CHAPTER 1

1.   ORIENTATION TO THE STUDY

1.1   Introduction

South Africa is currently in the middle of educational reform. The National Qualifications Framework (NQF) and the South African Qualification Authority (SAQA) are the two governing bodies restructuring education and training in South Africa. The objective of the educational reform is to raise the quality of education in the country, thus enabling it to become a bigger international economic role-player.

The SAQA act which promulgates the concept of outcomes-based education (OBE) and lifelong learning was introduced in 1995. This act underscores change, reform and restructuring of the entire educational system in South Africa. In the new democratic South Africa all citizens have an equal right to education on all levels. More learners of diverse ethnic, cultural, socio-economic and racial backgrounds are now studying at higher educational institutions in South Africa than ever before.

The School of Dentistry at the University of Pretoria has implemented a new curriculum to meet the demands of the new system. The new curriculum now spans a period of five years instead of the previous five and a half-years of study. Dentistry, like most sciences in the twenty-first century, is expanding rapidly with new knowledge, concepts and technologies. This growth in what the learners have to learn (knowledge, skills and attitudes) in a reduced time-span necessitates educational strategies that will enhance the quality of learning.

The new educational paradigm's foundation and focus are the learner and learning. Educators are encouraged to adopt strategies that will foster the development of the critical outcomes set by SAQA (1997:24). The critical outcomes determine the specific outcomes envisaged in each field of specialization. The following critical outcomes have been adopted for the

study unit of Toothmorphology as part of the Module of Odontology. The learner should be able to demonstrate the following:

1. *Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made.*

As a professional a dentist needs to make responsible decisions in everyday practice, which includes the diagnosis and treatment of diseases of the oral environment. Being critical and creative thinkers when dealing with people and solving their health problems as well as managing a practice is becoming all the more important for professionals in all walks of life because of the demands made by modern society.

2. *Work effectively with others as a member of a team, group, organization, and the community.*

It is inevitable for a dentist to work as part of a team and it is of paramount importance to learn how to function effectively with others in this particular professional context.

3. *Organize and manage himself/herself and his/her activities responsibly and effectively.*

Healthcare professionals like a dentist need to be responsible and organized when dealing with appointments, patient information and administrative duties.

4. *Collect, analyze, organize and critically evaluate information.*

A dentist must have the ability to collect information regarding a specific problem and to analyze, organize and critically evaluate the information with a view to making a diagnosis and deciding on a treatment plan for the problem. A dentist should also be able to collect relevant information regarding different aspects of everyday practice, e.g. a health problem of a patient, a business problem, an employee problem, and information on new technologies, skills and knowledge.

5. *Communicate effectively using visual, mathematical and/ or language skills in the modes of oral and/ or written presentation.*

Dentists must be able to communicate with patients, colleagues, oral hygienists, dental assistants and other employees about relevant issues in dentistry by using different media as well as oral and written presentations.

The following developmental outcomes that were adopted by SAQA (1997:25) are also included as important critical outcomes for learning in the study unit of Toothmorphology. These outcomes state that it must be the intention of any learning programme to make the learner aware of the importance of the following:

1. *Exploring and thinking about a variety of learning strategies in order to learn effectively.*

Currently learning theory underscores the importance of learners' understanding their own thinking preferences and getting the opportunity of exploring and developing diverse thinking and learning strategies. This will empower learners and help them to learn more effectively and to become lifelong learners.

2. *Responsible participation in the community.*

As a healthcare provider in the community the dentist needs to be a responsible person that other people can trust.

3. *Being culturally and aesthetically sensitive across a range of social contexts, which includes race, religion and language.*

Dentists must be aware of the diversity in the community and be able to show the necessary and equal respect for every patient.

The ultimate vision embodied in the critical outcomes is to help develop literate, creative and critical citizens in South Africa who will lead a productive and self-fulfilled life (Van der Horst & McDonald, 1997:7).

1.2 Motivation for this study

The new SAQA Act (1995) promulgates outcomes-based education (OBE) and lifelong learning that supports a learning-centred approach in which

learners take responsibility to learn while lecturers act as facilitators of learning. This move from the traditionally lecturer-centred to a learning-centred approach implies a vital paradigm shift from being a lecturer to a facilitator of learning. Research in education and psychology in the previous two decades emphasized the diverse preferences or styles of learning of individual learners. To help learners maximize their potential when learning new knowledge, skills and attitudes these preferred modes must be accommodated during learning interventions. The motivation for this study is to investigate the use of a model that will comply with the principles of OBE, enhance the process and quality of learning, cater for the individual needs of each learner and promote learning style flexibility.

1.3 Role of the study unit of Toothmorphology in the BChD curriculum

Dentists prevent and heal diseases in and around the human oral cavity. Most work in this regard requires dentists to repair and replace broken or diseased toothstructure. They need to have the necessary knowledge, skills and attitudes to practice their profession effectively. In the science of dentistry dentists strive after restoring form and function in the oral cavity in the most effective way for every situation. In the third year of the BChD curriculum the study unit of Toothmorphology familiarizes learners with the anatomy and structure of healthy toothstructure in the human oral cavity. Knowledge of each individual tooth's morphology helps dentists to restore lost structure to the best functional and aesthetical level possible.

1.4 Problem statement

The SAQA Act (1995) requires facilitators of learning to use innovative and creative learning-centred strategies to complement OBE and lifelong learning to maximize the potential of all learners. Lecturers in dental education should focus their attention on a few scenarios and problems before employing a specific model to facilitate learning:

1. Less than twenty-five percent of the permanent full-time lecturers in the School for Dentistry at the University of Pretoria had formal training in the science of education (Faculty of Health Sciences, 2001:1).

2. Traditionally, educational practices in the dental curriculum at the University of Pretoria were lecture-based. Content was mainly delivered via lectures using notes and textbooks. This practice caters mostly for strong left-brain learners and focuses on the knowledge of the lecturer and delivery of that knowledge to the learners.

3. Currently there is no inclusion of whole brain learning (thinking style diversity) in the dental education curriculum.

Lecturers in dentistry are faced with the problem of selecting and using an educational model that will assist the facilitation of learning in such a way that learners will successfully achieve the critical and the specific outcomes of the curriculum.

1.5 Rationale for this study

The future of the dental profession rests on two important academic processes. Academics, on the one hand, have to facilitate the process of learning of novice learners who have to become competent professionals. Learners on the other hand enter the learning environment to acquire and develop the necessary knowledge, skills and attitudes to become professionals that will be lifelong learners maximizing their potential. The rationale for conducting this study is the investigation and implementation of an educational model that can foster learning facilitation and learning per se in the study unit of Toothmorphology while accommodating the paradigm of OBE.

1.6 Formulation of the research hypotheses

The following research hypotheses have been formulated for this study:

♦ A whole brain approach enables the facilitator of learning to create a learning environment that empowers learners to maximize their potential.

♦ Whole brain learning accommodates and develops the expectations learners have about learning and thus makes learning more enjoyable, effective and productive.

The hypotheses will be investigated by means of a literature study, qualitative observation, statistical analysis of learner performances and qualitative assessment via questionnaires.

1.7   Research methodology

The research for this study includes a literature study, empirical research and action research.

1.7.1. The literature study will investigate the following:

♦ The SAQA Act (1995) and outcomes-based education (OBE).

♦ Different strategies for effective learning facilitation.

♦ Available learning style models.

♦ The research by Sperry and MacLean.

♦ The Metaphoric Four Quadrant Whole Brain Model.

1.7.2. An empirical research study will be done on the use of the Herrmann Brain Dominance Instrument (HBDI) and the Metaphoric Four Quadrant Whole Brain Model to facilitate learning of a BChD III group of learners in the study unit of Toothmorphology. This research will include the following:

♦ Qualitative observation (directly and indirectly through the use of personal notes, video-recordings and photography).

♦ Determining and describing the learners' preferred modes of learning (quantitative research).

♦ Comparing the learners' M-scores (matriculation results) with their preferred modes of thinking via the HBDI (quantitative research).

♦ Statistical analysis and description of the results of questionnaires learners have completed on the quality of their own learning and the process of facilitating learning that is used during learning opportunities (quantitative research).

◆ Statistical analysis and description of the learners' scores in three tests (quantitative research).

1.7.3. Action research is used as part of this study to evaluate the educational strategy of the study unit of Toothmorphology critically in order to identify problems and to improve its teaching practice on an ongoing basis.

1.8   Terminology

Action research

A collaborative, critical inquiry by the academics themselves (rather than expert educational researchers) into their own teaching practice, into problems of students learning and into curriculum problems (Zuber-Skerritt, 1992:1-2).

Assessment

Assessment is a strategy for measuring knowledge, behaviour or performance, values or attitudes (Van der Horst and McDonald, 1997:169).

Cognition

Cognition is the mechanism by which the brain acquires, processes, and uses knowledge.

Cognitive domain

The cognitive domain includes learning outcomes that relate to the head or intellect, such as memory, understanding and reasoning (Van der Horst and McDonald, 1997:37).

Commisurotomy

Commisurotomy is a procedure whereby the corpus callosum, a structure in the brain that connects the left and right hemispheres of the brain, is surgically split in two.

Competency

Competency is the term that comprises knowledge, skill and ability, and relates to the application of that knowledge and skill within an occupation or industry level to the standard of performance required in employment (SAQA, 1997).

Co-operative learning

Co-operative learning manifests when learners in small groups cooperate to learn with a deliberate attempt to maximize their human potential (Slabbert, 1997:175).

Co-operative learning involves working together to accomplish shared goals, using skills that benefit each group member (Singhanayok and Hooper, 1998:18).

For the purpose of this dissertation co-operative learning implies that learners use group work to maximize their potential.

Corpus callosum

The corpus callosum is a thick band of nerve fibers that connects the left and right sides of the brain (Herrmann, 1995:10).

Creativity

Creativity is a personal interaction with an idea, with material, or with a problem. It is a process that requires sequences and activities unique to the individual and that results in a product, an acquired skill, or a modified behaviour (Steinaker and Bell, 1979:91).

For the purpose of this dissertation creativity implies that a learner uses unusually innovative thinking and understanding to solve problems or perform tasks.

Critical thinking

Critical thinking refers to thinking at a high level of complexity where thought processes such as understanding, analysis, synthesis, application and evaluation are involved. Critical thinking includes more than just the intellectual domain of human functioning as it is supported by other domains, such as the emotional domain (SAQA, 1997:217).

Critical thinking is a logical process of interaction and of making choices with given sets of variables and manifests itself taxonomically as the process of interaction and of making choices develops (Steinaker and Bell, 1979:96).

Curriculum

The curriculum is the total structure of ideas and educational experiences making up any one educational system or its component parts. It includes the following:

◆ Decisions on the structure of the entire learning programme.
◆ The formulation of outcomes.
◆ Decisions on the content to be included.
◆ The strategies for facilitating learning and methods to be used.
◆ Choice of media.
◆ Assessment techniques.
◆ Evaluation (adapted from SAQA, 1997:36).

Deep learning

The deep approach to learning involves an active attempt by the student to understand the instructor's intended meaning and to relate the ideas presented in the classroom to the student's prior experiences and knowledge (Hendricson, Berlocher and Herbert, 1987:175).

For the purpose of this study deep learning occurs when a learner is actively using existing knowledge to create meaning of new information thereby altering his or her knowledge of the content.

Evaluate

To evaluate means to give one's own opinion about a topic, using certain standards as a basis (Van der Horst and McDonald, 1997:180).

Evaluation

Evaluation is the process of making a decision about the learning of the learner, using information gained from formal and informal assessment (Van der Horst and McDonald, 1997:169).

Facilitator of learning

For the purpose of this study the facilitator of learning is the lecturer that is responsible for guiding the instructional and learning processes.

Facilitating learning

Facilitating learning is a deliberate, conscious intervention in the life of a human being caused by activating learning through challenging obstacles which necessitate exploration into the unknown and by ensuring the continuation of that learning which results in maximizing the potential of the human through conquering the obstacles (Slabbert, 1997:31).

Formative assessment

Formative assessment helps learners to improve their performance, maximize their learning and reflect on and improve their own learning – it forms and shapes learning (Van der Horst and McDonald, 1997:168).

Hemispheric dominance

Hemispheric dominance refers to the degree to which each brain hemisphere tends to assume control of information processing and behaviour when given a chance to do so (Hellige, 1993:15).

Learning

Learning is the acquisition of new memories (Bridgeman, 1988:365).

Learning is the relative permanent change in an individual's attitude or behaviour that occurs as a result of repeated experience (Simms and Simms, 1995:2).

Learning is defined by the APA Division 15 Committee on Learner-centred Teacher Education for the 21st Century (1995), adapted from Gourgey (1998:81), as a process of creating meaningful representations of knowledge through internally mediated processes including self-awareness, self-questioning, self-monitoring, and self-regulation.

For the purpose of this dissertation learning is a lifelong process of change that is driven by the continuous integrated input and practice of knowledge, skills and attitudes to satisfy the demands of the future.

Learning programme

A learning programme consists of courses or units of learning, learning materials combined with a methodology, by which learners can achieve agreed-upon learning outcomes (SAQA, 1997:37).

Learning style

Learning style refers to an individual's characteristic mode of gaining, processing, and storing information during an educational experience (Carrier, Newell and Lange, 1982:652).

Learning theory

For the purpose of this dissertation learning theory is described as the effort by researchers to explain the process of learning and the learner.

Lifelong learning

Lifelong learning is a term that is associated with the continuous process of continually discovering one's own potential to fulfil our purpose in life as long as we live (Slabbert, 1997:29).

Meaningful learning

Meaningful learning is learning which can be related to existing aspects of the learner's conceptual structure (Lovell, 1980:161).

Memory

Memory is the human ability to access information in the brain that was experienced or stored previously; memory has been described as a link to the past (Beitz, 1996:164).

Metacognition

Metacognition is the intra-personal communication process by which individuals know their personal cognitive processes and the use of critical thinking (Beitz, 1996:164).

Metacognitive knowledge

This comprises three types of knowledge, namely *self-knowledge*, *task knowledge* and *strategy knowledge* and refers to a learner's cognitive ability and skill to use these during learning.

Metalearning

Metalearning is the process of knowing one's personal learning behaviours (Beitz, 1996:159).

M-Score

The M-Score comprises the allocation of different numerical values to the symbols attained in matriculation subjects, depending on whether the subject was passed at Higher Grade or at Standard Grade by the candidate (Van Dyk, 1992).

Outcomes

Outcomes are the results of learning processes. It may include formal or informal learning activities and refers to knowledge, skills, attitudes and values that are learnt within particular contexts. The outcomes are what the

learners should be able to demonstrate to show that they understand and are able to apply the content (SAQA, 1997:4).

Paradigm

A paradigm is a basic way of perceiving, thinking, and doing - associated with a particular vision of reality. It can be classified as a framework of thought (SAQA, 1997:217).

Problem solving

Problem solving is the process through which the learner draws upon his repertoire of previously learned responses to find a solution to a new problem (Lovell, 1980:162).

Rote-learning

Rote learning occurs when material is learned by heart in a parrot fashion without it being related in any meaningful way to the learner's existing conceptual structures (Lovell, 1980:163).

Surface learning

The surface approach to learning is characterized by a tendency to memorize discreet facts, to be anxiously aware of the need to reproduce this information during a test, and to view any particular learning tasks in isolation from all other course work and from other events in the student's academic life (Hendricson et al., 1987:175).

1.9   Outlining of chapters

Chapter 1:   Chapter 1 introduces and justifies the study describing the role of the study unit of Toothmorphology in the BChD curriculum of the School of Dentistry at the University of Pretoria, stating the problem it investigates, formulating a research hypothesis and outlining the research methodology of the study.

Chapter 2: This chapter discusses outcomes-based education and describes the roles of the learner and the facilitator of learning. Effective strategies to facilitate learning including co-operative learning, meta-learning, theories of learning and learning styles are discussed. It includes an evaluation of different learning style models and outlines the reasons for using the Whole Brain Teaching and Learning Model as part of this dissertation.

Chapter 3: This chapter discusses traditional instruction in the study unit of Toothmorphology as well as facilitating learning using the Whole Brain Teaching and Learning Model. Diverse teaching interventions that were planned and implemented during learning sessions to accommodate and develop the learners in the group are discussed. This study also includes the use of action research as part of this study.

Chapter 4: In this chapter the results and statistics of the empirical research of this study are described and discussed. This includes the HBDI profile of the group, test scores during the study and the learners' M-Score. The chapter also describes the feedback from the learners after receiving instruction via the Whole Brain Teaching and Learning Model. Finally it reports on learner assignments and projects that were completed as part of the learning outcomes for this study.

Chapter 5: In this chapter the results and findings of the study are summarized and the importance of diversity during the facilitation of learning is illuminated. In this chapter the implementation of the Whole Brain Teaching and Learning Model in facilitating learning in dentistry is justified. The chapter also discusses the relevance of this model in the development of the critical and developmental outcomes of the learners, thus accommodating the new paradigm of learning in South Africa. This chapter concludes with the findings of this study and recommends further areas of research.