyre (1984) the learning cycle continuously recurs and is directed by the individual's needs and goals. Figure 1 is a graphic representation of Kolb's four stage cycle.

Figure 1. A representation of Kolb's four stage cycle
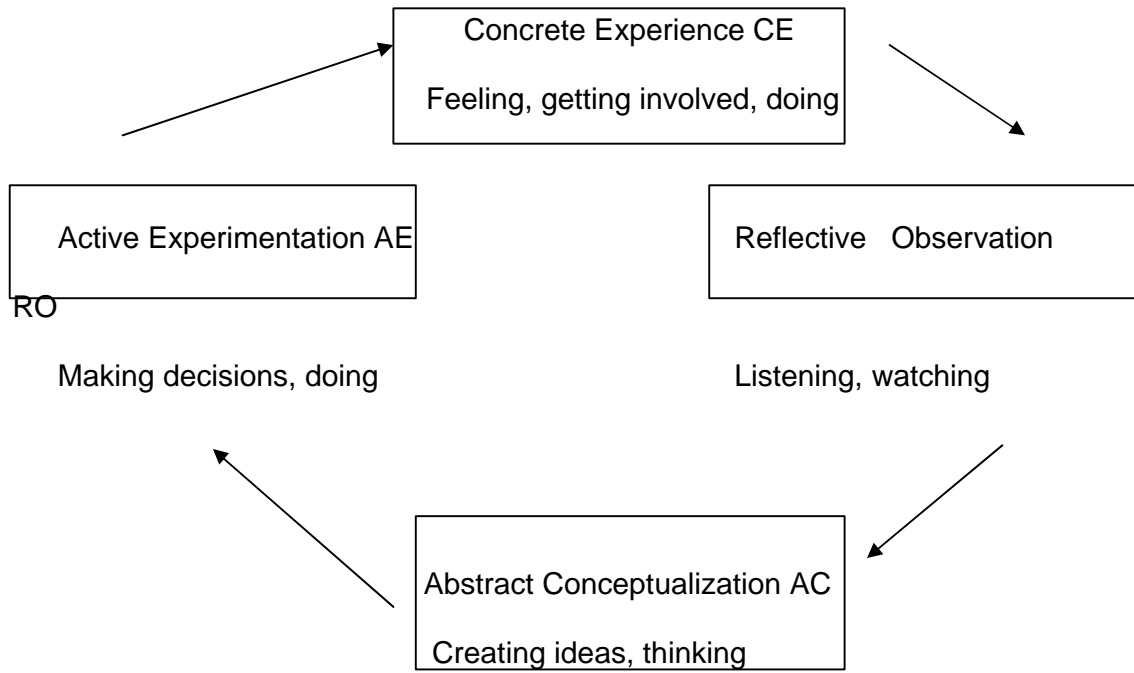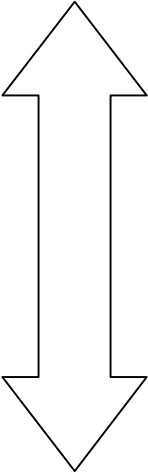
The four learning abilities of the learning cycle (Kolb, 1981; Kolb, 1984) will be described and unpacked in Table 1.

Table 1

The four learning abilities of the learning cycle

| **Concrete experience (CE)** |
| **(Knowledge by acquaintance, direct practical experience)** |

This stage of the learning emphasises personal involvement with people in everyday situations. In this stage, one would tend to rely more on one's feelings than on a systematic approach to problems and situations. In a learning situation, one would rely on one's ability to be open-minded and adaptable to change.

Learning from feeling
- Learning from specific experiences
- Relating to people
- Being sensitive to feelings and people
- Learning by intuition

Focuses On:

Being involved in experience and dealing with immediate human situations in a personal way.

Emphasises:

Feeling

Concern with uniqueness and complexity of present reality

Intuitive "artistic" approach to problems

Enjoys and is good at:

Relating to others

Intuitive decision making

Function well in unstructured situations

Values:

Relating to people

Being involved in real situations

Having an open-minded approach to life
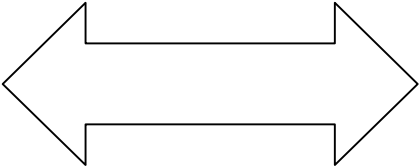
Table 1 continued

Abstract Conceptualization (AC)
(Knowledge about something that is theoretical, more comprehensive)

In this stage, learning involves using logic and ideas, rather than feelings, to understand problems or situations. Typically, one would rely on systematic planning and develop theories and ideas to solve problems.

Learn by thinking
- Logically analyzing ideas
- Systematic planning
- Acting on an intellectual understanding of a situation – deductive thinking

Focuses on:

Using logic, ideas and concepts

Emphasises:

Thinking

Concerned with building general theories

A scientific approach to problems

Enjoys and is good at:

Systematic planning

Manipulation of abstract symbols

Quantitative analysis

Values:

Precision

The rigour and discipline of analyzing ideas

The aesthetic quality of a neat conceptual system

Concrete Experience

How we take in or

perceive information

Abstract Conceptualization

Table 1 continued

Reflective Observation (RO)
(What the experience means to the experiencer (transformed by Intention)

In this stage of the learning cycle, people understand ideas and situations from different points of view. In a learning situation one would rely on patience, objectivity, and careful judgement, but would rely on one's own thoughts and feelings in forming opinions.

Learn by watching and listening
- Carefully observing before making judgements
- Viewing issues from different perspectives
- Looking inward for the meaning of things

Focuses on:

Understanding the meaning of ideas and situations by carefully observing and impartially describing them

Emphasises:

Understanding

Concern with what is true or how things happen

Enjoys and is good at:

Intuiting the meaning of situations and ideas and seeing their implications

Looking at things from different perspectives and appreciating different points of view

Relying on their own thoughts and feelings to form opinions

Values

Patience, impartiality and considered thoughtful judgement

Table 1 continued

Active Experimentation (AE) (Transform theory of AC by testing it in practice (by Extension)
Learning in this stage takes an active form – experimenting with influencing or changing situations. One would take a practical approach and be concerned with what really works, as opposed to simply watching a situation. One values getting things done and seeing the results of one's influence and ingenuity.

Learning by doing

- Ability to get things done

- Risk taking

- Influencing people and events through action

Focuses on:

Actively influencing people and changing situations

Emphasises

Practical applications

A pragmatic concern with what works

Doing

Enjoys and is good at:

Getting things accomplished

Taking some risks to achieve their objectives

Values:

Having an influence on the environment around them

Like to see results

Active   Reflective

Experimentation   Observation

How we process or
transform what we
take in

Individual Learning Styles

Kolb (1993) defines a learning style as the process by which one learns and deals with life situations on a day-to-day basis. One's learning style develops as a result of one's hereditary equipment, past life experience and the demands of one's present environment. Through socialisation we resolve

conflicts between action and reflection, and between immediate experience and detached analysis in characteristic and stable ways (Kolb, 1981).

According to Kolb (1981), there are four types of learners and this depends on their position on the two dimensions and the four learning abilities. This will be further described on pages 38-40. The four learning styles and their dominant learning abilities are:

1. Divergers (Reflectors): They combine Concrete Experience (CE) and Reflective Observation (RO).

2. Assimilators (Theorists): They combine Abstract Conceptualization (AC) and Reflective Observation (RO).

3. Convergers (Pragmatists): They combine Abstract Conceptualization (AC) and Active Experimentation (AE).

4. Accommodators (Activists): They combine Concrete Experience (CE) and Active Experimentation (AE) (Kolb, 1981).

Since Kolb's model describes two dimensions of learning and the four learning orientations and styles used within the learning process it comprises of two models in one. Kolb asserts that learning styles are stable states (enduring patterns) of individual human behaviour that arise from consistent patterns of transactions between the person and environment. Learning activities should respond to the distinct learning style of learners and encourage the development of a fuller range of learning styles (Kolb, 1984). Therefore, one's learning style can be adjusted according to the task at hand. Also, refer to Chapter 6 for ways of intervening and developing one's learning skills.

Figure 2 (cited from Marek, n.d., p38) illustrates the four stage learning cycle which gives rise to the four learning abilities. It also illustrates the four learning styles that arise depending on its position on the two dimensions and the four learning abilities.

Marek
Page 38

Concrete
Experience

Grasping via
APPREHENSION

Accommodative
Knowledge

Divergent
Knowledge

Active
Experimentation

Transformation
via
EXTENSION

Transformation
via
INTENTION

Reflective
Observation

Convergent
Knowledge

Assimilative
Knowledge

Grasping via
COMPREHENSION

Abstract
Conceptualization

Figure 2.
Kolb's Structural Dimensions of Experiential Learning and Resulting
Basic Knowledge Forms

Further explanations of the four learning styles are represented in Table 2.

Characteristics of the four learning styles (Kolb, 1984) will be described in the

table below.

Table 2

Characteristics of the learning styles

CONVERGER : pragmatist
AC: Learns best through reflective thinking exercises that are focused on things and symbols rather than people AE: Learns best through experimentation and touch
Description
Convergent knowledge is a number of facts or principles on a single topic: problems that have "right" and "wrong" answers.
Strengths:
Practical application of ideas, Problem solving, Decision making Goal oriented, plans systematically and manages time Follows instructions with care and accuracy Intolerant of what they regard as insignificant Learns by thinking and doing Do best in situations like conventional intelligence tests where there is a single correct answer or solution to a question or problem Knowledge is organized in such a way that through hypothetical-deductive reasoning it can be focused on specific problems Prefers technical tasks and problems above social and interpersonal issues

Table 2 continued

DIVERGER: reflector
CE: Learns best through specific examples in a personal way RO: learns best through visual and auditory observation
Description
Divergent knowledge is more about creativity. It is about the generation of a number of accounts of experience.
Strengths:
Strong in imaginative ability Awareness of meaning and values Do best in situations that call for generation of alternative ideas and implications such as brainstorming View concrete situations from many perspectives Organize many relationships into a meaningful "gestalt" Emphasis on observation rather than action Interested in people and tend to be imaginative and feeling oriented. Broad cultural interests

Table 2 continued

ASSIMILATOR : theorists
AC: learns best through reflective thinking exercises that are focused on things and symbols rather than people RO: learns best through visual and auditory observation
Description
Assimilator knowledge is knowledge already in their heads and includes fitting particular instances into general categories,
Strengths:
Inductive reasoning and the ability to create theoretical models Assimilating disparate observations into an integrated explanation Less focused on people and more concerned with ideas and abstract concepts Ideas are judged less by their practical value – it is more important that the theory be logically sound and precise Where the theory or plans do not fit the facts, they are more likely to disregard or re-examine the facts than the theory

Table 2 continued

ACCOMMODATOR: activist
AE: learns best through experimentation and touch and
CE: learns best through specific example in a specific way
Description
Accommodator knowledge is knowledge from the outside world and is about working from the general principle to the particular application
Strengths:
Greatest strength is doing things
Carrying out plans and tasks
Getting involved in new experiences
Do best in situations where one must adapt oneself to immediate changing circumstances
Emphasis on opportunity seeking, risk taking and action
Solve problems in an intuitive trial-and-error manner
Rely heavily on others for information rather than their own analytical ability
At ease with people but sometimes seen as impatient and pushy
Where the theory or plans do not fit the facts they are more likely to discard the plan or theory than the facts.

Practical use of Kolb's theory

Burke (1997) found Kolb's theory to be grounded both in a theoretical and practical perspective. From a theoretical perspective Kolb's theory draws upon many lines of overlapping research on cognitive development and style. Practically Kolb's theory provides a pedagogically appealing heuristic for framing classroom activities (Burke, 1997).

Research results demonstrate a relationship between learning styles of undergraduate majors and learning styles of managers in various professions (Kolb, 1984). Studies suggest that the dimensions identified by experiential learning theory (abstract-concrete and active-reflective dimensions) sharply differentiate among academic disciplines (Kolb, 1981).

Natural sciences and Mathematics tend to fall in the abstract-reflective quadrant, science-based professions tend to fall in the abstract-active

quadrant. The social professions tend to fall in the concrete-active quadrant and the humanities and social sciences tend to fall in the concrete-reflective quadrant. What constitutes valid knowledge for these disciplines differs widely from one another. It can be observed in the differences related to how knowledge is reported (e.g., numerical or logical, words or images), in inquiry methods (e.g., case studies, experiments, logical analysis) and in criteria for evaluation (e.g., practical versus statistical significance).

Kolb (1984) reports that research results indicate that various professions are characterised by certain learning styles. Accommodators tend to be Business majors; Convergers tend to be Engineers; Divergers tend to be History, English, Psychology and Political Science majors; and Assimilators tend to be Mathematics, Chemistry, Economics and Sociology majors. Physics majors tend to fall between Convergers and Assimilators.

In 1990, Hickcox reviewed 81 studies and articles spanning the period 1971 to 1989. These focused on the application or the relationship of Kolb's theory and/or the Learning Style Inventory (LSI) to higher or adult education settings. 18 studies were conducted with the LSI being administered to various special populations (Hickcox, 1990). 15 of the 18 studies and articles were supportive of Kolb's theory and many of them reported on the relationship between learning styles and field of study or career direction.

Kolb's theory has been researched internationally and empirical support has been found for it (Kelly, 1997; Pickworth, 1997). Learning styles as conceptualised by Kolb (1981) have been found to be related to academic performance (Connelly, 2003; Rutz, 2003) and to differ across students in different faculties (Dos Santo & Vendramini, 2002; Kolb, 1981). For example,

Dos Santos and Vendramini (2002) found that Pharmacy and Psychology students were more reflective than active (the RO mean was the highest) and both showed a greater inclination to Abstract Conceptualization (AC) than Concrete Experience (CE). Computing engineering students, however, were found to be more active than reflective (higher AE than RO scores), while they were also more inclined to use Abstract Conceptualization (AC) than Concrete Experience (CE). These findings were very similar to those reported by Kolb (1981).

There have been very few South African studies that have been conducted thus far on Kolb's theory and the learning styles he proposes. Pickworth (1997) compared the theories of Holland and Kolb and empirically investigated the vocational personality types and learning styles of a sample of South African learners doing BSc and BA studies. Pickworth (1997) found that on the Learning Style Inventory there were more Accommodators and Divergers in the BA group and more Convergers in the BSc group, while Assimilators were fairly equally represented in the BSc and BA groups.

Govender's (1997) research examined the relationship between learning styles of learners and their satisfaction in using a clinical self-study laboratory. Govender (1997) found that Assimilators were the most dominant learning style among third year nursing learners. His study also revealed that learners with a Diverger learning style had the highest mean score for satisfaction for using the laboratory and learners with an Accommodator learning style had the highest mean score in regards to decision making satisfaction.

De Klerk (1993) found that apprentices mainly use a convergent learning style with a performance-oriented learning approach. He found no meaningful relationship between academic achievement and learning styles. Carstens (1995) researched the effectiveness of the experiential learning cycle as a training model for lecturers involved in the service Year for Christ and he found it to be the most effective training model.

Managing the learning process

Several authors representing different disciplines endorse the use of the learning cycle to guide and improve teaching practice through curriculum design and the choice of instructional and assessment methods. There are two areas that the application of learning focuses on. Firstly, the learning styles of both teachers/lecturers and learners can be assessed to provide them with personal information for the learning process. Having information on the learning style of learners can help lecturers become more sensitive to the differences that learners bring to the classroom (Claxton & Murrell, 1987). Also, for learners having this information, it could increase their chances of success, as well as encourage them to develop alternative ways to their dominant style.

Secondly, the theoretical knowledge about learning styles can be used to inform teachers with the view to enriching teaching and learning practices. Learning experiences and the learner's style can be matched or mismatched. For beginning or at-risk learner   s it may be more important to match the learner's style with their learning experience. When mismatching the learner's learning style and the learning experience, the learner can become more flexible in the learning process, therefore engaging all stages of the learning

cycle by choosing various teaching strategies. When the learners experience is at the centre of the learning process and the experience is encouraged by a facilitator and integrated into the curriculum, the lecture decreases and a system of theory, experience, and reflection becomes the priority.

Sugarman (1985) suggests that counsellors and clients, as well as lecturers and learners could use the experiential learning model effectively as a teaching model. Kolb's theory has an abstract quality and can be applied in a flexible way to address a variety of learning needs. In the counselling process, counsellors could use Kolb's model to reflect on their counselling styles and to plan interventions with clients. Clients can expand their repertoire of learning skills using Kolb's ideas. Lecturers can use the model when planning for individual sessions and for developing balanced training programmes. Abbey, Hunt and Weiser (1985) support the use the learning cycle in the counselling process and in the supervision of trainee counsellors. The counsellor needs to be flexible in order to apply all four the learning abilities in therapy and in supervision. Counsellors are therefore trained to be more sensitive to all four phases of the learning cycle and the four learning abilities and it can be used in describing the sequences in counselling, variations among clients, counsellors and supervisors and how the variations affect counselling and supervision.

Claxton and Murrell (1987) state that information on learner's learning styles can be used to improve educational practice and can be used in the application of course design (Pickworth, 1997). The most effective learning experience occurs when learners' use all four phases of the learning cycle. When designing learning activities, the learning cycle should be used in such

a way that learners are systematically engaged in each of the four learning abilities so that they become more skilled learners. Activities such as fieldwork, interviews, viewing films and participating in role-plays or simulations are examples of concrete experience. Examples of reflective observation are writing a reflective paper, keeping a journal or sharing their perspectives with other learners in small groups. Abstract Conceptualization includes learners taking in information such as in a lecture, or engages in research and developing hypotheses or theories of their own. With active experimentation learners apply principles or theories through laboratory or practical work.

Some essential elements of successful experiential learning include:

- Placing emphasis on a balance between action, reflection and application.

- Providing learning experiences that are individualized, sequential, and developmental.

- Providing opportunities for unplanned learning from new experiences.

- Instructor acting only as a facilitator of the experience.

- The learner having an active role in the planning and carrying out of activities.

- The learner experiencing numerous roles (leader, team member, employee, tutor, etc.).

- The learner claiming responsibility for actions.

- The importance of progress being monitored, assessed and giving feedback, is conveyed to the learner.

- Outcomes are considered as being real and important. (http://people.uleth.ca/~steve.craig/whatis.htm)

Claxton and Murrell (1987) state that the learning cycle could also be used when planning assessment procedures, to assess a learner's ability to think in divergent, convergent, assimilative and accommodative ways.

Learning and Problem Solving

The concept of learning tends to evoke a picture of the learner in a passive role and the teacher in an active role. The teacher tends to make the decisions regarding the learning objectives, as well as the teaching and assessment strategy. Problem-solving on the other hand evokes a picture of the responsibility of solving the problem residing with the problem-solver. Kolb (1981, 1984) provides an integrated model of learning and problem-solving in which the stages of problem solving are linked to the stages of the learning cycle. The two concepts are integrated as problem-solving is part of learning and learning is often a process of problem-solving. Carlson, Keane and Martin (1984) used an integrated learning and problem solving model to describe the research and development of organizations as being learning systems (Pickworth, 1997).

According to Claxton and Murrell (1987), knowledge of learning styles in the work setting is relevant for two reasons. Firstly, persons with different styles can be used to perform different functions according to their strengths. For example, Divergers are good at generating ideas and Convergers are good at making decisions. At times, teams comprising of people with a variety of styles could be used for some tasks whereas for other tasks a more homogenous group may be more appropriate. However, it is important that

the opportunity be given to people to develop competence in styles other than their areas of strength. Secondly, an explicit objective for organisations to ensure that they remain vibrant and effective, is to learn from experience.

Some examples of techniques for problem solving used by the four learning styles are provide in the table below.

Table 3

Techniques for problem solving

ASSIMILATOR	ACCOMMODATOR
❖ Reasons it out step by step	❖ Talk things over with others
❖ Pays attention to detail	❖ Asks lots of questions
❖ Sticks with one problem one at a time	❖ Will experiment with different techniques
❖ Good at making lists, timetables and plans	❖ Uses feeling well
❖ Sees links between ideas	❖ Will take risks
❖ Good critic of own ideas	❖ Will use all the senses (see it, hear, feel it)
❖ Works well on their own	
CONVERGER	DIVERGER
❖ Task-oriented	❖ Sees long-term implications of things
❖ Works well on their own	❖ Sees new ways of doing things/creative solutions or new alternatives
❖ Wants to get results	❖ Uses daydreams well
❖ Makes plans for action and timetables	❖ Good at seeing the whole picture
❖ Good at getting the necessary information	
❖ Does not get distracted	
❖ Pays attention to detail	

Learning styles and culture

The term used to describe learning styles and culture is cultural learning styles, which is the learning styles of individuals that are the product of a cultural background and upbringing. Cultural learning styles take learning styles a step further by stating that cultural upbringing plays a decisive role in determining a learner's learning style. Guild and Garger (1998) state that

differences arising in children's learning styles due to culture may develop through early life experiences. Worthley (1999) states that through child-rearing practices, the cultural group's values and traditional lifestyle may influence the learning styles the individual will develop. There have been studies on identifying the learning style preferences among participants from a variety of cultures and the way in which they prefer to enhance their learning. According to Irvine and York (1995), cooperative learning seems to be the recommended technique for learners from diverse cultural backgrounds.

According to Dunn (1997), cultural learning styles should not be used to establish limited style categories for members of any cultural, national, racial, or religious groups as learners who do not to perform as well as their peers, tend to differ in their learning style, despite the fact that they share the same cultural background. The strength of the individual's learning styles needs to be emphasized rather than their culture and instruction should be matched to the individual preferences (Dunn & Griggs, 1996). There are steps that teachers can take to make learning a success for all learners despite their cultural backgrounds (Bennet, 1995). They are that teachers need to: (a) know their own teaching and learning styles; (b) determine how far they can stray from these strengths and preferences and still be comfortable; (c) start with a few learners who are having difficulty in their class; (d) know the learning style patterns that seem to characterize the various ethnic groups; (e) build the classroom flexibility slowly by adding one new strategy at a time; and (f) use visual, auditory, tactile, and kinesthetic activities when teaching concepts and skills.

<u>Five Factors that Shape and Influence Learning Styles</u>

Research has examined learning styles and their associated behaviour patterns at five particular levels of behaviour namely: personality types, early educational specialisation, professional career, current job role, and adaptive competencies (Kolb, Boyatzis & Mainemelis 1999). These five levels of behaviour are discussed below.

1. <u>Personality Types</u>

Carl Jung, cited in Kolb, Boyatzis and Mainemelis (1999) views learning styles as being a result of the individual's preferred way of adapting in the world and experimental learning theory supports this as well. A measure used to depict Jung's personality typology is the Myers-Briggs Type Indicator (MBTI). The Extraversion/Introversion of Jung's dialectical dimension correlates with the Active/Reflective dialectic of Experiential Learning theory as measured by the Learning Style Inventory (LSI) and the MBTI's Feeling/Thinking dimension correlates with LSI's Concrete Experience/Abstract Conceptualization dimension. The Accommodating learning style correlates with the MBTI's Sensing type and the Assimilator with the MBTI's Intuitive type. Diverger correlates with the MBTI's Feeling type and the Converger with the Thinking type. Derived from this, the Accommodator is the Extraverted Sensing type, the Converger is the Extraverted Thinking type, the Assimilator corresponds to the Introverted Intuitive type and the Diverger to the Introverted Feeling type. Therefore, the descriptions of the MBTI are quite similar to the learning styles described by the experiential learning theory (Kolb, 1984).

2. Educational Specialisation

An individual's early educational experiences shape the individual's learning styles as it instills positive attitudes toward specific sets of learning skills, as well as teaching learners how to learn. When in school one learns facts and learns how to learn. One may even be able to trace this early influence as it may occur in our adult learning style. As we progress through our schooling years there is a process of specialisation that takes place that becomes sharper during our college or university years. This specialisation, together with and the social knowledge acquired, influences the individual's orientation toward learning. This often results in a relation between learning styles and the individual's early training in an educational specialty or discipline (Kolb, Boyatzis & Mainemelis, 1999).

Individuals with Diverging learning styles tend to major in their undergraduate years in the Arts, History, Political Science, English, and Psychology, whereas individuals with Covergering learning styles tend to major in more abstract and applied areas such as Physical Sciences and Engineering (Kolb, Boyatzis & Mainemelis, 1999). People with Accommodating learning styles tend to major in Business and Management and people with Assimilating learning styles tend to major in Economics, Mathematics, Sociology and Chemistry (Kolb, Boyatzis & Mainemelis, 1999).

3. Professional Career Choice

With one's professional career choice comes an exposure to a specialized learning environment (as we acquire habits of behaviour) and a commitment to a professional problem. Also, one shares a membership with one's peers who share a common professional mentality, a set of values and beliefs about

how to behave professionally. One's learning style is therefore shaped through this orientation, the habits acquired through training and through the pressures of being a competent professional.

In terms of learning styles, research has illustrated the distribution across the spectrum of career fields as follows:

a) Divergers show a preference for careers in the social service, arts and communication; b) Assimilators: careers in the sciences and information or research; c) Convergers: careers in technology, economics and environment science; and d) Accommodators: careers in organisations and business.

4. <u>Current Job Role</u>

An individual's learning style is influenced by the individual's current job role due to the task demands and pressures of that particular job. These shape the individual's learning orientation. People also tend to choose experiences that they have been successful at before, and that they are good at in order to become more skilled in the process. This is referred to as "accentuation". Executive jobs require an Accommodating learning style because they are orientated towards task accomplishment and decision-making under uncertain circumstances. Personal jobs are better suited to a Diverging learning style, as these jobs require the establishment of personal relationships and effective communication with other people. Information jobs require an Assimilating learning style due to data gathering, analysis and conceptual modeling characteristics of the job. Technical jobs require Convergent learning style due to the technical and problem solving skills the job requires.

5. <u>Adaptive Competencies</u>

The specific task or problem that the person is involved in also shapes and influences the learning style because every task an individual faces has a corresponding set of skills for effective performance. Therefore, to effectively match the task demands with one's personal skills results in adaptive competencies. Each learning style has its own set of competencies and they are as follows; a) the Accommodator has leadership skills, acts intuitively and can take action; b) the Diverger is skilled at building relationships, helping others and sense-making; c) the Assimilator has related thinking skills such as information-gathering, information-analysis, and theory building; and d) the Converger has skills such as being adept at quantitative analysis, use of technology and goal-setting (Kolb, 1984).

Refer to Appendix A page 133 for an illustration on the relation between the learning styles and the five levels of behaviour.

The strengths of Kolb's theory are as follows:

- It provides ready pointers to application.
- It directs us to ensure that a range of teaching methods is used in a course.
- It provides a theoretical rationale for educators and points out how to improve on that practice.
- The importance of encouraging learners to reflect and providing them with feedback to reinforce their learning is made explicit.
- It supports the development of a classroom that is aware of diversity.

- It brings awareness of the way in which different learning styles need to be combined for effective learning.

- It can be applied to all areas of the discipline.

- It can be used by individuals and teams.

- It can be applied widely from a single classroom to whole degree programmes (Healey & Jenkins, 2000).

Criticism of the Theory

There are three components that need to be addressed when evaluating Kolb's work in which he combines a theory of learning and a theory of learning styles viz: a) establishing the existence of individual differences in learning styles, b) effectively measuring these differences, if they are found to exist, and c) validating the cyclical model of learning (Sugarman, 1985). Aspects (a) and (c) of Kolb's work are viewed favorably. This is due to the fact that Kolb's theory accounts for each individual having his/her own set of experiences and set of learning abilities that they feel comfortable with. His theory also demonstrates how one can utilise one's experience and learning strengths in the process of constructing knowledge. Kolb was able to create a complete learning cycle in which the entire process could be traced (Oxendine, Robinson & Willson, 2004). The major criticism of Kolb's work has focused on his method of assessing learning styles and specifically the psychometric properties of the Learning Styles Inventory due it being an ipsative measure. This is a different measure to the one utilised in the present study.

Kolb's assumption that learning styles are not fixed traits, but stable traits is another aspect of the theory that is challenged. It works on the assumption that learners could be encouraged to develop learning styles they least use or prefer. The ideal situation would be to produce flexible learners. There is some research that suggests that learning styles can be changed. Kolb (1984) refers to a longitudinal study that demonstrated that learners' preferences after two years at college shifted from concrete to more abstract, and from reflective to more active. Research by Motuang (1998) found that learners at a fourth year level used different or additional learning styles to those used by first year learners.

According to Miller (1992) learning styles should be defined more comprehensively as personality styles (types). Miller (1991) viewed learning styles as " complex adjustment to life, that are learned early in life and remain held in place, as it were, by demands of psychodynamics" (p.231). Therefore, Miller is skeptical of the idea that learners could be taught to use styles other than those they usually prefer since the more "specialised" a learners learning style is, the more difficult it will be to encourage versatility. Miller (1991) sees the encouragement of learning style versatility among all learners to be a waste of time and resources. Also, it could be psychologically damaging for the emotionally unstable learners, for whom the learning style may serve as a defensive function.

A study done by Furnham (1992) on personality and three learning style instruments, including the Learning Style Inventory, concluded that well-established and theoretically sound personality variables were closely and coherently related to learning styles. Furnham questioned that if this is the

case why not simply measure personality. He promoted the use of personality tests in the investigation of the role of learning in conjunction with or in place of three learning style measures used in his study.

A critique of the research of learning styles done by Curry (1990) noted that the operationalisation of learning styles theory is plagued by three pervasive problems viz: (a) confusion in definitions (Claxton & Murrell, 1987); (b) weakness in reliability and validity of measurements (Claxton & Murrell, 1987); and (c) identification of relevant characteristics in learners and instructional settings.

Summary

This chapter provided an introduction to learning style models and more specifically an overview of David Kolb's theory of experiential learning and learning styles. Kolb's theory, which entails four learning abilities representing a four stage cyclical process, was reviewed. These four learning abilities are represented on two dimensions viz, the CE and AC apprehension dimension, and the RO and AE transformation dimension. While we all possess all four learning abilities, each individual differs in regards to their strengths and weaknesses that can be assessed on the two dimensions. This is then characterised into the four learning styles namely; Diverger (CE preferred to AC and RO preferred to AE), Assimilator (AC preferred to CE and RO preferred to AE), Converger (AC preferred to CE and AE preferred to RO) and Accommodator (CE preferred to AC and AE preferred to RO) these learning styles were reviewed, highlighting their strengths and weaknesses. Practical use of Kolb's theory was reviewed as well as the criticism thereof. With

regards to learning, the theoretical overview covered in Chapter 3 indicates that Kolb's experiential learning theory has made major contributions to an individual's development. Chapter 4 will focus on the research problem and methodology used in this study.

Chapter 4

Research Problem and Methodology

Introduction

This chapter firstly addresses the research problem which underpinned the research undertaken. The aims of the study will be described and an overview of the specific research design used to achieve the aims of the study will be provided. The participants and sampling procedure are discussed. The measures used in the study, namely, Kolb's Learning Style Indicator and academic performance are described. This chapter will also provide an outline of the procedure employed in the study, the ethical considerations and the methods used to analyse the data.

Problem Formulation

As pointed out previously in this study, higher education in South Africa is characterised by high drop out and failure rates and low through put rates. One way of trying to address this problem is to identify the variables related to academic success and then to build these into admission requirements and academic development programmes and initiatives (Foxcroft & Watson, 2001). Various cognitive and noncognitive factors have been found to play a role in academic success. One of these noncognitive factors that have been found to play a role, which is relevant to this study, is learning styles. Kolb's (1981) theory of experiential learning and his conceptualisation of learning

styles were discussed in chapter three in this regard. While support has been found for Kolb's (1981) view of learning styles, more international than national research has been conducted to verify the theory. In view of the impact of learning styles on academic success, and the limited research related to Kolb's conceptualisation of learning styles in South Africa, the present study aims to contribute to the research related to the learning styles of South African learners. "Learning styles" will be operationalised according to Kolb's (1981) theory using a measure that is based on his theory, namely, the Learning Style Indicator (LSI). The LSI will be discussed in the "measures" section.

Given that previous researchers have found that the learning styles of learners in various faculties differ, the learning styles of the total sample as well as for learners in the various faculties represented in the sample will be described in the present study.

The aims of the present study are spelt out more clearly below.

Primary aims of the study

The general aim of the study was to explore and describe the learning styles of first year students at a higher education institution in South Africa. The specific aims of the study were:

4. To explore and describe the learning styles of first year university students.

5. To explore and describe the learning styles of first year university students per faculty.

6. To explore and describe the relationship between learning styles and academic performance for first year university students per faculty.

Not only will the findings of the present study contribute to our knowledge base of the learning styles of South African learners, but it will also provide information on learning styles to lecturers across faculties. Lecturers can therefore become more sensitive to the differences that learners bring to the classroom (Claxton & Murrell, 1987) and create a productive climate in the classroom (Sims & Sims, 1995).

Research Design

The study is quantitative in nature because numerical data was gathered. An exploratory, descriptive approach was used to explore and describe the learning styles of first year university learners and the correlational method was used to explore the relationship between learning styles and academic performance.

An exploratory research approach aims to gain familiarity with a phenomenon. The conclusions drawn are tentative and the value of this type of research lies in the fact that it provides further research topics within the field of the present research (Babbie, 1990). This study was exploratory in nature as there are very few studies on the learning styles that have focused on Kolb's (1981) experiential learning theory and no research to date has been conducted on the measure used in the present study in South Africa.

The research method was also descriptive in nature as the study aimed to describe the learning styles of first year university learners for the total sample as well as per faculty. Descriptive research establishes the foundation

of future research and therefore considered a necessary first step in research (Rosnow & Rosenthal, 1996). A large amount of information can be collected using a descriptive research design, which results in savings with regard to expenses and time. The advantage of using a descriptive research method is that it is specific and objective. The disadvantages of this method are that there is no method of controlling extraneous variables, no cause-and-effect conclusions can be drawn and self-reported measures may be affected by bias factors or response sets.

A correlation method was used to explore the third specific aim. The correlational method is appropriate to use when the aim is to establish the magnitude and direction of a relationship between two variables, in this case, to establish the relationship between learning styles and academic performance. Despite being the most appropriate method to use, the correlational method has certain disadvantages. These are that no causal conclusions can be reached and that extraneous (third) variables such as academic preparedness and cognitive factors, for example, could impact on the relationship between learning styles and academic performance. While such third variables cannot be controlled in the correlational method, the researcher needs to be aware of this when interpreting the statistical results.

Participants

The participants in this study were first year learners who took part in the Explore programme run by the Unit for Student Counselling at the University of Port Elizabeth (UPE) during orientation week in February 2003. The Learning Styles Indicator was one of the measures which learners

completed as part of the Explore programme. The sample comprises of 391 first year learners. The total number of first year students registered at the university for 2003 were 1557. The sample thus consisted of 25% of first year students.

Gender

The majority (n= 237) of the learners in the sample were female (60.49%) while 39.51% were male. The sample was however reflective in terms of the gender distribution of first years as more females (56%) enrolled in 2003 than males (44%).

Ethnicity

Table 4 provides a description of the ethnicity breakdown of the sample.

Table 4

Ethnicity

	N	%
White	167	42.71
Coloured	95	24.30
Indian	9	2.30
Black	117	29.92
Chinese	2	0.51
Tswana	1	0.26
Total	391	100.00

Language

Table 5 provides a description of the language distribution of the sample.

Table 5

Language distribution

	n	%
Afrikaans	91	23.27
English	156	39.90
Xhosa	88	22.51
German	1	0.26
Sotho (South)	7	1.79
Afr/Eng	30	7.67
Zulu	4	1.02
Venda	5	1.28
Sotho (North)	3	0.77
Swati	1	0.26
Other Africa	3	0.77
French	1	0.26
Chinese	1	0.26
Total	391	100.00

As illustrated in Table 5, the sample was made up of a variety of different language groups. The majority of the students (85.7%) were either English, Afrikaans or Xhosa speaking, while only 14.3% spoke other languages. The English-speaking group was the majority (40%), followed by Xhosa-speaking (22%) and Afrikaans-speaking (22%). The Learning Style Indicator was administered to the participants in English, which

accommodated the majority of the participants. All undergraduate courses are presented in English, as it is assumed that the majority of the learners understand this medium of instruction.

<u>Faculty</u>

The sample was made up of the six different faculties at the university. The largest group was the Economics faculty (47%), with the second most represented faculty being Health Sciences (17%). Very few participants were from the Education faculty (3%). The sample was, however, reflective of the university in terms of the percentage of students in each faculty. The exception was the Education faculty where very few students were included in the sample. The faculty distribution for first year enrolment and the sample is reflected in Table 6.

Table 6

Faculty Distribution

	Enrolment	Sample
Economic	654 (42%)	187 (47.83%)
Science	162 (10%)	52 (13.30%)
Arts	202 (13%)	39 (9.97%)
Law	112 (7%)	31 (7.93%)
Health Sciences	311 (20%)	71 (17.65%)
Education	116 (13%)	13 (3.32%)

Sampling Method

The study employed a convenience, non-probability sampling technique to obtain a sample of first year university students. Convenience sampling is the process whereby the researcher selects a sample primarily because it is accessible and reasonably reflective of the population of interest (Harris, 1998). According to Leary (1991) this is the crudest form of sampling because anyone who is convenient becomes part of the population. One of the limitations is that there is an unequal chance of being included in the sample and although the sample may provide the researcher with prolific

data, the sample will probably not be representative of the sample. There are no attempts to control bias and it implies difficulties concerning the generalisability of the results. However with the study being an exploratory descriptive research generalisability was not a concern.

When using non-probability sampling the researcher has no way of knowing the probability that a particular case will be selected for the sample (Harvey & McDonald, 1993; Leary, 1991). The advantage of non-probability sampling is that it is cost effective in terms of saving time and money. Non-probability convenience sampling is also less complicated than probability sampling methods as it takes advantage of respondents who are readily available. However the disadvantage of non-probability sampling is that it is less precise and limits the possibility of generalising the results beyond the specific sample (Bailey, 1987).

Patton (1987) stated that despite the disadvantages of non-probability convenience sampling it is the most commonly employed sampling strategy in the social sciences. Cozby (1993) stated that a major advantage of this type of sampling is that it is less expensive in terms of cost and time.

Measures

Two measures are utilized in this study, namely, Kolb's Learning Style Indicator and academic performance.

Kolb's Learning Style Indicator

(Available at http://www.nwlink.com/~donclark/hrd/kolb.html, and through http://www.usd.edu/~ssanto/learnstyles.htm)

Kolb developed and subsequently refined the Learning Style Inventory (1976, 1983, 1993). It is a self-description, self-scoring test that aims to help

an individual identify their relative emphasis on the four learning abilities within the learning cycle (CE, RO, AC, AE) and their predominant learning style (Diverger, Assimilator, Converger or Accommodator) (Pickworth, 1997). Flowing from this, the Learning Style Indicator was developed as a brief online instrument, which is available to internet users to identify the learning style of an individual (Learning styles, 2000). The Learning Style Indicator does not appear to have been extensively used in South Africa to date.

The purpose of the Learning Style Indicator is to identify learning styles so as to help people better understand their preferences in learning situations. By knowing their style, people are empowered to understand their strengths and weaknesses, and maximize their learning potential (Kolb, 1993), "make transitions to higher levels of personal and cognitive functioning" (Knox, 1986, p.25) and it allows educators to cover materials in a way that best fits the diversity of the classroom (Kelly, 1997).

There are 18 statements that are divided into two sections in the inventory. The student indicates which part of the statement most closely describes him/her. The Learning Style Indicator is an ipsative instrument in that students rate the statements with respect to themselves. Section one's score provides an indication on the AE/RO dimension and section two's total provides an indication on the AC/CE dimension. The score is then used to determine the predominant learning style of the individual. The reliability of this instrument has been found to range from .52 to .86 (1997 McFarland in Personality types).

Research has shown that people are fairly accurate self-perceivers. Self-description is one of the most powerful perspectives on behavior assuming

that the person wants an accurate picture of him/herself. The result of the Learning Style Indicator as well as any psychological test needs to be validated from other perspectives. The measure should be used as a tool of self-inquiry. (www.learningfromexperience.com/html/faq.html)

The measure was used in an informal pilot study conducted at the Unit for Student Counselling at the University of Port Elizabeth in 2002 and in 2003. In the pilot study it was used with senior and second year high-risk students of a particular faculty whose academic records displayed worrisome profiles (Connelly, 2003). The students in the pilot study reported no language difficulties with the items of the Learning Style Indicator. Furthermore, they reported that after receiving feedback on their learning styles, they were more motivated and more in control of their learning, which positively impacted on their academic progress, in their opinion (Connelly, 2003).

Academic Performance

This study utilized first year academic performance by obtaining the average mark across all modules for the academic year. Other researchers in South Africa have used this way of determining academic performance (e.g., Huysamen, 2000; Huysamen & Raubenheimer, 1999; Huysamen & Roosendaal, 1999; Nock, 2001; Seymour, 2002; Skuy et.al., 1996).

The information obtained from the Learning Styles Indicator placed learners into one of four categories. Consequently, to be able to correlate academic performance and learning styles (aim 3), it was necessary that academic performance was categorised. This was achieved in the following way. The average mark was classified into four academic performance categories namely, a 'fail' category, which included learners who obtained an

average of less than 50%, a 'low average' category, which included learners who obtained an average between 50% and 60%, a "high average' category, which included learners who obtained an average between 61% and 74%, and a distinction' category which included learners who obtained an average of 75% and more.

Procedure

The participants were drawn from a bigger project. The Unit for Student Counselling's Explore programme is part of the first year students' orientation programme. Students who participated in the Explore programme did so on a voluntary basis. All first year students received a first year guide providing them with information about UPE and the activities of the orientation program. The Explore programme was advertised in this booklet. Students were informed of the benefits of the programme which included fostering personal, career and academic development to enable them to maximize their potential at the university (Dixie, 2003). The Explore programme consists of six assessment measures namely: The Career Barriers Questionnaire, The Career Decision Making Self-Efficacy Scale, the South African Perceived Wellness Questionnaire, the Self-Directed Search Questionnaire (SDS), the Jung Personality Questionnaire (JPQ), and the Learning Style Indicator.

The Explore assessment battery was administered to a total of 391 students who were divided into groups averaging around 30 students each. Testers consisted of intern psychologists and psychologists who were trained in the administration of the battery and in providing feedback on the battery to the students. Each student was provided with the questionnaires, answer

sheets and a pencil. They were allocated three hours in which to complete the assessment battery. Instructions were read prior to the commencement of each test and after completion of a test the answer sheet was collected. There were also written instructions in their questionnaire booklet.

After completion, the protocols were collected and were scored by Octoplus which then generated a database for the Unit for Student Counselling. Two days later, the students were able to attend voluntary feedback sessions. The students were provided with a profile booklet in which they could enter their results and could refer back to when needed. They were also informed of the option of individual sessions with a counsellor for more in-depth feedback. The present researcher obtained permission from the Unit for Student Counselling to access the Learning Style Indicator data from the database.

First year academic performance was accessed from the ITS system via the Admissions and Placement Assessment Programme (APAP) database. The resultant data was merged with the Learning Style Indicator data from the Explore database of the Unit for Student Counselling.

Ethical Considerations

Participation in the Explore programme was voluntary and informed consent was obtained from the participants. The consent form of the Ethics Committee was not used for the Explore programme, as it was not available when the data was collected. The proposal was sent to the Ethics Committee and their approval was obtained. Feedback was provided to all participants

and participants were assured that their data would be treated as being strictly confidential.

Data Analysis

This study had three aims and data were analysed accordingly. Descriptive statistics were used to achieve the aims.

The first aim of this study was to explore and describe the learning styles of first year university students. This was achieved by using descriptive statistics such as frequency counts for each of the four styles, which were then converted to percentages. This enabled the researcher to identify and describe the four learning styles associated with Kolb's experiential learning theory.

The second aim of this study was to explore and describe the learning styles of first year university students per faculty. This enabled the researcher to describe the learning style most characteristic of the various faculties. According to Bailey (1987) descriptive statistics are useful as the data is presented in a tabular format so that information is presented concisely and comprehensibly to the reader.

The third aim of this study was to explore the possible relationship between learning styles and academic performance of first year university students per faculty. For each faculty separately, the four learning style types (i.e., Diverger, Converger, Assimilator, and Accommodator) were cross tabulated with academic performance categories (i.e., fail = <50%, low average = 50 and <60, high average = 61 and <74, and distinction = ->75). Frequency counts and percentages were obtained for each cell in the table.

The cross tabulation were complied for each faculty individually and not for the total sample as the academic programmes vary in difficulty across faculties. It would have been useful to test significance of the relationship between learning styles and academic performance. However, the small size of some of the cells precluded either a Chi-square or a contingency coefficient from being computed. Consequently, the researcher had to draw inferences regarding the relationship between learning styles and academic performance from the cross tabulation tables.

Summary

This chapter focused on the research design and methodology that was employed in this study. The characteristics of the participants in this study were noted, and a description of the sample was supplied. The data collection method was explained and the method of data analysis was discussed. The results will be presented in Chapter 5.

CHAPTER 5
RESULTS AND DISCUSSION

Introduction

This chapter will report on the results of this study. The first two aims of this study were to explore and describe the learning styles of first year university students firstly, as a whole and secondly, per faculty. The third aim was to explore and describe the possible relationship between the learning styles and academic performance of first year university students per faculty.

Firstly, the distribution of learning styles across the sample as a whole will be presented and discussed across faculties. There are four learning styles that were surveyed and there are six faculties at the institution where the study took place. Particular reference will be made to the most common and least common learning styles. Secondly, the relationship between the learners' level of academic performance and their learning styles will be presented and discussed.

Description of the distribution of the four Learning Styles across the whole sample

As noted in Chapter 3, the result of the Learning Style Indicator yields four learning styles. This section provides a description of the distribution of the four learning styles in the sample studied.

The distribution of the four learning styles for the whole sample is presented in Table 7. An examination of Table 7 indicates that all four of the learning styles were represented in the sample. The most represented style was the Diverger (39.7%). Accommodators followed a close second at 37%,

with about a fifth (19.9%) of the sample being Assimilators. The least represented style was the Converger (2.4%). Most studies find all four learning styles to be represented even though there may be a variation of the dominant learning style (e.g., Govender, 1997; Kolb, 1981; Pickworth, 1997).

Table 7

Description of Learning Styles: whole sample

	f	%
Accommodator	146	37.73
Diverger	154	39.79
Assimilator	77	19.90
Converger	10	2.58
Total	387	100.00

Learning Styles per Faculty

The distribution of the four learning styles per faculty is presented in Tables 8 to13.

Table 8

Description of Learning Styles: Economic and Building Sciences

	f	%
Accommodator	66	34.38
Diverger	80	41.67
Assimilator	40	20.83
Converger	6	3.12
Total	192	100.00

The Economic and Building Sciences faculty consists of programmes in the Economics Sciences and the Building Sciences. Programmes available in the Economic Sciences include a three-year Bachelor of Commerce (BCom) programme in which students can specialise in one of the following: General, Chartered Accounting, Human Resource Management, Computer Science & Information Systems, Marketing Management, Law, Sport and Recreation Management, and Economics and Statistics; and a four-year BCom programme (BCom Rationum and BCom Small, Medium & Micro Enterprise Development). Programmes available in the Building Sciences include Architecture, Construction Management and Quantity Surveying.

In the Economic and Building Sciences faculty the majority of students were Divergers, about a third were Accommodators and about a fifth were Assimilators. Very few were Convergers.

Kolb (1984) found that those in the Business field tended to be Accommodators and those in the Economics field tended to be Assimilators. Biglan (1976) found people in the Economics field to be Divergers, while those in Finance and Accounting tended to be Accommodators which could explain why the majority of the sample was either Divergers or Accommodators. Feldman (1974) found that Architecture majors tended to be Accommodators, Business majors tended to be Convergers and Economics majors tended to be Assimilators. Kolb (1981) states that Architecture requires artistic and engineering skills. Novin, Arjomand and Jourdan (2003) found Accounting majors to be mainly Convergers, while Management, Marketing and General Business major were mainly Assimilators. However, a small percentage of the majors were Accommodators and Divergers. Kolb

(1981) states that in Management qualitative and quantitative analysis is involved and this could account for the spread of the learning styles in the Economics and Building Science faculty.

These various studies found different spreads of learning styles for the various majors, which can account for the representation of the four learning styles in the present study as a variety of majors, were represented in the sample. No research studies could be located on the learning styles of learners studying Construction Management and Quantity Surveying.

Table 9

Description of Learning Styles: Science

	f	%
Accommodator	20	37.04
Diverger	22	40.74
Assimilator	11	20.37
Converger	1	1.85
Total	54	100.00

The programmes available in the Science faculty are Bachelor of Science (BSc) (Biological Sciences, Earth Sciences, Mathematical Sciences and Physical Sciences) and BSc in Information Technology.

In the Science Faculty, the majority of students sampled were either Divergers (40.74%) or Accommodators (37.04%). About a fifth of the sample were Assimilators and very few were Convergers. Pickworth (1997), utilising the Learning Style Questionnaire, found Convergers to be the most dominant learning style for Bachelor of Science learners followed by Assimilator,

Accommodator and Diverger. Pickworth (1997) found the same spread for the Learning Style Inventory. The science field has evolved over the years to become a more people-oriented field than it was before, consequently one does not find the scientist restricted to the laboratories and this could explain the spread of learning styles across the present study's sample.

Table 10

Description of Learning Styles: Arts

	f	%
Accommodator	18	45
Diverger	15	37.5
Assimilator	7	17.5
Total	40	100.00

In the Arts faculty, there are three schools namely; School of Social Sciences and Humanities, School of Language, Media & Communication and the School of Music with each one offering various programmes. The School of Social Sciences and Humanities consists of Bachelor of Arts (BA programme where one can choose to major in social sciences or on local or foreign languages or a combination of these), BA in Human Resource Management and Bachelor of Administration (BAdmin). The School of Language, Media & Communication offers a BA in Media, Communication & Culture. The School of Music consists of a Certificate of Applied Choral Conducting, Diploma in Music Education, Bachelor of Music (Education), BMus (Ed) and BMus (specialising in performing arts, music education and music technology).

The Arts faculty consisted mainly of Accommodators, followed by Divergers. Less than a fifth were Assimilators while none of the sample were Convergers. Pickworth (1997), using the Learning Style Questionnaire, found Convergers to be the most dominant learning style among Bachelor of Arts learners, followed by Assimilator, Accommodator and Diverger. Convergers were the most dominant learning style when using the Learning Style Indicator as well, but Accommodators was second in line, followed by Assimilators and Divergers (Pickworth, 1997). Pickworth's findings differ to the results of the present study, which could be due to the size of the sample or as Kolb states that within one field there could be spread of learning styles (Kolb, 1981). Kolb (1981) found that Divergers dominated in the Arts and Humanities. Fox and Ronkowski (1997) found the humanities field to comprise of Divergers and Assimilators. Fox and Ronkowski (1997) found that Political Science majors tended to be Assimilators whereas Kolb (1981), Biglan (1976) and Feldman (1974) found such majors to be Divergers. Kolb (1981) found that Sociology could be highly abstract and theoretical or concrete and active. Biglan (1976), Feldman (1974) and Nulty and Barrett (1996) found that learners majoring in Sociology to be Divergers. A fairly consistent finding in previous research is that the Assimilator and Diverger learning styles are usually prominently represented among the Arts students. This finding was supported by the results of the present study.

Table 11

Description of Learning Styles: Education

	f	%
Accommodator	7	53.85
Diverger	6	46.15
Total	13	100.00

Assimilators and Convergers were not represented in the Education faculty. Accommodators and Divergers tend to be associated with people-oriented professions while Assimilators and Convergers are associated with more fact-oriented professions. Biglan (1976) found that Special Education, Secondary Education and Education Administration majors tended to be Accommodators. Feldman (1974) found that Education and Educational Administration fields tended to be Accommodators.

Table 12

Description of Learning Styles: Health Sciences

	f	%
Accommodator	27	38.03
Diverger	32	45.07
Assimilator	10	14.08
Converger	2	2.82
Total	71	100.00

Programmes available in the Health Sciences Faculty are Nursing Science, Psychology (BA in Psychology, BPsych Counselling, Bachelor of

Sport Psychology), Social Development Professions (BA Social Work, BA in Youth Work), Pharmacy and Human Movement Science.

In the Health Sciences faculty, Divergers comprised the dominant learning style and more than a third were Accommodators. Govender (1997), researching a sample of nursing students, found Assimilators to be the majority learning style followed by the Converger, Diverger and Accommodator. Feldman's (1974) research found nursing students to be Divergers which could have contributed to the number of Divergers in the present study. Biglan (1976) found nursing students to be Convergers.

Research focussed on undergraduate students doing athletic training found the most dominant learning style to be that of the Converger, followed by Assimilator, Accommodator and Diverger (Stradley, Buckley, Kaminski, Horodyski, Flemming, & Janeele, 2002). Bower, Stemmans, Ingersoll, and Langley (2001) on the other hand found the Assimilators to be the most dominant learning style among athletes. Neither of the learning styles was strongly represented in the present Health Sciences sample.

Biglan (1976) found Psychology majors to be Divergers while Feldman (1974) found them to be Accommodators, which corresponds with Kolb's (1981) findings. Kolb (1981) found that Psychology can vary in its basic mode of inquiry, for example Clinical Psychology tends to use Divergent learning, Experimental Psychology uses Convergent learning and Industrial and Educational Psychology tends to use practical accommodative skills. Feldman (1974) found social work majors to be Accommodators. Kruzich, Firesen and van Soest's (1986) analysis found social work graduates to be Divergers, the social work field to be dominated by Accommodators and social work

academics tended to be Convergers. This indicates the differences in learning style that can occur in one chosen field. The fact that Divergers and Accommodators were the dominant styles in the Health Sciences faculty, probably links to the representation of those styles among psychology and social work majors.

Given the fact that various studies have found a different spread of the learning styles according to the type of major, the fact that the present data was not analysed for each major type is a limitation. However, such an analysis was not possible given the relatively small sample size per faculty in the first place.

Table 13

Description of Learning Styles: Law

	F	%
Accommodator	14	45.16
Diverger	6	19.35
Assimilator	10	32.26
Converger	1	3.23
Total	31	100.00

In the Law faculty Accommodators were the majority learning style followed by Assimilators. Feldman (1974) found that the law field tended to be dominated by Accommodators. Connelly (2003) found Accommodators to be the most dominant learning style among high-risk law students. Accommodators tendency to be impulsive and easily distracted, can negatively impact on their academic performance and this could possibly

explain why the identified high-risk law students' dominant learning style was that of the Accommodator. The findings of the present study are thus in keeping with these previous studies.

The relationship between Learning style and Academic Performance per Faculty

This section will explore the significance of the relationship between learning styles and academic performance per faculty. Furthermore, this section will also provide the findings related to the learning abilities of each of the learning styles represented in the various faculties. This section draws on the content of chapter three which contains an in-depth discussion of the experiential learning cycle.

Briefly summarised, learning comprises of two dimensions; namely how one readily perceives the information to be learned and how one prefers to process that information. When the student perceives information it occurs either by Concrete Experience (CE) (learning from feeling and personal experiences and involvement) or Abstract Conceptualization (AC)(learning by thinking) and processing information occurs either by Reflective Observation (watching/listening) or Active Experimentation (doing). Each learning style is a combination of two learning abilities which can be broken up as follows:

1. CE and RO - Diverger
2. CE and AE - Accommodator
3. AC and AE - Converger
4. AC and RO - Assimilator

While people tend to use all learning styles occasionally, they have preferences that may be strong, moderate or mild (Felder & Solomon, 1996).

Pickworth and Schoeman (2000) found that people learn more effectively if they develop learning abilities in their areas of weakness.

Table 14 will provide a brief synopsis of the four learning abilities featured in this study.

Table 14

Learning Abilities

CE (Feeling)	AE (Doing)
Responsive feeling, people-oriented	Performing, hands on
Learns through specific examples in a personal way	"Lets get on with it" attitude
Getting involved	Learns through experimentation and touch
	Using theories to solve problems or make decisions
AC (Thinking)	RO (Watching/Listening)
Thinking (controlled feelings)	A tentative, impartial and reflective approach to learning
Fact-oriented, focus on things, creating ideas	Watching others or developing observations about own experience
Sees the "Big picture"	Learns best through visual and auditory observation
Learns through reflective thinking exercises that are focused on symbols and things rather than people	
Creating theories to explain observations	

Table 15

Economic and Building Sciences: Academic performance and Learning Styles

	Distinction	High average	Low average	Fail	Total
Accommodator	6 (9.09%)	19 (28.79%)	22 (33.33%)	19 (28.79%)	66 (100%)
Diverger	7 (8.75%)	30 (37.50%)	30 (37.50%)	13 (16.25%)	80 (100%)
Assimilator	6 (15%)	16 (40%)	11 (27.5%)	7 (17.5%)	40 (100%)
Converger	0	2 (33.33%)	1 (16.67%)	3 (50%)	6 (100%)
Total	19 (9.89%)	67 (34.9%)	64 (33.33%)	42 (21.88%)	192 (100%)

In view of the fact that some of the cells in Table 15 were empty or had very small frequencies, it was not possible to analyse the data further by performing, for example, a chi-square or a contingency coefficient.

As can be seen from Table 15, no real pattern emerged regarding the relationship between academic performance and learning styles. There was a spread of academic performance for each of the learning styles. Whether the student was an Accommodator, Diverger or Assimilator their chances of passing was somewhat better than their chances of failing. Although, it should be noted that the chances of an Accommodator failing was somewhat higher than if the student was a Diverger or Assimilator. For the few Convergers in the sample, the chances of passing or failing were equal.

Table 16

Economic and Building Sciences: Learning Abilities per Learning Style

	Diverger	Accommodator	Converger	Assimilator
	Mean	Mean	Mean	Mean
AE	3.91	**6.88**	**6.5**	3.38
RO	**5.07**	2.11	2.5	**5.61**
AC	3.88	3.11	**5.66**	**6.64**
CE	**5.07**	**5.85**	3.33	2.30

In this faculty a student utilises theories in problem solving and decision-making, which supports the finding that Active Experimentation (AE) had the highest average score followed by Active Conceptualization (AC). AC is related to creating theories to explain observations.

The Divergers in this faculty seems to be using both learning abilities Reflective Observation (RO) and Concrete Experimentation (CE) on an equal footing therefore neither learning ability can be considered as a strength. For the Accommodators and Convergers the AE learning ability had the highest average score, while the AC learning ability had the highest average score among the Assimilators.

Table 17

Science: Academic performance and Learning Styles

	Distinction	High average	Low average	Fail	Total
Accommodator	2 (10.00%)	9 (45%)	6 (30%)	3 (15%)	20 (100%)
Diverger	4 (18.18%)	13 (59.09)	2 (9.09%)	3 (13.64%)	22 (100%)
Assimilator	2 (18.18%)	4 (36.36%)	4 (36.36%)	1 (9.1%)	11 (100%)
Converger	0	0	1 (100%)	0	1 (100%)
Total	8 (14.81%)	26 (48.15%)	13 (24.07%)	7 (12.96%)	54 (100%)

In view of the fact that some of the cells in Table 17 were empty or had very small frequencies, it was not possible to analyse the data further by performing, for example, a chi-square or a contingency coefficient.

As can be seen from Table 17, no real pattern emerged regarding the relationship between academic performance and learning styles. There was a spread of academic performance for each of the learning styles. Whether the student was an Accommodator, Diverger or Assimilator their chances of passing was somewhat better than their chances of failing. Although, it should be noted that the chances of an Accommodator failing was somewhat higher than if the student was a Diverger or Assimilator. For the Converger in the sample, the chances of passing were good.

Table 18

Science: Learning Abilities per Learning Style

	Diverger	Accommodator	Converger	Assimilator
	Mean	Mean	Mean	Mean
AE	3.85	**6.85**	**6**	3.54
RO	**5.15**	2.15	3	**5.45**
AC	3.8	3.35	**7**	**6.63**
CE	**5.2**	**5.6**	2	2.36

Students who engage the Abstract Conceptualization (AC) learning ability tend to be fact-oriented and tend to look mainly at the "Big Picture". AC had the highest distribution followed by Active Experimentation (AE). The AE learning ability accounts for the experimentation component of the Science discipline.

For Divergers, a very small difference between the average score of the Reflective Observation (RO) and Concrete Experimentation (CE) learning abilities was found. The same was true for the difference in average score for the AE and AC learning abilities. This finding could imply that they are using RO/CE and AE/AC combination, respectively, on a fairly equal footing.

For Accommodators, the AE learning ability had the highest average score. There was only one Converger who performed in the low average range and the AC learning ability had the highest average score. For Assimilators, the AC learning ability had the highest average score.

Willcoxson and Prosser (1995) found that science learners scored higher on the AE learning ability. In contrast, the present study found that

science learners scored higher on the AC learning ability. The AC learning ability is suited to the science field in which problem solving relies on systematic planning, development of theory and ideas. With new challenges arising, society requires people that are able to examine facts, create and logically analyse ideas.

Table 19

<u>Arts: Academic performance and Learning Styles</u>

	Distinction	High average	Low average	Fail	Total
Accommodator	1 (5.56%)	7 (38.9%)	8 (44.44%)	2 (11.1%)	18 (100%)
Diverger	1 (6.66%)	7 (46.67%)	3 (20%)	4 (26.67%)	15 (100%)
Assimilator	1 (14.29%)	5 (71.43%)	1 (14.28%)	0 (0%)	7 (100%)
Total	3 (7.50%)	19 (47.50%)	12 (30%)	6 (15%)	40 (100%)

In view of the fact that some of the cells in Table 19 were empty or had very small frequencies, it was not possible to analyse the data further by performing, for example, a chi-square or a contingency coefficient.

As can be seen from Table 19, no consistent pattern emerged regarding the relationship between academic performance and learning styles. There was a spread of academic performance for only three of the learning styles. There were no Convergers in the sample. Whether the

student was an Accommodator, or Assimilator their chances of passing was somewhat better than their chances of failing. It should be noted that more Divergers tended to fail and all the Assimilators passed.

Table 20

<u>Arts: Learning Abilities per Learning Style</u>

	Diverger	Accommodator	Assimilator
	Mean	Mean	Mean
AE	3.38	**6.94**	3.57
RO	**5.53**	2.05	**4.85**
AC	3.07	2.44	**7.28**
CE	**5.92**	**6.55**	1.57

In the Arts faculty the Concrete Experimentation (CE) learning ability had the highest overall average score followed by Active Experimentation (AE). This corresponds with a study done by Willcoxson and Prosser (1995) who found that Arts students scored higher for the CE learning ability. The CE learning ability relates to the programmes in the Arts faculty which are more people-oriented, where people are more responsive to their feelings and have a need to get involved. AE had the second highest average score, which involves performing and learning through experimentation and touch.

For Divergers the CE learning ability had the highest average score. 37.5 % of learners in the Arts faculty comprised of Divergers. Research has found that the Arts faculty tends to be dominated by Divergers (Biglan, 1976; Feldman, 1974; Fox & Ronkowski, 1997; Kolb, 1981).

For Accommodators, the AE learning ability had the highest average score. The difference between the AE/CE average score and the AC/RO average score was substantial.

For Assimilators, the Abstract Conceptualization (AC) learning ability had the highest average score. There is a considerable difference between AC and Reflective Observation (RO), which seems to indicate that the AC learning ability is preferred. The average score for the CE learning ability for the Assimilator is quite low which seems to indicate that they tend to rely very little on their feelings and intuition (CE).

Table 21

Education: Academic performance and Learning Styles

	High average	Low average	Fail	Total
Accommodator	2 (28.57%)	3 (42.86%)	2 (28.57%)	7 (100%)
Diverger	4 (66.67%)	2 (33.33%)	0 (0%)	6 (100%)
Total	6 (46.1%)	5 (38.5%)	2 (15.4%)	13 (100%)

In view of the fact that some of the cells in Table 21 were empty or had very small frequencies, it was not possible to analyse the data further by performing, for example, a chi-square or a contingency coefficient.

As can be seen from Table 21, no real pattern emerged regarding the relationship between academic performance and learning styles. There was a

spread of academic performance for only two of the four of the learning styles. Whether the student was an Accommodator or Diverger their chances of passing was somewhat better than their chances of failing. Although, it should be noted that the chances of an Accommodator failing was somewhat higher than if the student was a Diverger.

Table 22

Education: Learning Abilities per Learning Style

	Diverger	Accommodator
	Mean	Mean
AE	3.66	**6.71**
RO	**5.33**	2.28
AC	3	2.57
CE	**6**	**6.28**

The high Concrete Experimentation (CE) score is indicative of the people-oriented nature of the Education discipline that involves being responsive to feelings and being imaginative. The second highest score active Experimentation (AE) takes cognisance of the   hands-on aspect of the discipline. For Divergers and Accommodators, the CE learning ability had the highest average score.

Table 23

<u>Health Sciences: Academic performance and Learning Styles</u>

	Distinction	High average	Low average	Fail	Total
Accommodator	5 (18.52%)	12 (44.44%)	9 (33.33%)	1 (3.70%)	27 (100%)
Diverger	8 (25%)	12 (37.50%)	7 (21.87%)	5 (15.63%)	32 (100%)
Assimilator	3 (30%)	3 (30%)	3 (30%)	1 (10%)	10 (100%)
Converger	1 (50%)	1 (50%)	0	0	2 (100%)
Total	17 (23.94%)	28 (39.44%)	19 (26.76%)	7 (9.86%)	71 (100%)

In view of the fact that some of the cells in Table 23 were empty or had very small frequencies, it was not possible to analyse the data further by performing, for example, a chi-square or a contingency coefficient.

As can be seen from Table 23, no real pattern emerged regarding the relationship between academic performance and learning styles. There was a spread of academic performance for each of the learning styles. Whether the student was an Accommodator, Diverger, Assimilator or Converger their chances of passing was somewhat better than their chances of failing. Although, it should be noted that the chances of a Converger failing was somewhat higher than if the student was an Accommodator, Diverger or Assimilator.

Table 24

Health Sciences: Learning Abilities per Learning Style

	Diverger	Accommodator	Converger	Assimilator
	Mean	Mean	Mean	Mean
AE	4.26	**6.7**	**6.5**	6.5
RO	**4.71**	2.3	2.5	**2.5**
AC	3.58	3	**6**	**6**
CE	**5.42**	**6**	3	3

In the Health Sciences faculty the Active Experimentation (AE) learning ability had the highest score followed by Abstract Conceptualization (AC). In this faculty the student uses existing theories to solve problems or make decisions. Since they also learn through experimentation and touch, this could explain why AE has the highest average score. The second highest score, AC, involves looking at the "Big Picture" by focusing on things and symbols rather than people.

For Divergers the Concrete Experimentation (CE) learning ability had the highest average score. There does not seem to be a considerable difference between the average score for Reflective Observation (RO), AE and AC learning abilities. The learners seem to be utilising all four learning abilities on a similar basis and this seems to indicate that they have a more balanced profile and therefore may be more adaptively flexible learners. For Accommodators and Convergers, the AE learning ability had the highest average score.

The Assimilator learning style is a combination of the AC and RO learning abilities. Dos Santos and Vendramini (2002) found that the pharmacy field scored higher for the RO learning ability followed by AC, AE, CE learning abilities. This differs from the present study's findings in that the AE's average score is higher than both the RO and AC learning abilities. In addition, the study found the RO learning ability's average score is the lowest of all four learning abilities. These Assimilators seem to be using a combination of a hands-on (AE) and thinking (AC) oriented approach to their learning which may be an indication of their adaptation to the learning environment they have been exposed to.

Table 25

Law: Academic performance and Learning Styles

	Distinction	High average	Low average	Fail	Total
Accommodator	2 (14.29%)	7 (50%)	5 (35.71%)	0	14 (100%)
Diverger	0	1 (16.67%)	3 (50%)	2 (33.33%)	6 (100%)
Assimilator	2 (20%)	3 (30%)	2 (20%)	3 (30%)	10 (100%)
Converger	0	1 (100%)	0	0	1 (100%)
Total	4 (12.90%)	12 (38.71%)	10 (32.26%)	5 (16.13%)	31 (100%)

In view of the fact that some of the cells in Table 25 were empty or had very small frequencies, it was not possible to analyse the data further by performing, for example, a chi-square or a contingency coefficient.

As can be seen from Table 25, no consistent pattern emerged regarding the relationship between academic performance and learning styles. There was a spread of academic performance for each of the learning styles. Whether the student was an Accommodator, Diverger or Assimilator their chances of passing was somewhat better than their chances of failing. Although, it should be noted that the chances of an Accommodator and Converger passing was somewhat higher than if the student was a Diverger or Assimilator.

Table 26

<u>Law: Learning Abilities per Learning Style</u>

	Diverger	Accommodator	Converger	Assimilator
	Mean	Mean	Mean	Mean
AE	4.33	**6.71**	**7**	3.4
RO	**4.66**	2.21	2	**5.6**
AC	5	2.57	**6**	**6.3**
CE	**4**	**6.42**	3	2.7

In the Law faculty the Active Experimentation (AE) learning ability had the highest average score followed by Abstract Conceptualization (AC). In law one uses the existing theories or laws to solve problems or to make decisions thus accounting for the high AE. When using the AC learning ability the students use laws to explain particular behaviour and create new

laws/theories (AC). By utilising these two learning abilities new laws and acts are constantly being created. The AE and AE combination give rise to the Converger learning style and this contradicts with the present studies findings. However, this could account for the learner's adaptation to their environment.

The Diverger learning style is a combination of the Concrete Experimentation (CE) and Reflective Observation (RO) learning abilities. However, the AC score was higher than both the CE and RO scores. The CE learning ability's score is the lowest of all four learning abilities for Diverger students in the Law faculty. These Divergers seem to be using a combination of thinking (AC) and observing (RO) oriented approach to their learning. This may be an indication of their adaptation to the learning environment to which they have been exposed. Divergers mainly tend to use feeling (CE) and observation (RO) but in this situation the Divergers seems to be trying to set aside their feelings to observe the facts of the case and process the situation by thinking it through (AC).

For Accommodators, the AE learning ability had the highest average score. The RO and AC learning abilities seem to be quite low in comparison to the other two learning abilities. As stated earlier the dominant learning style for the Law faculty were Accommodators which corresponds with other research (Connelly, 2003; Feldman, 1974).

A study done by Briggs Myers and McCaulley (1992) found that the sensing type is significantly related to poor achievement, failures or drop out rates. Therefore, caution should be taken with Accommodators since Accommodators correlate with Jung's extraverted sensing type (Kolb, Boyatzis & Mainemelis 1999).

For the Convergers, the AE learning ability had the highest average score. In the law faculty there was only one Converger who performed in the high average category. The AC learning ability for Assimilators had the highest average score.

Summary of findings

Across the six faculties Accommodators and Divergers were the most dominant learning styles. Learning styles were not differentiated across the faculties as most of the learning styles were represented in each faculty. The AE learning ability has the highest average distribution across all six faculties. This implies that the learners learn by doing; they tend to be extroverted in that they act to influence people and events; and they have the ability to get things done and are risk takers.

In terms of Jung's typology the AE learning ability is similar to extroversion (Refer to chapter three, page 48). According to Jung (1990) most learners tend to express their energy outwardly towards people, objects and events rather than expressing it inwardly and they are therefore less preoccupied with their own emotions and experiences. Gauss (2002) found a higher incidence of extroversion in a South African university sample and a higher academic average was associated with extroversion despite extroverts being twice as likely to fail. Briggs Myers and McCaulley (1992) found that introverts are well suited to independent study, which is often required at a tertiary level, while extroverts tend to be distracted from their studies by external activities. Extroverts can achieve higher academic grades when they

apply themselves. They do however tend to be easily distracted and this contributes to their higher failure rates (Gauss, 2002).

It is claimed that cognitive retention can increase from 20 to 90 percent through experiential learning and learning can be enhanced if more of the learning stages are utilised (Stice, 1987). However, there was no significant relationship found between learning styles and academic performance in this study.

In conclusion, this chapter explored the findings of this study in terms of learning styles of the sample as a whole as well as per faculty and in relation to academic performance. The last chapter in this study will discuss the value of the study, practical implications of the findings, limitations and make recommendations to guide future research in the field. Finally the researcher will draw conclusions with regards to the study in its entirety.

CHAPTER 6

VALUE, PRACTICAL IMPLICATIONS, LIMITATIONS AND RECOMMENDATIONS

The value of the study will be discussed, followed by the practical implications of the findings of this study. These are practical suggestions that tertiary educators as well as learners can use to strengthen their learning styles. The limitations of the study will be highlighted. The remainder of the chapter will explore some recommendations for future research and then the researcher will draw conclusions of the study in its entirety.

Value of study and Practical Implications

The study found that the majority of learners were Divergers and Accommodators despite all four learning styles being represented. The Converger was the most underrepresented learning style in the sample. Fairhurst and Fairhurst (1995) propose that a balance needs to found between accommodating learners' preference and assisting learners to develop and stretch their weaker underdeveloped learning style preferences and in so doing, improve their learning style flexibility. Effective learning is the ability to be flexibly competent in each learning mode when deemed necessary and not to use one mode in all situations (www.learningfromexperience.com/html/faq.html).

Most of the courses offered at university-level are characterised by the information delivery mode which fails to accommodate all learning styles. A knowledge of the learners learning style would enable lecturers to utilise

alternative teaching methods that will increase the learners' level of learning performance and general satisfaction (Terry, 2001).

Limitations

Limitations will be discussed in terms of the method, the measure, and the generalisability of the results.

The non-experimental descriptive research method does not allow for the control of extraneous variables. The researcher therefore has no way of knowing if or to what extent external factors may have impacted on the sample groups responses to the Learning Style Indicator in the testing environment. This is also true for academic performance in that there is no way of knowing if the aggregate mark calculated for the learners is an accurate reflection of their optimal academic abilities despite academic marks being awarded on a continuous assessment basis. If sample size was larger per faculty this would have enabled the researcher to breakdown each faculty into the various programmes. This in turn would have allowed the researcher to gain a clearer picture of learning styles per programme.

The Learning Style Indicator is a self-report measure. The learners were encouraged by the researcher to respond truthfully by ensuring confidentiality and emphasising that there were no right or wrong answers. There is no way of knowing the extent to which social desirability may have biased the sample responses. The testing took place with first years at the beginning of the year prior to the start of lectures when learners are easily influenced and eager to please.

The Learning Style Indicator is based on Kolb's experiential learning theory. The results of the Learning Style Indicator offer a framework in order

to facilitate learners appreciation of their own individual learning. This serves as a reference point and is not exact, fixed and inflexible learning style categories. All the learners participating in the Explore programme offered by the Unit of Student Counselling did not attend the feedback sessions. These feedback sessions did not concentrate on the Learning Style Indicator specifically but offering an overview of all the measures offered in the Explore programme. Since the sessions did not go in-depth into each learning style, it is difficult to assess the level of insight gained by individual students. This could account for the non-significant relationship between learning styles and academic performance.

The results of the study cannot be generalised beyond this sample group as a convenience sample was used. The ability to draw definite conclusions might have enhanced the usefulness of the study. The small cell size in the academic performance and learning style categories across the faculties limited the study to a descriptive level and hindered further statistical analysis.

Recommendations for future research

Recommendations will be discussed in terms of the generalisability of findings, sample variables, programmes within faculties, the measure, teaching styles and practical recommendations for academic staff and learners.

In order to allow for greater generalisation of the present findings future research undertakings in this field, might consider using a randomised sampling technique as the results will then be able to be generalised to a

larger population. Thus the utilisation of findings and the value of the study would be increased.

In addition, the researcher could further breakdown the sample in terms of biographical variables such as gender, race, and language group to explore the learning style of the learners in each of these subgroups. This information will yield more specific and detailed information regarding the unique needs of the South African learners.

A larger scale research undertaking with a large sample might consider exploring the degrees offered in the various faculties as well the majors offered. This would provide more specific information of the learners learning style within the various degree programmes within faculties.

The Learning Style Indicator is included in the Explore Programme run by the Unit for Student Counselling as part of orientation of first year learners to the university. A similar undertaking could be done for the university's advancement programme which is a one year foundation course for students who want to enrol for any degree programme, but who do not meet the university's requirement for admission into the degree programme. These students are viewed as high-risk students who require more assistance. The information obtained could assist the programme with early intervention by deepening learners' insight into their strengths and weaknesses and assisting them to achieve their optimal academic potential.

The teaching styles of lecturers can be investigated to provide lecturers with information on the way they tend to approach information and teach. This could be included when designing induction and learning programs for tertiary educators.

This section elaborates on the practical utility of learning styles to guide learners and educators. It is because of this practical utility, that it is worth persisting with research into learning styles even if the present results have not been too encouraging.

Kolb's learning cycle can be used during the initial framework of a problem. The rationale behind the learning cycle is to make small and incremental improvements that will lead to major improvements over time. The idea of the learning cycle is that the more one reflects on a task, the more one has the opportunity to redefine and modify one's efforts. (www.css.edu/users/dswenson/web/PAGEMILL/Kolb.htm). According to Kelly (1999) learning has become important in an emerging, networked world of information-based economies. This is probably more so than determining a person's or organisation's adaptation, survival or growth (Kelly, 1999), therefore complex, service-oriented jobs demand flexibility. Kolb's experiential learning theory helps one to understand learning and flexibility at a deeper and more comprehensive level. The theory also provides practical guidance aimed at helping people improve their learning and to design better processes in education and development.

By knowing the learners' preference the instructor can engage the learners in a broad range of learning activities that will reinforce their current learning style strengths and address their weaknesses by expanding their repertoires of experience. This will diversify and "stretch" (Lemire, 1996, 92) learners. Therefore, instructors need to include broad-based options in which learners can make a choice to match learning style preferences or a more focused alternative which will force them to learn and practice specific

learning style skills and strategies that they may be less familiar with. The content of educational programmes that cater for a single learning style fails to meet the expectations of many of their learners (Rutz, 2003). Therefore problems could be minimised and quality enhanced if teaching styles were modified to accommodate all the learning styles by addressing each side of the learning style dimension at least some of the time (Felder, 1993) and thus creating lifelong learners that are capable of learning and working in diverse settings (McClanaghan, 2000). The experiential learning model can be used to plan classroom learning, essay research–writing, and examinations in accordance with the learners learning style preferences.

Each learning style has its strengths that the learner can draw upon (see Chapter 3). Learners need to be aware of weaknesses (areas of growth) that are associated with each learning style giving them the opportunity to become more proficient in the other modes. There are ways learners can develop their learning styles. There are some interventions and guidelines that instructors can consider utilising in order to strengthen the learners learning style. A graphic representation of the areas of growth, how to develop your learning style, interventions and guidelines will follow.

Some suggestions for various learning situations:

Classroom learning:

For Concrete Experimentation (CE), Active Experimentation (AE) learning ability and Accommodators, large and small group class discussions and student-led presentations will be beneficial. The Assimilator wants a preset of primary topics to be listed, the Accommodator would like to choose their own corollary topics and wants it to be fully explained, the Diverger

wants every topic to be carefully introduced and the Accommodator and Converger needs it to be applied to real life examples. The Converger and Reflective Observation (RO) need questions and answers to be initiated by the instructor whereas the CE learning ability and the Diverger need questions and answers initiated by learners. Lesson activities can be planned according to the various learning modes and styles preferences, thus exposing the whole class to activities that will broaden their perspectives on learning. (Terry, 2001)

Group Assignment:

Learners with a CE learning ability will prefer to choose their own group members. The Diverger, Accommodator, the RO and the CE learning ability work well with the initial planning, the Accommodator and the Assimilator prefers researching, the writing and presentation of the assignment is preferred by Converger and the AE learning ability. (Terry, 2001)

Essay Writing:

The CE learning ability, Divergers and Accommodators perform well in determining and narrowing the topic. Learners with the RO learning ability are adept in the development of the initial research required to construct a thesis. Active Conceptualization (AC) learning ability and the Assimilator's strong in doing the primary research and note-taking, whereas the writing, rewriting and referencing section of essay writing is the AE learning ability and Convergers strength. (Terry, 2001)

Examinations:

The Assimilator needs the examination format to be consistent and the Assimilator and Accommodator wants things to be clearly explained. The CE

learning ability prefers multiple choice questions that test rote knowledge, the Diverger prefers deductive reasoning and the Accommodator prefers inductive reasoning. The Assimilator and AC perform well with true-false questions, whereas essay answers work well for CE, RO and AE learning ability. (Terry, 2001)

Divergers prefer the exam format and Accommodators prefer subjective tests, while Convergers and Assimilators prefer objective exams. The Diverger prefers test and examination questions to be evaluative, the Assimilator wants it to assess knowledge and comprehension, the Converger prefers the questions to be evaluative and the Assimilator prefers it to be examining synthesis (Anderson & Adams, 1991, Harb, Terry, Hurt, & Williamson, 1995).

The areas of growth, possible intervention and how they can each develop their learning style skills is tabulated below:

Converger (Common sense learners, Analytic and behavioural skills):

Areas of growth	Develop your convergent learning skills through:
- Tends to be impersonal and finicky - Impatient with what they regard as unimportant - Tends to be rigid when a new approach is needed - Sometimes find it difficult to work in a team - Rushed decisions may cause them to solve the wrong problems	- Creating new ways of thinking and doing - Experimenting with new ideas - Choosing the best solution - Setting goals - Making decisions
Interventions:	Guidelines for instructors:
- Lectures with models - Hands-on materials and demonstrations - Peer feedback - Laboratories - Observations - Workbooks - Fieldtrips - Activities that apply skill	- They prefer an interactive style of instruction - Allow them to evaluate alternatives and arrive at answers logically - They need to be encouraged to distinguish between problems that require objective evaluation and those that demand subjective judgement - They need to learn that they need to flexible particularly with the increasing diversity of today's workforce - Instructor seen as coach

Diverger (Innovative learners, interpersonal and information skills):

Areas of growth	Develop your divergent learning skills by:
- Being undecided when too many alternatives are offered - Trying to do too much; working unsystematically therefore can't complete tasks - Not being assertive enough - Inability to defend own viewpoint - Gives in easily - Procrastination: delays till it too late	- Being sensitive to others feelings - Being sensitive to values - Listening with an open mind - Gathering information - Imagining the implications of certain situations
Interventions	Guidelines for instructors:
- Lectures with reflections - Brainstorming - Keeping logs, journals - Movies - Short assignments, leading to class activities	- Information needs to be presented in a detailed, systematic manner - Mingle - Answer questions, making suggestions - Ready reference guides and organised summaries - Flexibility and ability to think on feet - Instructor as motivator - Formal lecture with feeling tone

Assimilator (Analytic learner, information and analytic skills):

Areas of growth	Develop your Assimilator learning skills by:
• Backlog of work building up because of time spent considering ideas in detail • Sometimes comes up with ideas and theories that are not feasible • Does not rely on feeling, doesn't speak about personal problems, very private • Too tenacious once a theory or idea has been decided on • An overcautious attitude restrains them from taking risks	• Organising information • Building conceptual model • Testing theories and ideas • Designing experiments • Analysing quantitative data
Interventions: • Mini lecture • Problem solving activities • Papers • Case studies • Theory readings • Independent study, thinking alone • Optional reading assignment • Games	Guidelines for instructors: The lecture has to be followed by a demonstration of subject that corresponds to a prepared tutorial and for which answers are provided There need to be prepared exercises that are provided by a person that is available and able to answer questions The instructor needs to be well-organised and plan the lesson carefully and make few changes The cases that are used should require them to assimilate and synthesise information to build a theory or model. Instructor as expert Formal lecture with thinking tone Lecture with visual aids/programmed notes

Accommodator (Dynamic learners, behavioural and interpersonal skills):

Areas of growth	Develop your Accommodator learning skills by:
• May get impatient and pushy • Spends energy on trivial activities which may not necessarily bring about any improvement • Tends to work without pre-set goals • Can manifest manipulative behaviour	• Committing yourself to objectives • Seeking new opportunities • Influencing and leading others • Being personally involved • Dealing with people
Interventions: • Lectures with slides • Instructional reading • Peer feedback • Group discussions • Simulations • Case studies • Homework • Intensive text reading	Guidelines for instructors: Devils advocate questions "what if?" and "why not?" Need to be active participants in their learning Instructor as evaluator Student lectures Student prepared problems

Summary

There are parameters within which a research undertaking takes place. These parameters may have a negative or positive impact on a study. Viewed negatively, these parameters could be associated with being limitations. The researcher's opinion takes a positive view in that these parameters will facilitate future research undertakings thereby leading to improved research.

The researcher is of the opinion that this research undertaking has proven to be invaluable for the following reasons: a) It illustrates how learning theory can be utilised in South Africa; b) It can be applied in a tertiary education setting; and c) It emphasises how existing theories can be applied to modern and dynamic education contexts, with specific emphasis on the new learner-centred, outcomes-based educational system, to facilitate transitional processes.

This study has highlighted the learning styles of first year university learners at a specific university. It has been valuable to collect and compile information relating to the learners learning style as it provides a vehicle to utilise this information for learning and training purposes.

The researcher is of the opinion that findings of this study will contribute to furthering learning style research at the specific university where the study was conducted as well as other tertiary institutions in South Africa.

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APPENDIX A

Relation between learning styles and five levels of behaviour

Behaviour level	Diverging	Assimilating	Converging	Accommodating
Personality types (related to MBTI)	Introverted Feeling	Introverted Intuition	Extraverted Thinking	Extraverted Sensation
Educational specialization	Art, English, History, Psychology	Economics, Mathematics, Sociology, Chemistry	Engineering, Physical sciences	Business Management
Professional career	Social service, Arts, Communication	Sciences, Research, Information	Technology, Economics, Environment science	Organisations, Business
Current jobs	Personal jobs (counselling & personnel administration)	Information jobs (planning and research)	Technical jobs (engineering & production)	Executive jobs (general management)
Adaptive competencies	Valuing skills (relationship, helping others, sense-making)	Thinking skills (information-gathering, information-analysis, theory building)	Decision skills (quantitative analysis, use of technology, goal-setting)	Action skills (leadership, intuitive, action)