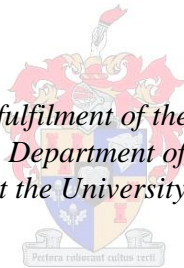


Aligning clinical assessment practices with the Prosthetic curriculum

by
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Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the owner of the copyright thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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Summary

Removable Prosthetic Dentistry (PRO400) is a fourth year module of the undergraduate dentistry programme which consists of a large clinical component. After reviewing relevant literature and conducting module evaluations, clinical tests were introduced and implemented in 2008 as an additional clinical assessment method. The intention of introducing the clinical tests was an attempt to ensure that students were assessed fairly, that their theoretical knowledge and the ability to apply it clinically were properly assessed, and to provide feedback on their clinical performance.

The purpose of this concurrent mixed methods study was to compare the relationship between the students' performance in the clinical tests and daily clinical grades with their theoretical performance in the PRO400 module. The second part of the study explored the academic staff's perceptions of the clinical test as clinical assessment tool in the PRO400 module.

The case study design enabled the researcher to explore the question at hand in considerable depth. The mixed methods approach was useful to capture the best of both the qualitative and quantitative approaches. For the quantitative data-collection, record reviews of the results of fourth-year dental students' who completed the PRO400 module at the end of 2007 were used, and included 110 students. For the qualitative component three full-time lecturers within the Prosthetic department were interviewed.

The clinical test marks and clinical session marks of all the students (n=109) in PRO400 were compared to their theory mark of that year. The tests marks were entered into a spreadsheet in Microsoft Excel and the data analysis was done with the assistance of a statistician.

The analytical abstraction method was used to assist with the qualitative data analysis; first the basic level of analysis was done in the narrative form, followed by second higher level of data analysis. The basic and higher levels of analysis were discussed under the following themes: clinical tests, student performances, alignment of theory and clinical assessment and personal influence on supervisors' assessment practices and attitude. Role-taking and the supervisors' perceptions and concerns regarding the students were explored as emergent themes.

The quantitative findings were displayed using tables and graphs. Forty five students' clinical marks were 10% higher than their theory mark, while only 8 students' theory marks were 10% higher than their clinical test mark. There appeared to be hardly any relationship between the students' clinical daily grade assessment marks and their theory marks. The average theory mark was 47%, the average clinical test marks were 55% and the average daily clinical grade was 63%. Integration of the data obtained from the different data collection methods was done at the level of data interpretation.

The clinical test as an assessment tool is well accepted by the supervisors and they agreed that it is more reliable and accurate than the clinical daily grade assessment method. The quantitative findings relate well to other reported studies that concluded that the daily grade was poorly correlated with the competency exams (a similar phenomenon in the clinical test of the PRO400 module). From the findings of this study it appeared that there is a better correlation of the clinical test mark and the theory mark, than clinical daily mark and the theory mark. This finding related well with the lecturers' views that the clinical tests were more reliable as a clinical assessment tool than the daily clinical mark.

Opsomming

“Removable Prosthetic Dentistry (PRO400)” is ’n vierdejaar-module in die voorgraadse tandheelkundeprogram wat ’n groot kliniese komponent bevat. Ná ’n oorsig gedoen is van die relevante literatuur, en nadat die module-evaluering afgehandel is, is kliniese toetse in 2008 ingevoer en geïmplementeer as ’n bykomende metode van kliniese assessering. Die kliniese toetse is ingestel in ’n poging om te verseker dat studente se teoretiese kennis en hul vermoë om dit klinies toe te pas op ’n regverdigde wyse geassesseer word en om terugvoer te kan gee oor die studente se kliniese prestasie.

Die doel van hierdie studie, waarin gelyktydige gemengde metodes gebruik is, was om die verband tussen die studente se prestasie in die kliniese toetse, asook hul daaglikse kliniese punte en hul teoretiese prestasie in die PRO400-module vas te stel. Die tweede deel van die studie het ondersoek ingestel na die akademiese personeel se persepsies van die kliniese toets as ’n instrument vir kliniese assessering in die PRO400-module.

’n Dwarssnit-gevallestudie-ontwerp is gebruik en ’n gemengdemetode-benadering was nuttig om sowel kwalitatiewe as kwantitatiewe data in te samel. Vir die kwantitatiewe data-insamelingverslae is die uitslae van 109 vierdejaar-tandheelkundestudente in die PRO400-module aan die einde van 2007 gebruik. Vir die kwalitatiewe data-insameling is onderhoude gevoer met drie voltydse dosente in die Prostetiese Tandheelkunde-departement.

Die kliniese toetspunte en die kliniese sessiepunte van al die studente (n=109) in die PRO400-module is met hul teoriepunte van daardie jaar vergelyk. Die toetspunte is op ’n sigblad in Microsoft Excel ingevoer en die data-analise is met die hulp van ’n statistikus gedoen.

Die analitiese abstraksiemetode is vir die analise van die kwalitatiewe data gebruik. Die basiese vlak van data-analise in die narratiewe vorm is eerste gedoen. Dit is gevolg deur ’n tweede, hoërvlak-data-analise. Die basiese en hoër vlakke van analise is onder die volgende temas bespreek: kliniese toetse, studenteprestasie, ooreenstemming van teorie en kliniese assessering, en persoonlike invloed op studieleiers se assesseringspraktyke en houding. Rol-aanneming en die studieleiers se persepsies, asook kwessies rakende die studente is as ontluikende temas ondersoek.

Die resultate van hierdie studie het aangetoon dat die kliniese punte van 45 studente 10% hoër was as hul teoriepunte, en dat slegs agt studente se teoriepunte 10% hoër as hul kliniese toetspunte was. Dit het geblyk dat daar feitlik geen verband was tussen die studente se kliniese daaglikse assesseringspunte en hul teoriepunte nie. Die gemiddelde teoriepunt was 47%, die gemiddelde kliniese toetspunt was 55% en die gemiddelde daaglikse kliniese punt was 63%. Al die studieleiers het die kliniese toets as assesseringsinstrument goed aanvaar en hulle het saamgestem dat dit meer betroubaar en akkuraat is as die daaglikse kliniese assesseringsmetode.

Die kwantitatiewe bevindings hou goed verband met dié van soortgelyke studies waarin daar bevind is dat die daaglikse prestasie swak gekorreleer het met die bevoegdheidseksamen (’n soortgelyke beginsel as die kliniese toets van die Pro400). Dit het ook uit die bevindings van hierdie navorsing geblyk dat daar ’n beter korrelasie is tussen die kliniese toetspunt en die teoriepunt as tussen die daaglikse kliniese punt en die teoriepunt. Hierdie bevinding het ’n duidelike verband getoon met die dosente se siening dat die kliniese toets as ’n kliniese assesseringsinstrument meer betroubaar is as die daaglikse kliniese punt in die PRO400-module in die Tandheelkunde-program.

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This research has been a personal journey for me, as I was venturing out of my health science background into education. During this process there were people who supported and guided me to whom I shall always be grateful. Firstly I wish to thank my supervisor Prof. Eli Bitzer for his patience, and my friend and colleague Saadika Khan for her support and inspiration.

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CHAPTER 1: ORIENTATION TO THE STUDY

1.1 Introduction

Chapter 1 describes the background to this study. It aims to provide a clear understanding of the context in which this study was conducted. The motivation of the study is explained, followed by the description of the research problem. The aims of the study and the research methodology, including the data collection and analysis, are briefly discussed. The chapter concludes with the ethical consideration of this study and provides the outlines of the rest of the thesis.

1.2 Background to the study

Among the many challenges facing modern dental schools, one of the most prominent is the development of appropriate assessment systems (Tennant and Scriva, 2000:125). This also applies to the University of the Western Cape (UWC). Prosthetic Dentistry at UWC is one of the year modules in the fourth year of the undergraduate dentistry programme with a large clinical component. A major component involves regular assessment of the students' clinical management of patients. Dental students are required to develop the knowledge, skills and attitudes necessary to equip them to be competent, independent practitioners at the point of graduation (Manogue, Brown and Foster, 2001:364).

The three broad purposes of assessment according to Pellegrino, Chudowsky and Glaser (2003:1) are: to assist learning, to measure individual achievement and to evaluate programmes. Besides the attainment of a clinical mark, the clinical assessment serves to identify weaker students so that interventions can be implemented, and also to provide the student with a tool to measure their progress. For this reason the students' clinical grade in Prosthetic Dentistry (PRO400) at UWC is given to provide a record of the students' ability and progress, and also to provide feedback on their performance. According to the outcomes of this Prosthetic module the clinical assessment of the students includes theoretical knowledge, clinical skills and the ability to apply their theoretical knowledge. Due to large student numbers and part-time clinical supervisors, clinical assessment is difficult to control and implement. Assumptions are made that all clinical supervisors assess theoretical knowledge and its clinical application. However, from personal observations, this is not applicable to all members of staff.

From 2007 onwards the outcomes of the PRO400 were modified in an attempt to be more specific and relevant, while the content was divided into appropriate themes. Similar to what Gravette and Geyser (2004) described regarding the reaction of some universities when called upon to develop outcome-based programmes, the same problem occurred in the planning of PRO400: knowledge was reorganised and repackaged, but no significant shift towards an integrated outcome-based module could be detected. Disparity between the module outcomes, what was taught and what was assessed, was observed. Staff development at this time was focused on teaching strategies and theory assessment methods to ensure alignment of the outcomes, teaching strategies and assessment of all the modules. This training resulted in the PRO400 module being „reshaped’ in order to create an environment to promote student learning. Teaching strategies such as case-discussions, tutorials, small group work (during lectures) were introduced to encourage students to achieve the intended outcomes of this module by actively engaging with the content. Students construct meaning from what they do in order to learn (Biggs, 1999). The next step was to ensure that the assessment was aligned with the outcomes by the input of internal moderating. Lecturers within the department assisted with this process by ensuring that the questions asked in the OSCE’s and written papers were relevant and aligned with the outcomes of the module.

However, after departmental evaluation at the end of 2007, it was highlighted that there was not sufficient alignment between the students’ clinical performance and their theoretical performance. Most of the students’ clinical marks were higher than their theory marks. Students must be able to analyse and apply the acquired theory in order to diagnose and treat each patient successfully. The „discrepancy’ in the PRO400 was that although the clinical assessment method was aligned with the outcomes in the module guide, this alignment did not occur in practice. The assessment of the theory in this module was aligned with the outcomes and the teaching strategies, but the clinical assessment was neglected. Supervisors focused mostly on the practical procedures, thereby neglecting both actual clinical teaching and assisting the student to relate their theory to the clinical procedures. Henzi, Davis and Hendrickson (2006) concluded that although daily clinical observations of dental students was one of the primary forms of assessing students’ learning, the faculty perceived that these assessment methods were not particularly valuable to student development. All methods of assessment have strengths and intrinsic flaws, therefore the use of multiple observations and several different assessment methods over time can partially compensate for flaws in any one (Epstein, 2007). After reviewing the relevant literature and departmental discussions, clinical tests were introduced as an additional clinical

assessment method. The intention of introducing the clinical tests was an attempt to ensure that all students were assessed fairly, theoretical knowledge was included in the assessments, and to identify weaker students.

The purpose of this concurrent mixed methods study was to compare the relationship between the students' performance in the clinical tests and their daily clinical marks with their theoretical performance in the PRO400 module. The second part of the study explored the academic staff's perceptions of the clinical test as a clinical assessment tool in the Pro400 module.

1.3 Motivation

As a coordinator of the (PRO400) module, my responsibilities include mark administration and module evaluation. In 2007 the students' failure rate in this module was high compared with that of previous years, therefore I reviewed the different module assessment methods. There was little and sometimes no relation between the clinical mark that students obtained and their theoretical performance in tests and examinations. In most instances their clinical year mark (the average mark that a student obtains during the clinical sessions) was higher than their theoretical mark. Some students passed this fourth year module without passing any of the theoretical components such as tests and an examination. This would contribute to the training of dental students merely as "technicians" and not as good clinicians with the ability to reason and solve problems clinical situations. As clinical reasoning is one of the competencies that dentists require to succeed, the student needs to combine their theoretical knowledge with clinical skills. By aligning the clinical performance and the theoretical performance the students would be able to treat their patients competently. According to Biggs (2002) teaching and learning take place in a whole system, embracing classroom, department and institutional levels. In a poor system, the components (curriculum, teaching and assessment tasks) are not necessarily integrated and tuned to support learning, so that only "academic" students spontaneously use higher-order learning processes.

The Prosthetic department involved with the clinical tests would benefit from applying a more reliable clinical assessment method, which includes assessment of the students' theoretical knowledge and insight. Students would benefit by this assessment, because they would be required to integrate their clinical skills with their acquired theory, thereby fulfilling the clinical outcomes. The advantage of this form of assessment is that it involves authentic clinical procedures on real patients which are commonplace in the dental undergraduate curriculum, thereby encouraging learning "in context" (Macluskey *et al.*, 2004). It is also important to reflect

the best practice and innovation in education to satisfy the learning needs of students, while recognising the roles of and support issues for academic staff (Plasschaert *et al.*, 2007).

1.4 Description of the research problem

One of the main outcomes of PRO400 is to ensure that the students are clinically competent in certain procedures. Competence in dentistry involves assessment of the students' knowledge, practical skills and attitude (Macluskey *et al.*, 2004). A student needs to meet a minimum set of requirements regarding clinical procedures as set out in their study guide, while obtaining a fifty percent clinical mark to qualify for the final examination. The final promotion mark comprises a sixty percent clinical mark and forty percent theoretical performance mark (examination and tests). The clinical mark is obtained by means of continuous clinical assessments throughout the year. The clinical assessment tool is graded according to percentages linked to certain clinical competencies. Guidelines for the clinical supervisor (clinician responsible for the clinical assessment of students) are clearly set out in the module study guide. Assessment of the students' theoretical knowledge form part of the clinical assessment process as well. The theoretical knowledge is taught to the students in formal lectures, tutorials, block courses and assignments. Students need to apply their theoretical knowledge clinically in order to treat their patients comprehensively.

Students practice in a clinical context run by general practitioners, assisted by clinicians with expertise in particular procedures. This clinical context provides students with the opportunity to treat patients as if they were in a general dental practice setting. Irrespective of the clinic, students are required to draw up a comprehensive treatment plan for the patient in whose case they address all the needs of the patient in a holistic manner. Clinical skills are assessed on a continuous basis, by the inspection of each step of the work performed (daily grade). Students are allocated to clinical supervisors using an average of six to seven students per staff ratio. The clinical supervisor is responsible for these students, each of them treating their own patients in a session of two hours. Different stages of the clinical procedures have to be assessed by the supervisor for the student to proceed and complete this procedure. The supervisor observes the students' interactions with patients and inspects the process and outcomes of the dental (prosthetic) treatment.

As a module coordinator, it not possible to supervise all the students in this year of study; therefore one is dependent on other staff to assess the students. Some of the problems associated

with the clinical assessment method used, are that there was no correlation between the students' clinical competency and their theoretical knowledge; inconsistent methods of assessment with different supervisors; and varied clinical marks allocated to students by supervisors. Faulty assumptions and practices about assessment do more damage than any other single factor. Students learn what they think they'll be assessed on, not what's in the curriculum (Biggs, 2002).

Module evaluation is done annually and includes feedback from the students through questionnaires and data (results) from the student assessments. Evaluation is an essential part of the educational process. According to Morrison, (2003) the purpose of evaluation is to: ensure teaching is meeting students' learning needs, identify areas where teaching can be improved, inform the allocation of faculty resources, provide feedback and encouragement for teachers, identify and articulate what is valued by medical schools and facilitate development of the curriculum. The purpose of the module evaluation of the Pro400 was to improve teaching and to facilitate curriculum development. Evaluation may involve subjective and objective measures, and qualitative and quantitative approaches (Morrison, 2003). Information from the student assessment as method of module evaluation was used; it is useful for establishing whether students have indeed achieved the learning outcomes.

After a departmental evaluation of the module at the end of 2007 the clinical assessment method was modified. The challenge faced in the continuous assessment of clinical disciplines includes the relatively subjective nature of the clinical process and the individual variation between assessors (Macluskey *et al.*, 2004; Tennant and Scriva, 2000). Macluskey *et al.*, (2004) concluded that continuous clinical assessment can fail to identify those students who are underperforming, allowing them to continue without developing a reasonable level of competence or self-confidence. For this reason clinical tests were introduced in 2008 for all the fourth-year students. Formal feedback to the students was included in the clinical examination and the expectations, criteria and format were discussed with all the students. Well defined outcomes and competences are known to the assessors and the students. These criteria were made available to the students and assessors before the implementation of the clinical tests. Informing students of the standards (learning outcomes) and criteria by which performance will be judged was intended to help students develop the confidence to take greater responsibility for their own development and personal progress. According to Harden (1979) the student should be encouraged to accept some responsibility for assessing his/her own competence. These clinical tests were performed by full-time prosthetic staff members who are familiar with the clinical

assessment requirements, formal weightings to be allocated for each procedure and theoretical knowledge to be assessed with regard to each procedure. To ensure that this assessment method is reliable, three clinical examinations for each student would be conducted during the course of the year, thereby giving all the students frequent opportunities to demonstrate their level of performance. Reliability, consistency of the marking and fairness are ensured by involving two examiners for each assessment. The new clinical tests were administered by two full-time prosthetic staff members. To improve the reliability of the clinical assessment the examiners are usually paired, and each examiner should mark the student independently before conferring with each other (Harden, 1979:291).

1.5 Description of the students

The students involved in the research were in their fourth year of study at UWC. Their results in the PRO400 module were included in this study. It is a diverse group in terms of race, language, cultural background, religion, student ability and motivation. This group of students also included students from other African countries. About 90 percent of the students were young adults and the rest were adult learners with previous learning experience.

1.6 Description of the participants

The full-time supervisors are academics at the UWC Faculty of Dentistry. The scope of their qualifications includes general dentists, clinical assistants (dentists training as specialists) and specialists – all within the Prosthetic department. Their clinical and teaching experience within the faculty varies from two years to twenty years. In this department ninety percent of the staff is female. The part-time supervisors are mostly private practitioners with clinical experience varying from three to thirty years.

1.7 The aim of the study

The aim of the study is to improve on the validity and reliability of the clinical assessment in the Prosthetics 400 module.

1.8 Research question

Following the description of the research problem, students and participants, the primary research question was as follows:

Are the clinical tests aligned with the daily clinical performance and theoretical performance in the Prosthetics 400 module?

1.8.1 Primary research question

The primary research question was as follows:

Are the clinical tests aligned with the daily clinical performance in the Prosthetic 400 module?

1.8.2 Secondary aim

The secondary research questions were as follows:

- What is the prosthetic academic staff's view of the clinical tests and the alignment with the daily clinical and theoretical performance in examinations and tests?
- How does the clinical test mark and the daily clinical mark correlate with theoretical performance in examinations and tests?

1.9 Research methodology

The main purpose of this research was to compare the relationship between the students' performance in the clinical tests and their daily clinical marks. The secondary aims of the research were to explore the academic staff's perceptions of the clinical test as a clinical assessment tool, as well as to correlate the clinical tests and daily clinical marks with the students' theoretical performance in the PRO400 module. The research methodology was aimed at enabling the researcher to achieve the primary and secondary aims of this research. Firstly the research design, followed by the research approach, was briefly described. The second part of the research methodology described the study participants, data collection and data analysis. This research methodology concludes with a brief description of the ethical considerations. In Chapter Three the research methodology is described and discussed in more detail.

1.9.1 Research design

A case study design was used. This type of design enables researchers to gain in-depth understanding of the situation and meaning for those involved (Merriam, 1998:19). According to Darke, Shanks and Broadbent (1998) single cases allow researchers to investigate phenomena in depth to provide rich description and understanding. The clinical tests were a clinical education innovation and case study design has proven to be particularly useful for studying educational innovation as well (Merriam, 1998:38). For this research a case study design enabled the researcher to gain in-depth understanding of the situation.

1.9.2 Research approach

This study followed a mixed methods approach conducted within a pragmatic paradigm. Mixed methods approaches are followed where data collection also involves gathering quantitative and qualitative information. The mixed methods approach was useful to capture the best of both qualitative and quantitative approaches and this combination was valuable to gain deeper insights than either method alone (Creswell, 2003).

1.9.3 Study participants

Three full-time lecturers within the Prosthetic department were selected to participate in this study. The selection criteria were that they should have participated as examiners during the clinical tests in the PRO400 clinical module. Record reviews of the results of fourth year dental students' PRO400 module at the end of 2007 were used. There were 110 students in the class, but one student was excluded from the study because she had suspended her studies.

1.9.4 Data collection

Record reviews and interviews were used for the data collection. Participants in this research included the prosthetic staff members that participated in the prosthetic clinical tests. Interviews are one of the most important sources of case study information (Tellis, 1997). Open-ended interviews were used; the participants were asked to comment about certain events. In this study, interviews with the three lecturers were conducted by the researcher to obtain the qualitative data. The questions were grouped together in predetermined themes. Some of the limitations of interviews as a data collection method in this study could have been that the researcher conducted the interview and that the participants were not equally articulate and perceptive. For the quantitative data the students' theoretical performance marks and clinical mark were collected from the records of the final results of the PRO400 module towards the end of the module.

1.9.5 Data analysis

The analytical abstraction method (Crafford and Bitzer, 2009) was used to assist with the qualitative data analysis. First the basic level of data analysis was done in the narrative form, followed by second higher level of data analysis. The basic and higher level of analysis were discussed under the following themes: clinical tests, student performances, alignment of theory and clinical assessment, and personal influence on supervisors' assessment practices and attitudes. The data analysis of the quantitative data was done with the assistance of a statistician,

using basic descriptive statistics in the Microsoft Excel programme. Parametric tests, measures of variation and measures of average were applied to the quantitative data. The quantitative data were displayed in graphs and a table.

1.10 Ethical considerations

Participants were given the choice to participate in the study, and their written consent was obtained for the data collected to be used for the sole purpose of research. Anonymity was respected and assured. An ethical clearance was granted by the Ethical Committee of the Stellenbosch University. Ethical clearance was also obtained from the Research Committee at UWC Dental Faculty.

1.11 Outline of the thesis

The first chapter serves as an orientation to the study, and includes the background and the motivation of the study. This was followed by a description of the research problem, research question and the aims. Chapter One concludes with a discussion of the research procedure followed in this study.

Chapter Two consists of the literature review and the development of the theoretical framework, followed by the methodology of the research in Chapter Three. Finally the results are reported in Chapter Four and the conclusions and implications of the findings are discussed in the final chapter.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

“Alignment”, according to the Collins Concise Dictionary (1989:27), means “arrangement in a straight line” or “proper coordination or relation of components”. In an educational context the alignment of a course or curriculum means that the teaching practices, intended learning outcomes and the assessment practices should be aligned.

Constructive alignment forms part of the theoretical framework of this study; therefore relevant literature is discussed. Assessment, and more specifically clinical assessment, was explored, as clinical assessment tools forms an important part of clinical assessments. Key factors that should be included in reliable and valid clinical assessments are: theoretical knowledge and their application thereof, student learning, as well as feedback to students.

In this chapter a review of the relevant literature is reported by discussing constructivism, constructive alignment, assessment, a clinical assessment tool, theoretical knowledge and the concept of feedback. The chapter concludes with a brief review of student learning.

2.2 Constructivism

In the educational literature, constructivism is represented in various terms, e.g. as a theory of learning, teaching, education, cognition, personal knowledge and a world view (Jervis and Jervis, 2005). Constructivism states that learning is an active, contextualised process of constructing knowledge, rather than acquiring it. Knowledge is constructed and based on personal experiences and hypotheses of the environment. Each person has a different interpretation and construction of knowledge process. The learner is not a blank slate, but brings past experiences and cultural factors to a situation (Learning Theories Knowledgebase, 2008). All advocates of constructivism agree that it is the individual’s processing of stimuli from the environment and the resulting cognitive structures that produce adaptive behaviour, rather than the stimuli themselves. John Dewey is often cited as the philosophical founder of this approach. Bruner and Piaget are considered the chief theorists among the cognitive constructionists, while Vygotsky is the major theorist among the social constructionists. Activity theory and situated learning are two examples of modern work based on the work of Vygotsky and some of his followers (Huitt, 2003). A major theme in the theoretical framework of Bruner is that learning is an active process in which learners construct new ideas or concepts based upon their current/past knowledge. The

learner selects and transforms information, constructs hypotheses and make decisions relying on a cognitive structure to do so. Cognitive structure provides meaning and organisation to experiences and allows the individual to go beyond the information given (Learning Theories Knowledgebase, 2008).

Bruner (1966) states that a theory of instruction should address four major aspects: (1) predisposition towards learning, (2) the ways in which a body of knowledge can be structured so that it can be most readily grasped by the learner, (3) the most effective sequences in which to present material, and (4) the nature and pacing of rewards and punishments. Good methods for structuring knowledge should result in simplifying, generating new propositions and increasing the manipulation of information. Advocates of a constructivistic approach suggest that educators first consider the knowledge and experiences that students bring with them to the learning tasks. Advocates of the behavioural approach, on the other hand, advocates first deciding what knowledge or skills students should acquire and then developing curriculum that will provide for development (Huitt, 2003).

In the past, much of constructivism has led to a misplaced emphasis on the amount of face-to-face interaction in contrast to the quality of interactions (including extended and mediated as well as face-to-face interactions). In recent years more attention has been paid to the quality of interaction processes in which students are involved. These studies have shown that learning depends, in part, on the nature of student participation in interaction processes (Terwel, 1999). Constructivism has come to serve as an umbrella for a wide diversity of views (Duffy and Cunninham, 1984). Cobb (cited in Duffy and Cunninham, 1984) attempted to characterise this diversity as representing two major trends that are often grouped together: individual cognitive and sociocultural. The individual cognitive approach emphasises the constructive activity of the individual as he or she tries to make sense of the world. Learning is seen to occur when the learner's expectations are not met, and he or she must resolve the discrepancy between what was expected and what was actually encountered. In contrast, the sociocultural approach emphasises the socially and culturally situated context of cognition (Duffy and Cunninham, 1984). According to Terwel (1999) constructivism undoubtedly has a valuable contribution to make towards curriculum theory and practice. "The Tavistock Report identifies constructivism as a widely favoured approach to teaching, raising questions about the worth and validity of different kinds of knowledge and knowing" (Jervis and Jervis, 2005).

Constructive alignment is based on the twin principles of constructivism in learning and

alignment in teaching (Biggs, 2003). The “constructive” aspect refers to what the learner does, which is to construct meaning through relevant learning activities. The “alignment” aspect refers to what the teacher does, which is to set up a learning environment that supports the learning activities appropriate to achieving the desired learning outcomes (Biggs, 2002).

2.3 Constructive alignment

A good teaching system aligns teaching methods and assessment to the learning activities stated in the learning objectives, in order to ensure that all aspects of this system act in accordance and thereby support appropriate learning. The theory of constructive alignment was developed by John Biggs and has its roots in curriculum theory and constructivism. Constructive alignment represents a systemic theory that regards the total teaching context as a system wherein all contributing factors and stakeholders reside (Brabrand, 2007). To understand the system, one needs to identify and understand the parts of the system, how they interact with one another and affect one another. The theory of constructive alignment provides just that for the teaching system; it provides relevant and prototypical models of the parts that ultimately enable lecturers to predict how the teaching system will react under modification (Brabrand, 2007).

Constructive alignment is the underpinning concept behind the current requirements for programme specification, declarations of Intended Learning Outcome (ILO's) and assessment criteria, as well as the use of criterion-based assessment. There seems to be two parts to constructive alignment: students construct meaning from what they do to learn, and the teacher aligns the planned learning activities with the learning outcomes (see Figure 1) (Houghton and Warren, 2004).

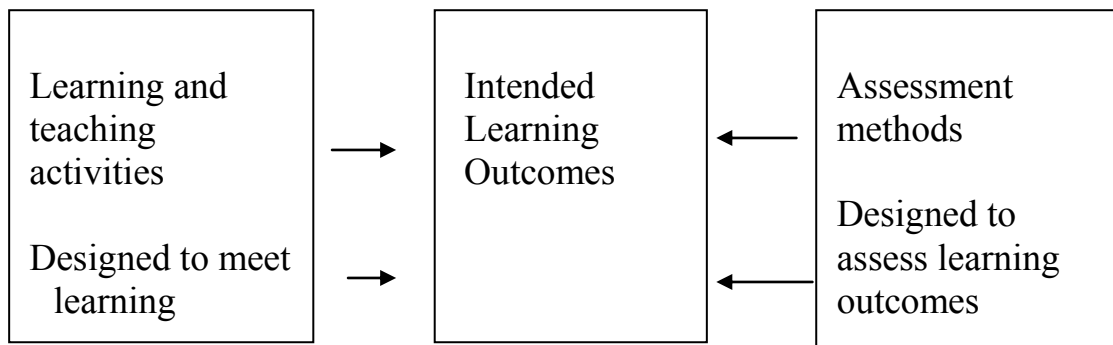


Figure 1. Aligning learning outcomes, learning and teaching activities and the assessment (Houghton and Warren, 2004).

The problem with an unaligned course or programme of learning is that there is usually a mismatch between the learning objectives and the assessment (see Figure 2).

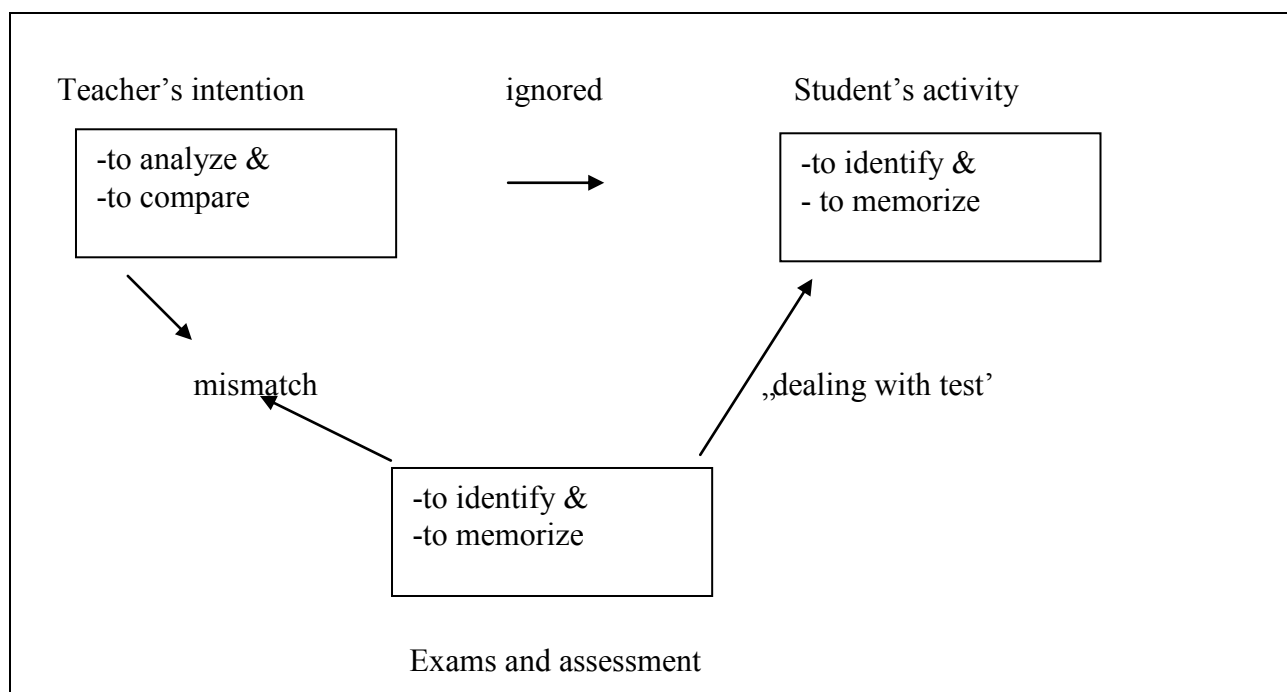


Figure 2: An unaligned course (Brabrand, 2007).

The key to reflecting on the way lecturers teach in higher education is to base their thinking on what they know about how students learn. Learning is constructed as a result of the learner's activities and learning activities that are most appropriate to achieving the curriculum objectives that result in a deep approach to learning (Biggs, 2003). Entwistle, 1993 (cited in Brown and Knight, 1994) identifies four approaches to learning: deep, surface, strategic and apathetic

approaches. The *deep approach* is characterised by the intention to understand the material, which involves relating ideas, re-working the material into a form that makes sense to the learner and drawing upon evidence to test them. Such a learner takes an active interest in his or her work – the model student. The *surface approach* centres on an intention to reproduce the material, and in this sense learning is passive, while memorisation is the prime academic tool. The *strategic approach* involves cue-consciousness. The student wishes to excel, but has decided that the way of excelling varies from course to course, and that the main task is to find out exactly what one is expected to do in order to obtain good grades in the courses. Associated with the strategic approach are good time management and an organised approach to study. The *apathetic approach* is characterised by a lack of interest and a lack of direction of the student (Brown and Knight, 1994). The researcher agrees with Biggs (2003) that the secret to good teaching is to maximise the chances that students will use a deep approach and to minimise the chances that they will use a surface approach. Students generally try to adapt their approach to what they perceive as the requirements of teachers, and particularly the final assessment. If the teaching and assessing is done in a way that encourages a positive working atmosphere, allowing students to make mistakes and learn from them, it would encourage students to adopt a deep approach to learning.

Within the PRO400 module, problem-based learning (PBL) is one of the teaching methods that are practised, and it is particularly common in medical and dental education. PBL reflects the way people learn in real life; they simply get on with solving the problems life puts before them with what resources are at hand (Biggs, 2003). Assessment methods within PBL must measure student achievement in the process of problem dissection, identification of learning objectives, the development of critical thinking skills, as well as later on the application of these skills in problem-solving situations (Albino et al., 2008: 1409); these skills are part of the ILO in PRO400. For this reason it makes sense that teaching and learning activities and assessment methods in the PRO400 module have to be based on the PBL principle.

The 3P model describes teaching as a balanced system in which all components support each other; to work properly all components must be aligned to each other.

The 3P model describes three points in time where learning-related factors are placed:

1-presage (before learning takes place), 2-process (during learning) and 3-product (the outcome of learning) (Biggs, 2003). An imbalance in the system will result in poor teaching and surface

learning. Apart from teachers and students, the critical components include: the curriculum we teach, teaching methods used, assessment procedures used, the climate teachers create, and the institutional climate. Each of these components needs to work towards the common end, deep learning (Biggs, 2003).

Constructivism and constructive alignment were discussed as the underlying concepts in this research. In the next part of the literature review assessment will be discussed in the following order: firstly in the international context, followed by the South African context, assessment in South African Dental Schools, and finally the assessment approaches.

2.4 Assessment

2.4.1 The international context

In the United States of America (USA), the assessment of medical students is largely based on a model that was developed by the Accreditation Council of Graduate Medical Education (ACGME). This model uses six interrelated domains of competence: medical knowledge, patient care, professionalism, communication and interpersonal skills, practice-based learning and improvement and systems-based practice (Epstein, 2007). Plasschaert *et al.*, 2007) define competence as the blend of knowledge, skills and attitudes, appropriate to the individual aspects of the profession. It is usually denoted as the minimum acceptable level of performance for a graduating dentist. Supervising clinicians' observations and impressions of students over a specific period remain the most common tool used to evaluate the performance of students. Although subjectivity can be a problem in the absence of clearly articulated standards, a more important issue is that direct observation of students while they are interacting with patients is also too infrequent (Epstein, 2007). Direct observation or video review, clinical simulations, multisource assessments and portfolios are some of the assessment methods that are used for medical students in USA.

The Association for Dental Education in Europe (ADEE) has the following requirements for assessment procedures and performance criteria (Plasschaert *et al.*, 2007):

- Clearly defined criteria for learning outcomes and assessment should be made in writing and communicated clearly to students and academic staff
- Multiple methods of assessment should be used and multiple samples of performance should be taken
- Both formative and summative assessments should be employed – students should receive feedback on their performance both academically and clinically

- It should be clear how assessments link with content, methods of teaching and learning, outcomes of learning and aims of provision. In other words, there should be demonstrable alignment of appropriate assessment
- Clinical assessments should include an estimate of performance of the dimensions of competence: knowledge, skills, observed behaviours (attitudes) and safety of prospective graduates
- All assessments should have defined criteria and marking or grading schemes that are available to students and staff members
- Tools that promote reflection, critical thinking and continued learning for example self-/ peer-assessment and portfolios should be in place
- Clinical activities should assess the quantity and quality of the performance
- A review of assessment must be in place to ensure the quality of process and its enhancement

In the School of Oral Health Sciences at the University of Western Australia an integrated quantitative and qualitative assessment system was developed and implemented in 1997 (Tennant and Scriva, 2000). According to a review by Tennant and Scriva (2000), this system provides both students and staff with effective data to enhance the learning process. Most importantly, the system has made a huge step forward in providing an equitable assessment scheme that can be applied in clinical disciplines where subjective decisions are often made (Tennant and Scriva, 2000).

2.4.2 Assessment in a South African context

One of the definitions of assessment by the South African Qualifications Authority (SAQA) is that it is about collecting evidence of learners' work so that judgments about learners' achievements or non-achievements can be made and decisions arrived at (Gravett and Geysler, 2004). In South Africa the socio-economic and policy contexts pose enormous challenges for assessment practices in higher education (Gravett and Geysler, 2004). In addition there are numerous pressures on higher education which are threatening the use of formative assessment (Yorke, 2003:483). These pressures include:

- An increasing concern with attainment standards, leading to greater emphasis on the (summative) assessment outcomes
- An increasing student/staff ratios, leading to a decrease in attention being given to individuals

- Curricular structures changing in the direction of greater unitisation, resulting in more frequent assessments of outcomes and less opportunity for formative feedback
- The demands placed on academic staff in addition to teaching, which include the need to be seen as research active, the generation of funding, public service and intra-institutional administration (Yorke, 2003:483)

In addition to these pressures in higher education the student population is becoming increasingly diverse in terms of culture, religion, life experiences and capabilities. Therefore the use of a variety of methods of assessment might assist teachers to address students' diverse backgrounds, learning styles and needs, and might also give students more opportunities to demonstrate their progress (Workshop on OBE, Faculty of Education, 1999). Assessment is now accepted as an integral part of learning, and not as a mere addition to a module (Gravett and Geysler, 2004). In the medical field the use of multiple methods of assessment can address many limitations of individual assessment formats (Epstein, 2007:392). In South Africa the Health Professional Council (HPCSA) specifies guidelines for the content of the dental curriculum and the assessment thereof. Each dental school, however, makes their own decisions about the methods and standard of assessment. This model may have the advantage of ensuring consistency between the curriculum and the assessment, but makes it difficult to compare students across dental schools for the purpose of postgraduate training (Epstein, 2007:393).

2.5 Assessment in South African dental schools

There are four dental schools in South Africa: one in the Western Cape and three in Gauteng. Only one school in Gauteng responded when asked about their assessment methods for the fourth-year undergraduate prosthetic course. At this institution all clinical assessment marks are excluded from the fourth-year prosthetic course, while clinical marks and quotas obtained are used only towards the fifth (final) year. This implies that the theoretical component of the course has a heavy weighting. The clinical assessment method currently used includes quality and quantity approaches to assessment, as well as mechanisms to overcome supervisor subjectivity. Students need to assess themselves before the supervisor grades them, immediate feedback is given and all the procedures are weighted according to complexity.

2.6 Assessment approaches

What and how students learn, depend to a major extent on how they expect to be assessed (Biggs 2003). The reality is that learning, for the most part, does not depend on the teacher's innovative teaching strategies, as student learning is mainly driven by assessment (Biggs, 2003). Methods of assessment influence students' conceptions of learning and their approaches to learning (Manogue, Brown and Foster, 2001:364). It is proposed that if the aim is to change students' learning, the methods of assessment need to be changed (Brown, 1997 cited in Rust, 2005). The purpose of the assessment determines the kind of assessment and the assessment tool. A mismatch between purpose and tool will almost certainly impact negatively on effective learning (Biggs, 2003). This could explain the poor relation between the clinical and theoretical performance of fourth-year students in the Pro400 module at UWC. The clinical assessment tool that was used did not match the aim of the clinical assessments in the PRO400 module. Biggs (2003:141) is emphatic in his statement that surface learning will inevitably be the result if assessments do not reflect the objectives of a curriculum.

Two approaches to assessment underlie current educational practice: the traditional quantitative approach and the qualitative and criterion-referenced approach. The traditional quantitative approach marks student performance and allocates grades, either by arbitrary cut-off points or grade on the curve (norm-reference). Conversely, the score obtained by an individual in the qualitative and criterion-referenced approach reflects how well the individual meets preset criteria (Biggs, 2002). Expressing performances as percentages is assumed to create a universal currency that is equivalent across subject areas and across the student population. This assumption, however, is completely unsustainable, as quantifying assessments results send the wrong message to students. For example: a student can slack on certain areas if he/she is doing well elsewhere. As there is no intrinsic connection between the curriculum and assessment, a student might focus only on what will get him/her through the assessment (Biggs, 2002). Before the introduction of the clinical tests in PRO400 the quantitative approach was used, which encouraged the students to concentrate on the clinical procedures, achieving the required quotas instead of treating their patients in a holistic manner and applying their theoretical knowledge appropriately.

Without sound educational principles it is challenging for any lecturer to reflect on his/her assessment practices. The alignment of educational principles is essential for any good

assessment method. I agree with Pellegrino et al. (2003:1) that educational assessment does not exist in isolation, and that it has to be clearly aligned with the module outcomes and instruction if it is to support learning. Assessment, within an outcomes-based approach, sets out to measure the extent to which learners are able to demonstrate competence in pre-determined outcomes. It is recognised that outcomes-based education might be an appropriate paradigm within which to educate dentists (Berthold, 2002:26). Therefore it is apparent that all assessment programmes should embrace two firm principles. In the first place assessment must reward learners who achieve the intended outcome of a particular course, and secondly it should ensure that those who proceed to the next stage have met the required standards of their previous stage of education (Hays, 2008:24). The degree of congruence between the learning outcomes and the assessment objectives should be evaluated as part of the course quality assurance (Hays, 2008: 24). Assessment represents a critical component of successful education in the skills, knowledge, affective processes and professional values that define competent practice in dentistry (Albino et al., 2008).

The major paradigm shift in assessment is reflected in the changing perceptions about the nature of assessment and its main purposes. Traditional assessments have often targeted a learner's ability to demonstrate the acquisition of knowledge, but new methods are needed to assess a learner's level of understanding within a content area and the organisation of the learner's cognitive structures (Gravett and Geysler, 2004). Norcini and McKinley (2007:240) added educational effect, feasibility and acceptability (as factors for purposes of assessment) to validity and reliability when they discussed the methods of assessment utilised in medical education. The educational effect of assessment capitalises on students' motivation to perform well and directs their study efforts in support of the curriculum. Feasibility is the degree to which the selected assessment method is affordable and efficient for testing purposes, implying that the costs of assessment need to be reasonable. Acceptability is the extent to which stakeholders in the process (students, patients and staff) endorse the measure and the interpretation of scores (Norcini and McKinley, 2007:240).

In the medical field the use of multiple methods of assessment can help role players to overcome many limitations of individual assessment formats (Epstein, 2007:392). Race (2007) also argues that the wider the diversity in the methods of assessment, the fairer the assessment should be to all students; the art of assessing therefore needs to embrace a variation of activities. Ultimately, the goal of assessment in education within the health professions is to determine students'

capacity to integrate and implement the various domains of learning that collectively define competent practice, over an extended period of time, with day-to-day consistency in a work environment that approximates the actual work setting where health care providers interact with patients (Albino et al., 2008). Using Miller’s Pyramid (see Figure 3), Albino et al. (2008:1416) used examples of assessment techniques in medical education, referring to how the student could be assessed on these different levels of the pyramid.

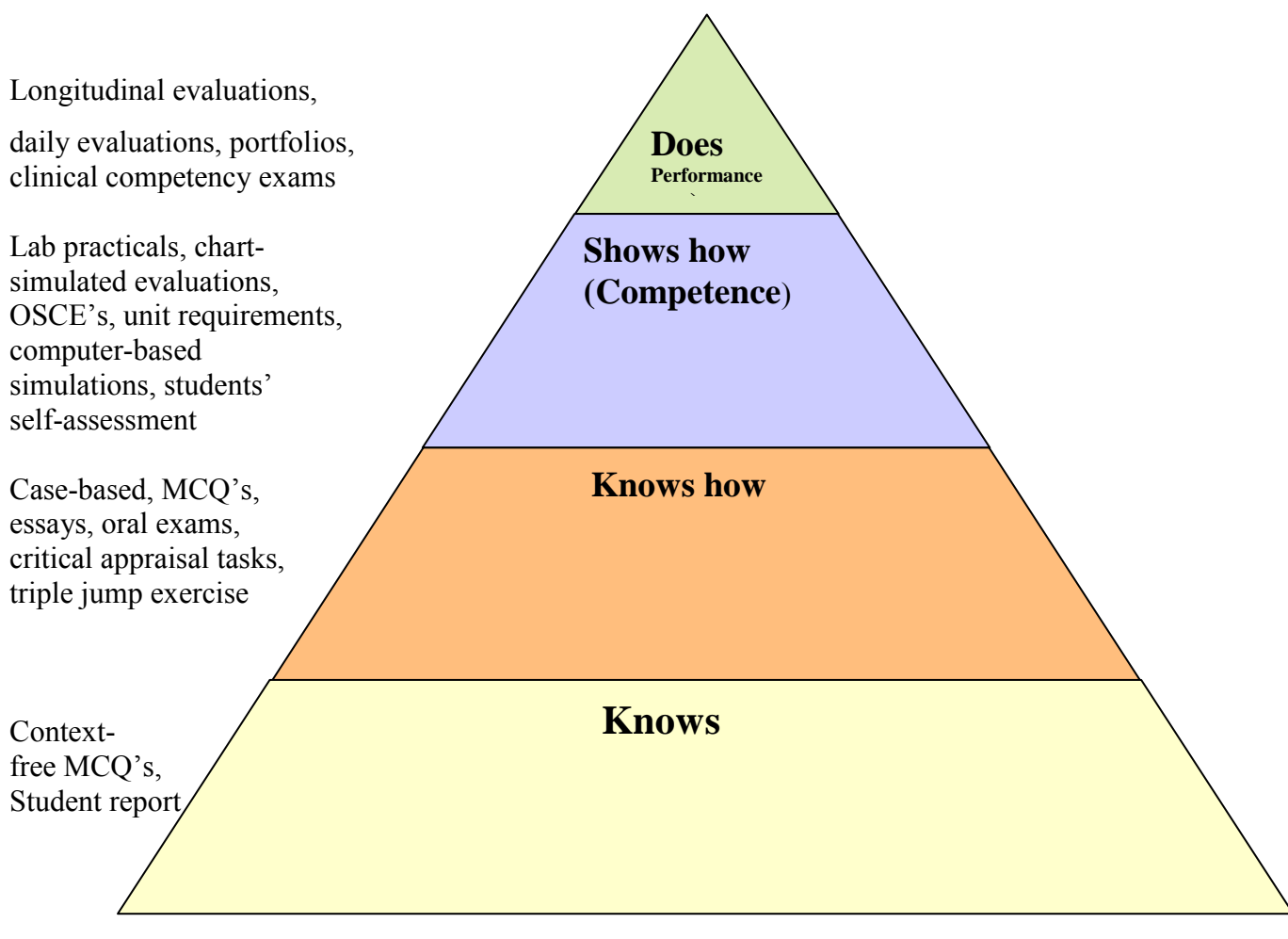


Figure 3: Miller’s pyramid of Professional Competence with examples of assessment techniques used in medical education (Albino *et al.*, 2008:1416)

At the „does’ level, the student is expected to execute the core tasks and responsibilities of a healthcare provider in “real” or very realistic working conditions, with limited instructors’ support over an extended period of time. The aim is to determine whether the student has mastered the fundamental competencies necessary for unsupervised practice, and whether he/she

can reproduce these skills on a consistent level of performance over several weeks to several months. Assessment techniques at this level emphasise the direct observation of performance and review representative work samples by means of various techniques, including the portfolio and clinical competency examinations in a variety of formats. Albino *et al.* (2008) used Miller's conceptualisation of the Pyramid of Professional Competencies (Figure 3) to identify assessment techniques that were unique to dental education, yet consistent with Miller's definitions of levels and associated measurement strategies. According to Hays (2008:25) the majority of knowledge assessment at undergraduate level should be at the level of "Knows How" and "Shows How", with "Does" featuring on the postgraduate level only. "Shows how" could also be described as the students demonstrating competence in the assessment pyramid (Figure 3). Competence is defined as "the quality of being functionally adequate or having sufficient knowledge judgement and skills for a particular duty" (Miller, 1990:63). The concept of competence implies the capabilities to determine when it is appropriate to carry out a task, as well as to be able to complete the task successfully. This will involve performance of broader, more generic tasks, such as planning, clinical reasoning and contingency management with awareness of the psychosocial context, and set within an ethical framework. The skills employed are not just the technical ability to carry out clinical tasks, but also the ability to apply them to new situations during a lifetime of practice (Mossey, Newton and Stirrups, 1997).

Contrary to this, the dental clinical assessments assess the undergraduate student at the level "Does" (Figure 3), due to the nature and extent of their clinical scope (Albino *et al.*, 2008). This assessment at the level "does" is done in the Pro400 clinical tests as well. Students treat patients with limited supervision by qualified dentists. Virtually all commentaries and expert opinions on performance assessment in education regarding the health professions indicate that not only the recall and recognition of specific facts and the demonstration of technical skills should be assessed, but also the students' capacity to synthesise information within a given context, and its application in unique situations that require critical thinking and problem-solving.

Berrong *et al.* (2008) examined the relationship between daily grades – a mainstay of evaluation in the clinic, in which students receive a rating for each patient procedure and performance on twenty-six clinical competency exams in which students work without instructor coaching. These researchers found that in the hundreds of daily grades that each senior student received in an academic year correlated poorly with performance during competency exams in which students worked without instructor "rescue", unless the patient was in danger of irreversible

damage. The researcher of this study experienced similar findings in the PRO400 module, and therefore wished to explore this matter in more depth. A study by Berrong (as in Albinio *et al.*, 2008) suggested that competency exams were a more reliable means of assessment of students' capacity to perform core skills than the traditional daily grade.

The clinical tests in the PRO400 module are done throughout the year; it is a formative assessment method. Formative assessment is focused on learning from assessment and it refers to assessment that takes place during the process of learning and teaching – this refers to day-to-day assessment. It is designed to support the teaching and learning process and assists in the process of future learning, meaning that it is developmental in nature (Gravett and Geysler, 2004). Ideally, a formative assessment that increases self-awareness and encourages self-evaluation and learning would be more beneficial and would identify those students requiring closer supervision (Macluskey *et al.*, 2004).

2.7 Clinical assessment tool

Assessment tools selected should be valid, reliable, practical and have an appropriate impact on student learning. The preferred assessment tool will vary with the outcome to be assessed (Shumway and Harden, 2003:569). For an assessment tool to be effective, it should meet different criteria. Miller (1990:63) developed a framework within which clinical assessment might occur, and consists of a knowledge base, competence, performance and action. The ideal clinical assessment tool should be able to assess these different levels. Thinking and understanding reside within performance (Pellegrino *et al.* 2003:1). The clinical assessment tool should be short, easy to use and to score, and should provide useful information to the academic (Gilgun, 2004:1010). Harden (1979:290) stated that clinical assessments should focus more on the students' application of knowledge in relation to the patient, clinical skills and attitudes than on the extent of his/her knowledge *per se*. In the PRO400 module the aim is to confer clinical skills, and for this reason it is important to do so subjectively. A clinical assessment tool should be able to measure clinical skills and attitudes, as well as theoretical knowledge of an undergraduate dental student. Blueprinting indicates that a process of assessment needs to be conducted according to a replicable plan. This fundamental procedure ensures that the test content is mapped carefully against learning objectives to produce a valid examination. It generates congruence or alignment between subject matter delivered during instruction or competencies expected to be acquired by the student and the items that appear in the test. In addition to ensuring adequate relevance and sampling, blueprinting helps to identify test

instruments appropriate to the constructs and contents of the assessment (Hamdy, 2006:175).

Reliability and validity are issues that need careful attention when planning clinical assessment. Reliability is a measure of the reproducibility of a test such as examiner judgments, cases used, candidate nervousness and test conditions. Validity focuses on whether a test actually succeeds in testing the competencies that it is designed to test (Wass, Van der Vleuten, Shatzer and Jones, 2001:946). It is concerned with whether there is anything about a test that affects an examinee's score so that the test fails to measure the learning outcomes intended. For assessment instruments, validity concerns itself with a specific measurement in a specific situation with a specific group of individuals. What is being measured depends as much on the content of the assessment as on any characteristic of the method (Shumway and Harden, 2003:572). Two examiners were used in the clinical test in PRO400 to improve inter-rater reliability and the addition of the clinical test as clinical assessment method aimed to improve the validity of the clinical assessment. No single valid assessment method that measure all facets of clinical competence have been designed (Wass, Van der Vleuten, Shatzer and Jones, 2001:946); therefore it is necessary to include multiple methods of clinical assessments to cover different competencies.

The American Board of Internal Medicine recommended the use of the mini Clinical Evaluation Exercise (mini-CEX) to assess the clinical competence of trainees (Norcini, 2005:25). Mini-Cex is a method for simultaneously assessing the clinical skills of medical students and offering them feedback on their performance. Three important strengths of the mini-CEX is that it evaluates the trainee's performance with a real patient, assesses the performance and provides educational feedback; and thirdly it presents trainees with a complete and realistic challenge (Norcini, 2005:26). This mini-Cex was modified by the researcher to include the clinical and theoretical assessment of dental students in Prosthetics 400 at UWC that was implemented in 2008.

2.8 Theoretical knowledge

Without sound theoretical knowledge a student is unable to cope with different scenarios in the clinical situation appropriately. According to the framework for clinical assessment (Miller, 1990:63) the students must also know how to use the knowledge they have accumulated. Traditional educational methodology includes a combination of lectures, group sessions/seminars and clinical sessions with most of the theoretical content presented in lectures. Currently it is well accepted that the more often students are confronted with situations in which

the theory is applied, the better the performance (Plaschaet *et al.*, 2007). Student learning is probably best facilitated by a combination of educational methods that emphasise learning skills and competence, rather than by the provision of knowledge alone (Plaschaet *et al.*, 2007). Students are critical of performance-based assessments, expressing different opinions about who should be involved in assessing their performance, but they still value this format, preferring it to assessment that addresses their theoretical knowledge only (Winning, Lim and Townsend, 2005).

It is the responsibility of clinical supervisors to assist students in making the connection between the theory they have learned and its clinical application. Bowen (2006:2221) stated that experience with patients is essential for establishing new connections between learned material and clinical presentations, and for developing the ability of reasoning and flexibility in using analytical reasoning and pattern recognition. Students are unable to integrate the theory and clinical skills due to their lack of clinical experience (Fugill, 2005:134). Bowen (2007:2217) suggests that teachers first need to consider how learners learn in the clinical environment in order to assess a learner's diagnostic reasoning effectively. Contextual teaching should be included in the clinical teaching (Fugill, 2005:134). According to Fugill (2005:135) it is the responsibility of the clinical teacher to facilitate learning within clinical activity, which might be structured to promote learning by interaction between knowledge, attitudes and skills. This would result in the clinical practice environment becoming a point of convergence of academic and practical understanding. Teachers can use case-specific instructional strategies to help learners strengthen their skills (Bowen, 2006:2221). According to Bowen (2006:2224) open-ended questions are useful to assess the students' clinical reasoning ability.

2.9 Clinical supervisors and student learning

Clinical supervisors have an extremely important role to play in comprehensive assessment, as students spend increasing amounts of their time in clinical settings and should be assessed there (Hays, 2008:24). The one-to-one interaction between the dental student and the clinical supervisor has been perceived as one of the key elements in student learning (Fugill, 2005:131). However, the presence of the patient and the duty of the clinical supervisor to prevent harm to the patient add additional complexities to the learning process (Fugill, 2005:131). Clinical supervisors draw conclusions about the students' performance by observations and discussions of clinical cases (Bowen, 2006:2217). Observation without relevant questioning and discussions is insufficient for the clinical assessment of dentistry students. Discussions would encourage students to think and practice as "technicians". Harden (1979:294) suggested that clinical supervisors' reports of students could provide useful measures of clinical competence. The main problem with this method is subjectivity (Harden, 1979:294). Hays (2008:23) stated that some clinical supervisors prefer not to play any role in assessment, because they fear that this might harm their relationship with the students.

Teacher attributes associated with effective clinical teaching in dental schools include providing specific feedback about performance, demonstrating an interest in teaching, making an effort to motivate students, knowing how to translate didactic information into patient care situations, explaining difficult concepts clearly, showing compassion and approaching treatment in a proactive manner (Henzi, Davis and Hendrickson, 2006). From the researchers' perceptions not all the clinical supervisors involved with the fourth-year dental students at UWC demonstrate the attributes as outlined by Henzi *et al.*, (2006). Teachers may emphasise the importance of understanding and application in learning, but students usually judge teachers on their teaching and assessment practices and not on their words (Gravett and Geysler, 2004). Good student learning depends on student-based factors such as ability, appropriate prior knowledge and teaching context. The latter includes teacher responsibility, informed decision-making and sound course management (Gravett and Geysler, 2004). In the field of dentistry, students may be driven not only by assessment, but by the achievement of the clinical quotas.

One of the essential guidelines on the medical undergraduate curriculum is that clinical learning should be based on curiosity and the exploration of knowledge. This has also been broadly welcomed as the way forward for dentistry (Mossey *et al.*, 1997). One needs to take heed of the major difference between medicine and dentistry in respect of the skills being conferred upon

graduates. While it is sufficient for a medical graduate to be competent in diagnosis and treatment planning, the dental graduate must also be a competent surgeon (Mossey *et al.*, 1997). Regardless of the educational approach used in dental education, the goal is to encourage the development of learning characteristics, such as critical thinking, self-directed learning and problem-solving (Plasschaet *et al.*, 2007).

2.10 Feedback

Assessment should provide feedback to support the learning process. With regard to the entire assessment process, the research literature is clear on the fact that feedback is arguably the most important aspect, given its potential to affect future learning and student achievement (Rust, O'Donovan and Price, 2005). Brown and Knight (1994) suggested that the usefulness of formative assessment is entirely dependent on the quality of feedback. The purpose of formative assessment is to provide constructive and developmental feedback to direct the learner towards improvement (Gravett and Geysler). This is the aim of the clinical tests in the Pro400 module, namely to provide constructive feedback to the student after the completion of tests. The most common challenges that lecturers experience with feedback on clinical tests are related to time constraints, as clinical sessions allow insufficient time for the discussion of the students' performance. Consequently feedback is often given some time after clinical tests, which is not as effective as immediate feedback after students' clinical performance. According to Gravett and Geysler (2004) feedback should be timely to be meaningful; late feedback is a waste of everybody's time.

Rust, O'Donovan and Price (2005:234) identified three conditions for effective feedback: acknowledge of the standards; comparing those standards to one's own work; and taking action to close the gap between the two. Both the second and third conditions require the student to actively engage with the feedback: "Students should be trained in how to interpret feedback, how to make connections between feedback and the characteristics of the work they produce, and how to improve their work in the future" (*ibid.* p.234). One of the most useful benefits of assessment can be related to feedback gained by students on their performance regarding skills they are intended to develop, and to their understanding of theories and concepts. An important part of the learning process is that students should be able to learn from their mistakes as well as their triumphs (Race, 2007). From personal experience with feedback to students, it appears that some of them are more interested in the mark allocated than in listening to the comments on their performance. Brown and Knight (1994) pointed out that students differ in terms of what they

expect from feedback. Some are in favour of a few “global” pointers on how to improve their work, and react poorly to detailed comments festooning their work. Others value these comments, realising that they can amend their understanding of the topic in the light of the tutor or supervisor’s observations. This range of reactions might have been predicted from work on learning styles (Brown and Knight, 1994). Students highly valued supervisor feedback, regarding immediate and constructive feedback as being most helpful (Winning *et al.*, 2005).

Feedback is generally recognised as an important tool for student learning, as it provides the student with understanding on which to base future learning (Fugill, 2005:134). Mager classified feedback in clinical teaching as: adequacy, diagnostic or corrective (Fugill, 2005:134). Different approaches to learning could be associated with different attitudes to feedback, as Table 1 suggests. The main implication (see Table 1) of this analysis is that in the ideal world the supervisor or tutor would have some notion of the learning approach preferred by each learner, while tailoring the feedback accordingly.

Table 1: Learning approaches and feedback (Brown and Knight, 1994)

<u>Learning approaches</u>	<u>Appropriate feedback</u>
<u>Deep</u>	<u>Detailed comments on the ideas, evidence and techniques. The goal is understanding and feedback should reflect it.</u>
<u>Surface</u>	<u>General comments. The relevance of detailed comments will not be seen.</u>
<u>Strategic</u>	<u>Mark-related comments, cueing students into what they need to do to get better marks. Detailed comments on ideas are not welcomed.</u>
<u>Apathetic</u>	<u>Encouraging comments needed – but “boot in the rear” comments might “kickstart” the learner. Confidence-building is generally preferred.</u>

Providing feedback about students’ performance is one of the teacher attributes that Henzi *et al.* (2006) associated with effective clinical teaching. Bowen (2006:2224) states that the clinical teacher should give the student appropriate cognitive feedback, while Harden (1979:295) highlights the importance of feedback to both the student and the examiner. This feedback should be used as part of assessments to improve the students’ clinical skills, as well as to reinforce good practice (Harden, 1979:295).

2.11 Summary of the chapter

Consensus in the literature seems overwhelming that any curriculum or course should be constructively aligned in order to be effective. This encourages deep learning, which should be the ultimate goal of any curriculum. What is taught, should be aligned with what is assessed, as well being aligned to the outcomes of the course. This study explores the alignment of the clinical test as a clinical assessment tool within the PRO400 module. The clinical assessment needs to meet certain criteria, as well assessing different levels as highlighted in the literature.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology applied in this study. The first section outlines the primary and secondary aims of the study. This is followed by the study design which includes a review of the case study as a research design, as well as a description of participant selection. The second section discusses and explains interviews as the qualitative data collection method, followed by a description of how quantitative data was collected. The chapter concludes with the discussion of the validity of the research and a brief discussion about the limitations of the research methodology employed in this research.

3.2 Aim of the study

This researcher conducted the research to achieve the primary and secondary aims as described in the following paragraph.

3.2.1 Primary aim

The primary aim of this research is to evaluate the alignment of clinical tests with daily clinical performance in the Prosthetic 400 module. To address this primary aim, quantitative and qualitative data collections were done as follows: the clinical test marks were statistically correlated with the daily clinical performance marks. The prosthetic staff were asked to comment in their interviews about the alignment of the clinical tests and clinical daily performance.

3.2.2 Secondary aim

Following the primary aim, the secondary aims were employed to assist the researcher in gaining more understanding and a richer description of this case study research. The secondary aims of this research were as follows:

- to explore the prosthetic academic staffs' perceptions of the alignment of the clinical tests and daily clinical performance
- to explore the prosthetic academic staff's perceptions of the effectiveness of the clinical tests
- to correlate the clinical test mark of the fourth-year dental students at the end of the module with theoretical performance in examinations and tests, and
- to relate the clinical daily mark of the fourth-year dental students at the end of a module with theoretical performance in examinations and tests.

3.3 Research approach

This study followed a mixed methods approach conducted within a pragmatic paradigm. Pragmatists draw from both qualitative and quantitative assumptions. Traditionally a gulf is seen to exist between qualitative and quantitative research, each belonging to distinctively different paradigms. Within health research there has been a rise of interest in the combined use of qualitative and quantitative methods, commonly known as “mixed methods” (Moffatt, White, Makickintosh and Howel, 2006). The mixed method design will be useful to capture the best of both qualitative and quantitative approaches. Combining these two methods may generate deeper insights than using either method alone. Mixed methods approaches occur where the data collection also involves gathering quantitative and qualitative information (Creswell, 2003:20). Qualitative research methods are valuable in providing rich descriptions of complex phenomena; tracking unique or unexpected events ; illuminating the experience and interpretation of events by actors with widely differing stakes and roles; giving voice to those whose views are rarely heard; conducting initial explorations to develop theories and generate and even test hypotheses, and then moving towards explanation. The best qualitative research is systematic and rigorous; it seeks to reduce bias and error and to identify evidence that disconfirms initial or emergent hypotheses (Sofaer, 1999). The concurrent triangulation strategy was employed to attempt to cross-validate the findings. The data collection (of both quantitative and qualitative methods) was done simultaneously. This strategy usually integrates the results of the two methods during the interpretation phase, while the convergence of the findings is a way to strengthen the knowledge claims of the study or to explain any lack of convergence that may result (Creswell, 2003:217). A shorter data collection time period is an advantage of utilising the concurrent triangulation strategy. Mitchell (cited in Morse, J 1991) noted five areas of concern with methodological triangulation: the difficulty of merging numerical and textual data; the interpretation of divergent results obtained from the use of qualitative and quantitative methods; the lack of a delineation of concepts; the weighing of information from different data sources; and the difficulty in ascertaining the contribution of each method when assimilating the data.

3.4 Study design

3.4.1 Case study

The study involved a descriptive case study research design. “Descriptive” means that the end product of a case study is a rich, “thick” description of the phenomenon under study. Thick description is a term borrowed from anthropology, referring to a complete, literal description of the entity or incident being investigated (Merriam, 1998). Descriptive cases require that the investigator begin with a descriptive theory, or face the possibility that problems will occur during the project. The descriptive theory must cover the depth and scope of the case under study (Tellis, 1997). A descriptive case study in education is one that presents the detailed account of the phenomenon under study. It is useful for presenting basic information about areas of education where little research has been conducted. Such studies often form a database for future comparison and theory building (Merriam, 1998). A case study is an empirical inquiry focusing on a contemporary phenomenon within its real-life context, and boundaries between phenomenon and its context are not clearly evident (Yin, 1994). Case studies are differentiated from other types of qualitative research in that they are intensive descriptions and analyses of a single unit or bounded system such as an individual programme, event, group, intervention or community. By concentrating on a single phenomenon or entity (case) the researcher aims to uncover the interaction of significant factors characteristic of the phenomenon (Merriam, 1998). The procedural characteristics in the situation include many variables of interest, multiple sources of evidence, theoretical propositions to guide the collection and analysis of data (Yin, 1994). Process as a focus for case study research can be viewed in two ways. Firstly, the process assists in describing the context and population of the study, discovering the extent to which the treatment or programme has been implemented and providing immediate feedback of a formative type. The second meaning of process is a causal explanation: discovering or confirming the process by which the treatment had the effect that it did (Merriam, 1998). In this case study research the process has a causal explanation: it confirmed the effect of the implementation of the clinical tests in the Pro400 module.

A case study design is employed to gain in-depth understanding of the situation and meaning for those involved. The interest is in the process rather than the outcomes, in context rather than a specific variable, and in discovery rather than in confirmation. Insights gained from case studies can directly influence policies, practice and future research (Merriam, 1998). Case studies have proven particularly useful for studying educational innovations, for evaluating programmes and

for informing policy (Merriam, 1998). Case study research may adopt single-case or multiple-case designs. A single-case study is appropriate where it represents a critical case, where it is an extreme or unique case, or where it is a revelatory case. Single cases allow researchers to investigate phenomena in depth to provide rich descriptions and understanding (Darke, Shanks and Broadbent, 1998). A frequent criticism of case-study methodology is that its dependence on a single case renders it incapable of providing a generalising conclusion. Commonly case studies use not only purposive sampling of sites, but purposive sampling of informants and experiences. This means that the researchers have at least some idea of what they are looking for and where they need to go to find it. The methods used in case-study research are similar to those applied in naturalistic inquiry, except that data collection is typically more structured.

The most common methods used in case-study research are key informant interviews, structured observations of events and interactions, and the collection and content analysis of relevant documents. Interviews can vary from the unstructured to the highly structured, but the questions remain overwhelmingly open-ended. Typically a list of questions is specified and there are probes associated with certain questions. It is also common for case-study researchers to use quantitative data. These data may provide background or generate specific questions to ask about the informants' interpretation(s) of certain data or about their perceptions of the impact of the situation as reflected in the data (Sofaer, 1999). Case studies are multi-perspectivist analyses; this means that the researcher considers not only the voice and perspective of the actors, but also of the relevant groups of actors and the interaction between them. This particular aspect is a salient point in the characteristics of case studies (Tell, 1997).

3.4.2 Participants

A purposive sampling strategy was used to include participants with a wide range of clinical assessment experience. Purposeful sampling is based on the assumption that the researcher wants to discover, understand and gain insight, and therefore requires the researcher to select a sample from which the most can be learned. To begin purposive sampling, the researcher must first determine what selection criteria are essential in choosing the participants (Merriam, 1999). In this study three full-time lecturers were selected on account of their involvement in the fourth-year clinical tests, and also on the grounds of their varied clinical and teaching experience. All three lecturers are responsible for undergraduate clinical supervision and teaching. However, responsibility for the assessment of any individual student could be delegated to a person who is in day-to-day contact with the student being evaluated. This may include the student's clinical

supervisor and assumes both impartiality on the part of the assessor and appropriate briefing or training regarding the assessment tool (Harden, 1979).

One of the participants in this study is a specialist (lecturer 1) who is primarily involved with the post-graduate teaching; the second lecturer (lecturer 2) is involved in third-year teaching; and the third participant (lecturer 3) is a lecturer responsible for fourth-year teaching. None of the participants have formal teaching education or training. Lecturer three, however, has done some action research and educational research in the past. As the researcher is a colleague of the lecturers and maintains a good relationship with them, the researcher brings certain biases to this study. For this reason member-checking, semi-structured interviews and the mixed method research approach were included to ensure that this research is valid and reliable.

3.4.3 Interviews

Interviewing is a common means of collecting qualitative data. The most common form of the interview is the person-to-person encounter in which one person elicits information from another. The main purpose of an interview is to obtain a special kind of information, “what is in and on someone else’s mind” (Merriam, 1998). Gillham (2003) advocates the use of interview techniques when: small numbers of people are involved, they are accessible, they are “keys”, and questions are mainly “open”, requiring an extended response with probes, while trust is also required. All three the lecturer participants agreed to participate in the interview and convenient times were scheduled. Before the commencement of each interview the researcher gave a short overview of the study. Thereafter the participants signed the agreed consent form (Annexure 1). The overwhelming strength of the face-to-face interview is the “richness” of the communication that is made possible (Gillham, 2003). Instrumentation is as critical in qualitative as in quantitative research. It takes training and practice to write open-ended questions, which is the hallmark of a good qualitative interview, and then to refrain from transforming them into close-ended questions – especially with a resistant subject when the interview is conducted (Sofaer, 2002). The interview questions were generated after the researcher had studied the relevant literature. The interview questions were checked by the researcher’s supervisor before the interviews were conducted. Semi-structured face-to-face individual interviews were conducted with the participants by the researcher and included a range of open-ended questions (Table 1). Interview notes were taken by the researcher during the interview, and after each interview the researcher completed detailed notes. Post-interview notes allow the researcher to monitor the process of data collection and to start analysing the information itself (Merriam, 1998).

Table 2: Interview questions

	<u>Do you think the clinical tests serve as a more accurate clinical assessment tool? Explain.</u>
1.	<u>In your experience, does the students' performance in the clinical tests correlate with their theoretical performance? Explain.</u>
2.	<u>What, in your view, are the positive attributes of the clinical tests as an assessment tool?</u>
3.	<u>What, in your view, are the negative attributes of the clinical tests as an assessment tool?</u>
4.	<u>What, if anything, would you change about the clinical tests assessment tool?</u>
5.	<u>Do you think participation in the clinical tests has influenced your clinical assessment of the students? Explain.</u>
6.	<u>When comparing the students' performance in the clinical tests and clinical quota mark, the clinical test marks were significantly lower. What is your personal experience in this regard?</u>
7.	<u>Do you think the way we assess theoretically in Pro400 is aligned with the clinical assessment? Explain.</u>

3.5 Quantitative data collection

The theory marks of PRO400 students were collected from the two written tests, spot tests and the final examination from the students' records in 2007. There were one hundred and ten students in the year-group class, but one student was excluded from the study because she had discontinued her studies during midyear. Clinical test marks were collected from the clinical tests performed in the year 2007, while the clinical daily mark was collected from the clinical mark that the students had obtained in that same year. As a module coordinator, the researcher had access to all the students' performance records. A statistician assisted the researcher with the quantitative data analysis.

3.6 Validity of the data

One cannot escape the personal interpretation brought to qualitative data analysis (Creswell, 2003:182). Therefore researchers should acknowledge that all inquiry is laden with values (Mertens, 2003 cited in Creswell, 2003:182). The researcher who conducted the interviews is a colleague of the participants and was the Pro400 module coordinator, all of which brought a degree of bias to this research. Just as a researcher refines instruments and uses statistical techniques to ensure reliability, the human instrument can also become more reliable through training and practice (Merriam, 1998:206). The researcher is a novice in the qualitative research method and this influenced the reliability. Validity concerns the accuracy of the questions asked, the data collected and the explanations offered. Generally it relates to the data and the analysis used in the research. Validity is seen as a strength of qualitative research, but is used to determine whether the findings are accurate from the standpoint of the researcher, the participant or the readers of an account. "Trustworthiness", "authenticity" and "credibility" are terms that refer to this idea (Miller and Creswell, 2000 cited in Creswell, 2003:196). Every researcher, including this particular researcher, wants to contribute results that are believable and trustworthy (Merriam, 1998). Reliability relates to the methods of data collection and the concern that they should be consistent and not distort the findings. Generally it entails an evaluation of the methods and techniques used to collect the data (Denscombe, 2002:100). Ensuring validity and reliability in qualitative research involves conducting the investigation in an ethical manner (Merriam, 1998). In a limited way qualitative researchers can use reliability to check consistent patterns of theme development among several investigators on a team, or they can generalise some facets of multiple-case analysis to other cases (Yin, 1989 cited in Creswell, 2003:195). Overall, reliability and generalisability play a minor role in qualitative inquiry. Four strategies were used to check the accuracy of the findings in this research: member checking,

triangulation, the use of rich, thick description to convey the findings and an attempt to clarify the bias brought to the study by the researcher. Member checking (Creswell, 2003:196) was used to validate the findings of the interview. After the completion of the individual interviews the researcher sent the individual notes of each interview to the respective interviewees to determine whether they felt that it was accurately recorded. One respondent added and changed some of the data, while the other two participants confirmed the accuracy of the interpretation of the interviews. In this research triangulation was used, which strengthened reliability as well as internal validity (Merriam, 1998). Interviews were conducted for the qualitative data collection and quantitative data was collected from the records. The participants may have been indirectly affected, because the researcher conducted the interview herself and is also the coordinator of the Pro400 module.

3.7 Data analysis

The unit of analysis is a critical factor in a case study design. Case studies tend to be selective, focusing on one or two issues that are fundamental to understanding the system being examined (Tellis, 1997). The analysis of qualitative data is probably the most challenging aspect of the use of these methods. Data from qualitative research are typically suggestive, rarely if ever, conclusive; yet the analysis process should be highly deliberate and systematic (Sofaer, 2002). The interview questions were grouped into the following themes: clinical tests, students' performance, the alignment of theoretical and clinical assessment and supervisors' perceptions of the clinical tests. In the health sciences, a popular approach is to use predetermined codes based on the theory being examined (Creswell, 2004:187). The analytical abstraction method was used to assist in the data analysis (Crafford and Bitzer, 2009:447). This method has a clear and logical step-by-step approach. The analysis of the qualitative data in this study was therefore done at two levels: the actual words used by the respondents (basic level) and the conceptualisation of these words (higher level) by the researcher (Crafford and Bitzer, 2009:447). In qualitative work we have to distinguish between our observations and our interpretations of those observations. Data analysis of qualitative research is time-consuming and resource intensive, but is a hallmark of respect for the data collected and for the willingness to be proven incorrect, which is the key-element of being "scientific" (Sofaer, 2002). The quantitative data, comparing the results of student performance in the theory of module PRO400 with their performance in clinical tests and the clinical quota marks, was analysed using basic descriptive statistics in a Microsoft Excel program. Data analysis consisted of identifying means and standard deviations. The data was presented in graphs and in a table format.

3.8 Limitations of the methodology

Construct validity is especially problematic in case study research, because of the potential researcher subjectivity (Tell, 1997). Qualitative case studies are limited by the sensitivity and integrity of the investigator. The researcher is the primary instrument of data collection and analysis (Merriam, 1998), as in this research. In this study the researcher conducted the interviews, analysed the data, had collegial relationships with the participants and was involved in compiling the PRO400 module. However, there was some degree of subjectivity and researcher bias in the researcher's data collection, and analysis was counteracted by the semi-structured interview questions and member-checking. Weaknesses of case study research also included difficulties in generalizing research results. However, research results might be used to replicate other similar case studies and compare the findings to similar studies in the field of Prosthetic Dentistry (Darke, Shanks and Broadbent, 1998).

This chapter described the research methodology used in this study. Chapter Four reports the finding of the research and aims to explain the implications for the PRO400 module.

CHAPTER 4: RESULTS

4.1 Introduction

The findings from the collected qualitative interview data, as well as the quantitative data from the records of the fourth-year dental students, are presented in this chapter. Firstly the quantitative findings are displayed using tables and graphs, followed by the qualitative findings. The discussion of data in this chapter is presented in four parts: Level 1 – basic level; Level 2 – advanced level of analysis; Level 3 – emergent themes and Level 4 – the conceptual level. The basic and higher levels of analysis are discussed under the following themes: clinical tests, student performance, alignment of theory and clinical assessment, and personal influence on supervisors' assessment practices and attitude. Role-taking and the supervisors' perceptions and concerns regarding the students are discussed as emergent themes. Lastly, the conceptual level of analysis is presented.

4.2 Findings

4.2.1 Quantitative data

The 2007 clinical test marks of all the students (109) in the PRO400 module were compared to their theory marks (Figure 4) of the same year. Also, the average clinical daily marks were compared to students' theory marks (Figure 5). The graph (Figure 4) shows the relationship between the clinical tests and the theory marks. On the line of equality the clinical tests equal the theory marks. Above the line more students performed better in their clinical tests than in their theory. Below the equality line fewer students' theory marks were better than their clinical tests marks. What could be derived (from Figure 4) is that forty-five students' clinical test marks were ten percent higher than their theory marks. Only eight students' theory marks were ten percent higher than their clinical test mark.

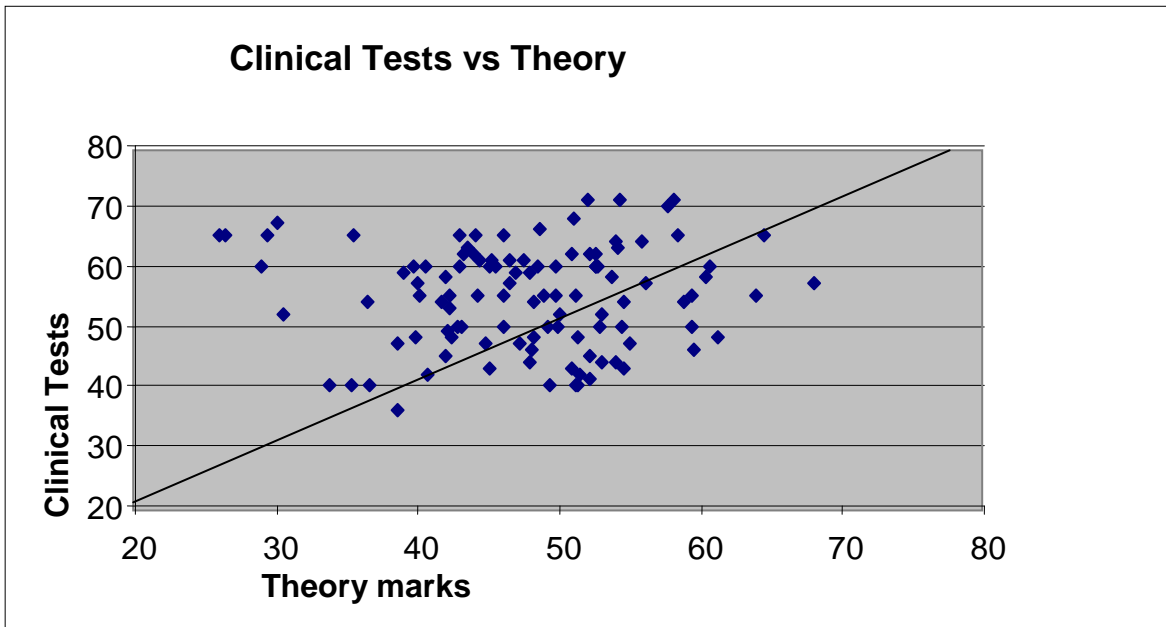


Figure 4: Clinical test marks versus Theory marks (n=109)

The graph below (Figure 5) shows the relationship between the clinical daily marks and the theory marks. There appears to be hardly any relationship between the students' clinical daily marks and their theory marks.

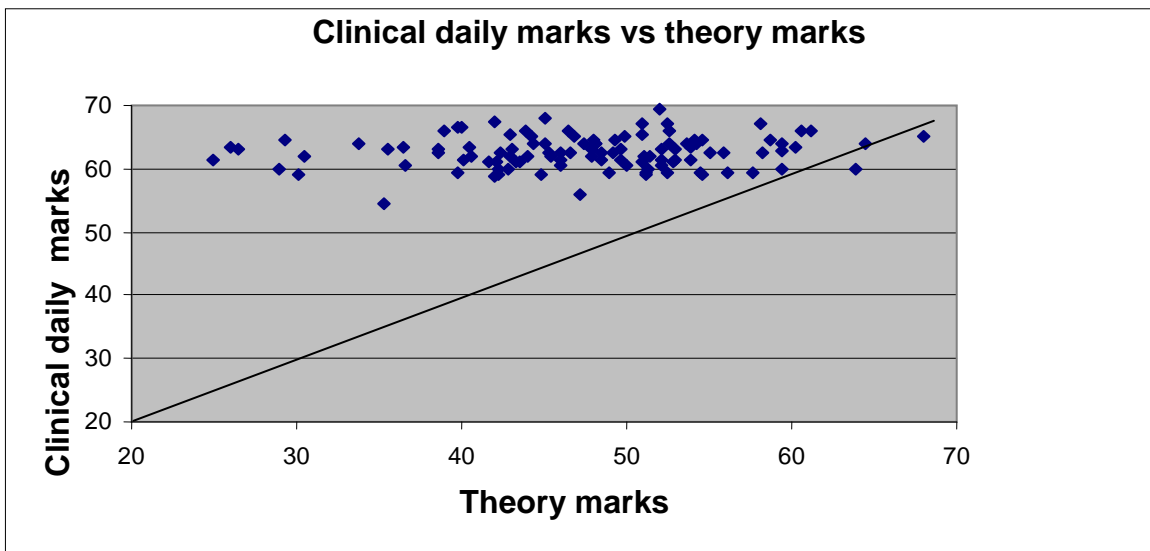


Figure 5: Clinical daily marks versus theory marks

The next graph (Figure 6) shows the relationship between the clinical test and the difference between the clinical test marks and the theory marks. As the clinical test marks increase, the difference increases between the clinical test marks and the theory marks. As the clinical tests marks decrease, the difference between the clinical test marks and theory marks decreases.

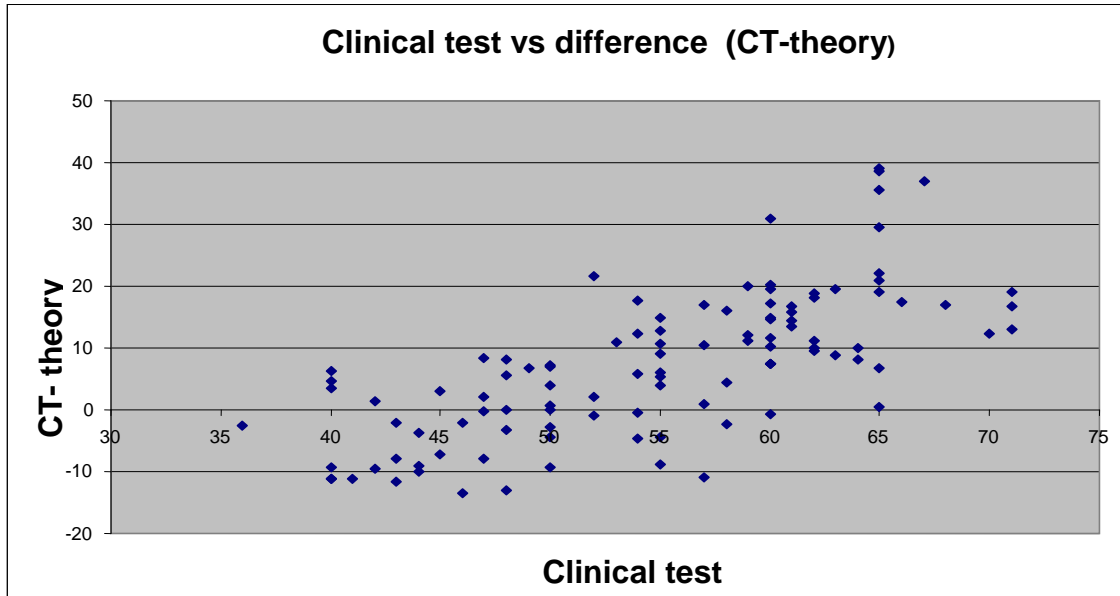


Figure 6: Clinical test marks versus the difference between the clinical test marks and theory marks

The graph in Figure 7 shows the relationship between the theory marks and the difference between the clinical tests marks and the theory marks. As the theory marks increase, the difference decreases.

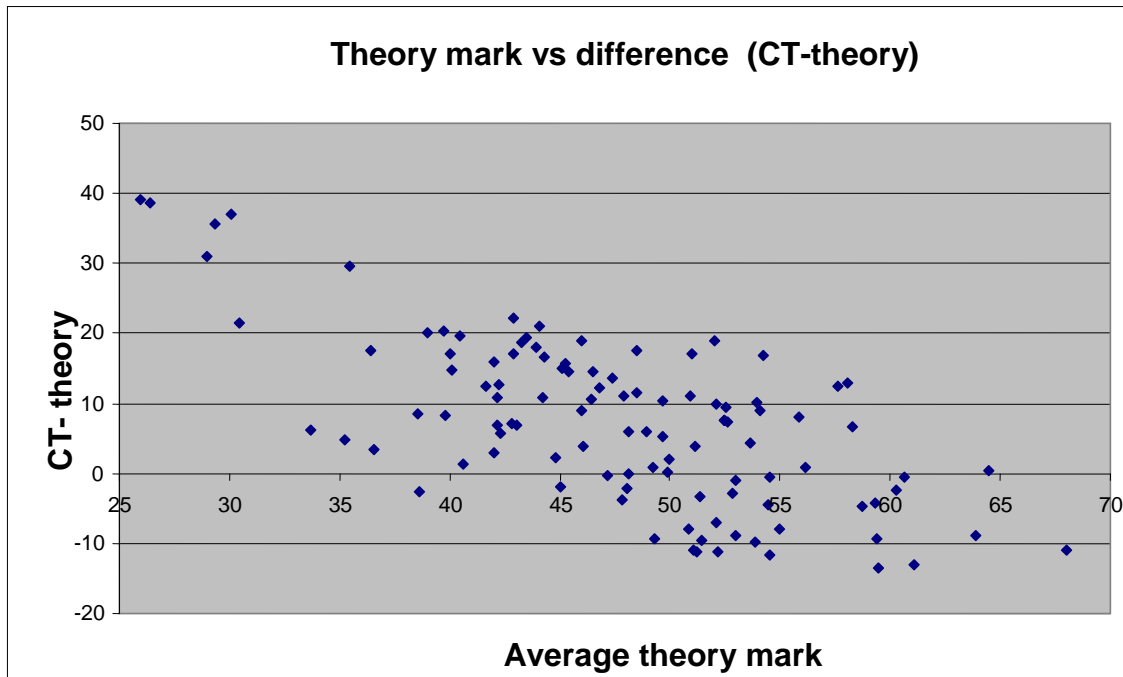


Figure 7: Theory marks versus the difference between the clinical test marks and theory marks

The results from the quantitative analysis are illustrated in Table 3. The average of the average theory marks was 47%, the average of the average clinical test marks 55% and the average of the clinical daily marks 63%. The standard deviation (average difference from the mean) was 8.5% for the theory marks, 8.5% for the clinical tests and 2.5% for the clinical daily mark. The standard deviation of the clinical daily mark is much lower than the standard deviation value of the theory mark and the clinical test marks. The interquartile (IQR) range of the clinical daily marks was 3%, the IQR for the clinical tests 13% and the IQR for the theory marks 10%.

Table 3: Quantitative results comparing the average theory marks, the clinical test marks and the clinical daily marks of the PRO400 module.

			Average theory marks	Clinical tests	Clinical daily marks
	Average		47.3854	54.8692	62.6169
	Stan Dev		8.4958	8.4508	2.5360
	Minimum		24.9702	36.0000	54.5000
p25	Q1		42.2897	48.0000	61.0000
p50	Q2	median	48.0691	55.0000	62.5000
p75	Q3		52.6900	61.0000	64.0000
	Maximum		67.9993	71.0000	69.5000
parametric coefficient of variation			0.1793	0.1540	0.0405
Q2-Q1			5.7794	7.0000	1.5000
Q3-Q2			4.6209	6.0000	1.5000
interquartile range			10.4003	13.0000	3.0000
N P coefficient of variation			0.216361	0.236364	0.048
nonparametric					

4.2.1.1 Higher level of quantitative data analysis

From the data derived from the graph (Figure 4) it appeared that the students generally performed better in the clinical tests than in their theory, which included tests and examinations in Pro400. Few students’ clinical test marks equalled their theory marks, which explain the findings of the graph (Figure 4). Since the clinical tests included a theoretical component, it appeared that the students’ clinical performance exceeded their theoretical performance.

During the daily clinical sessions it was expected that the clinical supervisors would allocate marks to the students based on clinical performance and some application of the relevant theory. From the graph (Figure 6) it can be derived that students’ clinical daily performance exceeded

the theory marks and that there was no relationship between the clinical daily marks and the theory marks. The assumption could be made that a limited amount of theory was included in these clinical daily sessions. The students' performance in the clinical tests related better to their theoretical performance than to their clinical daily marks.

4.2.2 Qualitative data

4.2.2.1 Level 1: basic level of analysis

4.2.2.1 (i) Clinical tests (CT)

All the respondents agreed that the clinical test is more accurate and standardised compared to the previous clinical assessments done. The following reasons for this were given:

“we have a list of questions and things that we have to check for each procedure”, “ it gives a better understanding of what students are capable of” [Lecturer 2]

“when we do the CT, compared to the normal clinics, we are forced to look at all the aspects to be assessed and mark these accordingly and appropriately – the tool demands this of us, even though this is expected in normal session too, we tend to give general marks” [Lecturer 3]

All three lecturers commented on the positive attributes of the clinical tests as an assessment tool:

“the most positive attribute is that there are two examiners: they discuss the students' performance, they reach consensus with the students' mark; two examiners make the CT more reliable and accurate and sometimes the student s (not all of them) prepare for it” [Lecturer 1]

“it's a specific session; it allows you to test theory and the application of the theory. The session changes you, it does not allow students to 'slip' past” [Lecturer 2]

“it is more standardised, better controlled; it ensures better preparation for the students, 'normally' the supervisor that's assigned to students per term – therefore the students do not prepare for the session. The clinical tests force them to prepare. There is a seriousness of the clinical session when there are clinical tests. Every session should be like a clinical test. We are also forced to be more specific when we do the assessments; the breakdown of the tool allows us to do this.” [Lecturer 3]

The respondents also identified negative attributes of the clinical tests as an assessment tool:

“it adds additional stress, for the students tend to be more focused to get answers during clinical tests correct and then less concerned about the patient. There are also time constraints: not enough time allocated to deal with other students' supervision as well. Each patient and case is different; as a result sometimes you are harsher in judgment of students.” [Lecturer 1]

“a big negative is the students’ perception of the clinical tests, maybe there must be some guidelines for supervisors on the how we ask questions as well as the manner of speech”
[Lecturer 2]

“it’s not entirely standardised; it depends on the stage or procedure of clinical work, because different procedures impact negatively on the outcomes of the session or procedure. Maybe if there are weightings for different procedures (more difficult and easy ones) on the tool – then it will be even more standardised.” [Lecturer 3]

The respondents suggested some changes to be made to the clinical tests:

“if possible, to create a data base with possible questions related to procedure – although this is very difficult because there are so much patient variables, each case is different” [Lecturer 1]

“include some guidelines for supervisors, do not wait for students to complete a clinical procedure first, because this takes up too much time and rushes the clinical test at the end of the session” [Lecturer 2]

“don’t know, maybe include some factor that removes the ‘difficult factor’ mentioned in previous answer, change the percentage or weighting – making it count more” [Lecturer 3]

4.2.2.1 (ii) Student performance

The lecturers varied in response to whether the students’ performance in the daily clinical sessions corresponds with their performance in their clinical examinations. One respondent was unsure, another said “most of the time, yes, with some exceptions” and the third respondent said “most of the time the students’ performance in the daily clinical sessions corresponds with their performance in their clinical tests”. Their comments on students’ performance included specific remarks such as:

“students that move under the “radar” are picked up by the clinical tests. The clinical tests allow the full-time staff to assess the very weak student that is always running away from them to part-time staff, as it is easier with them” [Lecturer 2]

All the lecturers agreed that they experienced that the student’s clinical test marks were lower than their clinical daily marks. Some of the reasons were as follows:

“In a ‘normal’ session you are not focused on clinically applied theoretical knowledge, only on the assessment of the procedure and clinical ability. Laziness, ‘human factor’, questioning the students and giving the students bad marks are not always nice and then this results that you

have to explain this to the students. You have no time to question all the students – it is unfair on them and you are biased; scared to become or to appear to be biased” [Lecturer 1]

“Clinical daily mark is obviously higher. You are not so critical; you tend to include more questioning for clinical tests compared with other clinical assessments” [Lecturer 2]

“In a few cases I have experienced this myself; it depends on the procedure. Students are ‘lax’, do not prepare and it also depend on the supervisor” [Lecturer 3]

4.2.2.1 (iii) Alignment of theoretical and clinical assessment

The respondents agreed that the theoretical and clinical assessment are not aligned. They elaborated as follows:

“No, for theory usually longer essay type questions are asked, some are more a reproduction of knowledge. In the clinics only more applied clinical knowledge are asked” [Lecturer 1]

"Not always. Some tests, e.g. towards the final examination, are more aligned, but we still need to align it more. First semester it is not well aligned.” [Lecturer 2]

“Yes, moving closer to that – not everything can be asked clinically – some must be asked theoretically” [Lecturer 3]

The following suggestions were made to improve the alignment of theory and clinics:

“Elaborate more on the techniques course. Integrate clinical and theory? How, I don’t know – maybe by twinning junior and senior dental students/dental technician students: they will be able to learn from each other” [Lecturer 1]

“Chair-side teaching. Supervising staff (including part-time) must be kept up to date with what we teach. Physically link it for the students who are not able to link theory and clinical work” [Lecturer 2]

“Gaps exist. Students are not able to bring together theory and practice. Theory: when introduced, it’s foreign, then we expect them to apply it – it is very difficult even at 4th year level. We also need to align our teaching – change it, bring in new teaching methodologies etc. to close the gap between theory and practice. Give students exercises that will specifically close these gaps – tutorials/reading (pre- and post-) lecture readings” [Lecturer 3]

4.2.2.1 (iv) Personal influence on supervisors' assessment practices and attitude

Two of the respondents indicated that their participation in the clinical tests has influenced the way in which they assessed the students clinically. Their explanations were as follows:

"I'm asking more questions. Personally I started to link the theory and clinical application for the students to make it easier for the students" [Lecturer 2]

"You (the supervisor) are in a different frame of mind when doing clinical tests" [Lecturer 2]

"Yes, it influenced the way I assess, teach, approach and guide the students clinically. It puts our interaction with the staff and students on the 'spot' – more professional, less casual, more serious if there is a clinical test. It puts us 'clinical staff' (involved in clinical tests) in a different 'space' e.g. how we feel, approach and how we prepare for the clinics. Clinical tests is a good thing. You also check on yourself and do more readings to keep you updated – strangely so – and we tend to discuss amongst staff – so yes, we are influenced in our teaching now more by the clinical tests" [Lecturer 3]

4.2.2.2 Level 2: Higher level analysis

The higher-level analysis of data, which is of an interpretive nature, is concerned with what is meant by the response, what is inferred or implied (Crafford and Bitzer, 2009:450). These interpretations are also linked to relevant literature in order to make understanding easier.

4.2.2.2 (i) Clinical tests

According to the results all the respondents strongly agreed that the clinical tests are more accurate and standardised compared to any other clinical assessment used within the Prosthetic department. Two examiners responsible for the clinical tests ensured the reliability and validity of the clinical test as an assessment tool, which is aligned with the clinical learning outcomes for Pro400 (Annexure 2). Recommendations on how the clinical tests can be improved included refining the guidelines for supervisors, allocating sufficient time, and incorporating weightings for unequal and difficult procedures or patients.

The respondents were of the opinion that more detailed guidelines are to be included in the clinical tests. In an article by Newble et al. (1994:214) the authors first defined what is to be tested, dividing it into three steps. The first two steps define the range of competencies (exit or terminal objectives) that students must know or be able to perform at the end of the course of study. The third step identifies the sample of competencies to be tested in the assessment procedure. Using these steps as guidelines, the Prosthetic department at UWC could probably

redefine the guidelines associated with the clinical tests. In addition, clear communication between students and tutors and clarity of criteria and standards appear to be essential components of effective assessment, including self-assessment (Winning, Lim and Townsend, 2005:500).

As with ambulatory settings in medicine, dental clinic sessions are characterised by time-pressured communication between students, tutors and patients, with limited opportunities for regular observations and feedback to students. Therefore, to improve this critical component of assessment and learning, we need to improve the management of time available in the clinical setting and the use of standardised and explicit criteria. We also need to support clinical tutors to develop a positive learning environment (Winning, Lim, Townsend, 2005:500).

4.2.2.2 (ii) Students' performance

The lecturers' responses about student performance varied; the different opinions might be related to lecturers' involvement with the students. However, all the respondents agreed that in their experience the students' clinical test marks were lower than their clinical daily marks.

4.2.2.2 (iii) Alignment of theory and clinical assessment

The respondents agreed that the alignment of theory and clinical assessment is an area that could be improved. Better alignment of these areas needs to be developed and the respondents' suggestions to this effect included more clinical teaching and the need for students to make the connection between theory and practice. Bowen (2006) emphasised that clinical supervisors have to assist the students in this regard, helping them to relate the theory to clinical application. This finding is in line with the proposition of Hays (2008:25), who maintains that clinical teachers should engage actively in domain groups, ensuring that the relevant material from their clinical discipline is appropriately integrated with teaching and assessment, not only in the course of a single year, but throughout the entire course. As the students, due to their limited clinical experience, are unable to integrate theory and practice and to make connections (Fugill, 2005), it is expected of the clinical supervisor, having the necessary clinical experience, to assist the students in closing the "gap". Lecturer 2 made a particular comment in this regard: "*personally I started to link the theory and clinical application for students to make it easier for them*". Without any educational background, the supervisors assisted the students in linking the theory with the clinics (practice).

Only one respondent suggested aligning teaching in classrooms in order to close the “gap” between theory and practice:

“we also need to align our teaching – change it, bring in new teaching methodologies to close the gap between theory and practice. Give students exercises that will specifically close the gaps like tutorials, reading (pre- and post-lecture readings)”

4.2.2.2 (iv) Personal influence on supervisors’ assessment practices and attitude

Two respondents admitted that the clinical tests have influenced the way in which they assess the students clinically. Throughout the interview the respondents indicated that these clinical tests had changed the session, how they prepare for the session and how they teach. They also pointed out how it had changed their overall behaviour with regard to assessment and student clinical teaching. Being involved in clinical testing, the supervisors were able to experience the students’ clinical competencies and theoretical knowledge, while they were able to identify the areas in need of development. The respondents realised that a “gap” existed between theory and practice and indicated possible methods of “closing” this “gap”.

4.2.3 **Emerging themes**

4.2.3 (i) Role-taking

The respondents indicated that they assume different roles when they participate in a clinical test. Some of the comments indicating that supervisors change their approach to assessment during a clinical test include the following:

“you (the supervisor) are in a different frame of mind” [Lecturer 2]

“you as a supervisor are more critical” [Lecturer 2]

“you are harsher in your judgment of students” [Lecturer 1]

From the researcher’s personal involvement it appeared as if supervisors “distance” themselves from the students in order to be more objective when allocating marks during a clinical test. One of the respondents added that there is a “seriousness” about the session which seems to transform the supervisor.

In a study on the experiences and concerns of medical markers (Hawthorne, Wood, Hood, Cannings-John and Houston, 2006:6), the markers also took on a variety of marking “roles”, dependent on their personalities and experience. The markers were concerned about their internal and external reliability and their ability to be objective. Similarly, from the interviews in my

study, it appeared that the more experienced and senior academics were less personal in the interview, compared to the other interviewees. This could either be the result of senior academics not being involved in the undergraduate teaching as much as the other respondents, or alternatively, it could point towards some form of “maturity” in the experience of being an internal and external clinical examiner.

One respondent commented: “...*questioning the student and giving the students bad marks are not always nice and then this results that you have to explain this to the students*” [Lecturer 1]. It appears that this lecturer might not be comfortable with constructively giving feedback to the students, or prefers not to have any role in assessment, for fear of harming the relationship with the students (Hays, 2008).

The other two respondents made it clear that the experience of being involved in the clinical tests influenced their approach to clinical assessments in particular ways.

4.2.3 (ii) Supervisor perceptions and concerns regarding the students

From the data it became clear that the supervisors had their own perceptions of how the students experienced the clinical tests. Some of these perceptions were:

“...*the students enjoy the clinical tests, they know the impact of the clinical tests and prepare for it*” [Lecturer 3]

“...*students expect the clinical tests to happen and they are informed about it. Sometimes the students (not all of them) prepare for it*” [Lecturer 1]

“...*students are lax; they do not prepare and for the weak students who move under the ‘radar’ the clinical tests is a good indication of who the real weak students are*” [Lecturer 3]

“...*the clinical test allows the full-time staff to assess the very weak student who is always running away from them to part-time staff, as it is easier with them*” [Lecturer 3]

Concerns of the students were highlighted in the following comments:

“...*for the students the clinical tests add additional stress, they become more focused on getting the answers during the clinical test correct and less concerned about their patient*” [Lecturer 1]

“...*students with difficult patients are being disadvantaged, it influences the clinical test*” [Lecturer 1]

“...*students are not able to link theory and practice, when we introduce theory it is foreign, then we expect them to apply it – it is very difficult, even at fourth year level*” [Lecturer 3]

“...*pressures of poor laboratory work influence the students’ performance*” [Lecturer 1]

4.2.4 Conceptual level of analysis

The clinical test as an assessment tool is well accepted by the supervisors and they agreed that it is more reliable and accurate than the clinical daily grade assessment method. The quantitative findings relate well to a study by Berrong *et al.* (cited in Albino *et al.*, 2008:1407) who concluded that the daily grades were poorly correlated with the competency exams (similar principle as the clinical test of the PRO400). From the findings in the PRO400 research, it appeared that there is a better correlation between the clinical test marks and the theory marks than between the daily clinical marks and the theory. This quantitative finding related well with the lecturers' views that the clinical tests were more reliable as a clinical assessment tool than the daily clinical mark. All the lecturers agreed that the assessment of the theory and clinical assessments in PRO400 are not aligned and suggested that clinical teaching could be improved by "linking" the theory to the practical application thereof. This is in accordance with the literature as discussed in the higher level analysis (level 2) in this chapter.

4.2.5 Conclusion

The findings pointed out that subjectivity on the part of the supervisors might influence clinical assessments. The clinical test as a "new" clinical assessment method has apparently encouraged the supervisors to reflect on clinical assessment and student teaching. It can be concluded that reflection is an important stage in teachers' professional growth.

This chapter displayed and discussed the quantitative and qualitative findings of this study. There appears to be some convergence of the quantitative and qualitative findings with regard to the clinical tests being a more reliable and valid method of clinical assessment when compared to the daily clinical grade in the PRO400 module. The final chapter of this thesis includes a discussion of the findings, the conclusions drawn from the findings and an exploration of possible future areas of development, as highlighted by this study.

CHAPTER 5: CONCLUSIONS, DISCUSSION AND IMPLICATIONS

5.1 Introduction

This final chapter includes the conclusions, discussions and implications for clinical assessments in the PRO400 module. The first section focuses on the conclusions and discussions followed by possible implications that are discussed under the following headings: clinical tests, clinical teaching, assessment criteria and module evaluation. . This chapter concludes with a discussion on the limitations of this research.

5.2 Conclusions and discussion

From the quantitative findings it became clear that there was a weak correlation of the students' performance in the clinical test with their clinical daily grades. However there was a stronger correlation with the students' performance in the clinical tests with their theoretical performance. The theoretical assessment is aligned with learning outcomes and teaching activities in the PRO400 module as discussed in chapter one. Although alignment of a course in education specifically indicates that the learning outcomes, teaching practices and assessment are aligned, the researcher assume that if the students' performance in their clinical tests and theory correlates stronger that it is aligned better with each other. If the researcher uses the same assumption that correlation (in quantitative terms) equals alignment it could be concluded that the daily clinical performance are not aligned with the clinical tests or theory in the PRO400 module. From the qualitative findings it was concluded that the prosthetic lecturers perceptions were that the clinical daily assessment were not aligned with the theory however that there were a better alignment of the clinical tests and theory. The lectures' perceptions were that the clinical tests were also more reliable than the daily clinical grades as assessment tool. Clinical tests in the PRO400 module are well accepted by lecturers and considered to be more accurate than the clinical daily grade. It also reflects more accurate the students' ability. What are examined in the clinical test (clinical performance and theoretical application) is in line with the outcomes of the PRO400 and the clinical daily grade poorly reflects the students' ability because theory is not consistently tested as it is probably influenced by the supervisors' subjectivity (only one supervisor assesses). It is however difficult to disregard the use of clinical daily grades because of time constraints, supervisor availability, students' clinical quotas and large student classes.

This research used concurrent triangulation in its data collection method, with the intention of integrating the findings of both quantitative and qualitative findings in the interpretation phase of the research. A mutual verification of research results and a potential increase of validity produced by such verification were regarded as the primary goal of triangulation. The convergence of empirical results is regarded as an indicator of validity and strengthens the initial assumptions and theoretical framework used to structure the research process (Tashakkori and Teddlie, 2003). The research findings of this study indicate that there is a definite convergence of the qualitative and quantitative results, thereby verifying the following: the clinical tests, as assessment tool, are more reliable than the daily clinical assessment tool, while the clinical tests show a better correlation with the students' theoretical performance than with their daily clinical grade performance.

The researcher expected the staff to be more negative towards the clinical tests in view of issues such as time constraints and an increased workload. Contrary to the researcher's expectations, however, the lecturers' reflection on their assessment methods and teaching was positive.

The major paradigm shift in assessment is reflected in the changing perceptions about the nature of assessment and its main purposes. Traditional forms of assessment have often targeted a learner's abilities to demonstrate the acquisition of knowledge. New methods are needed to assess students' level of understanding within a particular content area and within the organisation of the learner's cognitive structures (Gravett and Geysler, 2004). In the context of this statement the daily clinical assessment could be described as a traditional assessment method and the clinical tests as a "new" method of assessment in PRO400. Epstein (2007:392) states that by using multiple methods of assessment, many limitations of individual assessment formats can be overcome. Race (2007) also argues that the wider the diversity in the methods of assessment, the fairer the assessment would be to students. The art of improved assessment therefore needs to embrace several kinds of activities. For this reason it seems important that the clinical test as an assessment method is used to complement the daily clinical assessment method.

The clinical test is aligned with the intended learning outcomes in PRO400 whereby students are expected to perform clinical skills on a patient, and to apply theoretical knowledge appropriately. The ultimate aim is constructive alignment in PRO400. According to Biggs (1999) students construct meaning from what they do in order to learn. The clinical sessions (where dental students are supervised when treating real patients) constitute learning activities for the students in this module. If students are expected to learn (by constructing their own meaning), clinical

supervisors or teachers need to create the appropriate environments for such optimal learning to occur.

From the results of this study, as well as from the conclusions drawn, it appears that the area of development should focus on learning and teaching activities within the clinical context. Apart from improving the teaching strategies in formal lectures, the clinical setting could be seen as an “extension” of the classroom. Clinical teaching can be viewed as an extension of the role of the lecturer, as they assist students in making connections in terms of applying what was taught in the classroom to the clinical setting.

5.3 Implications of the study for development

This research has certain implications for further development in the following areas: clinical tests, clinical teaching and assessment criteria.

5.3.1 Clinical tests

- Students should receive immediate feedback once the clinical tests have been completed. Better time management would ensure that sufficient time is available for feedback after a clinical test. This feedback should be given by one of examiners involved in the clinical test.
- The weighting of the clinical tests and daily grades should be re-evaluated in order to increase the value of clinical tests as an assessment method.
- Supervisors should receive clearer and more detailed guidelines to minimise subjectivity in their allocation of marks during clinical tests.
- The standardization of theoretical questions put to students in the clinical test
- To find measures to decrease the subjectivity of translating the grading of the clinical performance to a percentage

5.3.2 Clinical teaching

For clinical teaching to be valuable, all clinical supervisors (full-time and part-time) should be informed of what is expected of them. All the supervisors have the necessary clinical experience needed to guide the students in the clinical setting. However, their limited educational background influences optimal clinical teaching. The supervisors should continue to develop the necessary skills for guiding their students in making a connection between theory and its clinical application.

Bowen (2006:2221) stated that experience with patients is essential for establishing new

connections in memory between learned material and clinical presentations, as well as for developing reasoning flexibility, by using analytic reasoning and pattern recognition. Students are unable to integrate theory and clinical skills due to their lack of clinical experience (Fugill, 2005:134). Bowen (2007:2217) suggests that teachers first need to consider how learners learn in the clinical environment in order to assess a learner’s diagnostic reasoning effectively. This means that contextual teaching should be included in the clinical teaching (Fugill, 2005:134). The importance of clinical teaching has been highlighted in this research however the quality and extent of clinical teaching within the Dental Faculty have not been explored. Clinical supervisors spend hours doing clinical supervising per week and the extent of their clinical teaching has not been researched.

5.3.3 Assessment criteria

In the light of the existing variation in clinical scenarios, the criteria need to be broad enough to encompass a number of clinical variables (Maclueskey et al., 2004). The provision of assessment criteria to students and assessors alike is an important factor to ensure equitable and consistent assessment (Tennant and Scriva, 2000). The intended learning outcomes for each clinical procedure should be specified and weighted according to complexity. The assessment criteria should differ from the ILO’s only insofar as they might give more detail of performance levels required for specific rewards.

5.3.4 Module evaluation

The inclusion of the degree of congruence between learning objectives and assessment (including clinical) objectives could form part of the PRO400 module evaluation process, similar as what has been suggested by Houghton and Warren (2004) and as depicted in Figure 8 below.

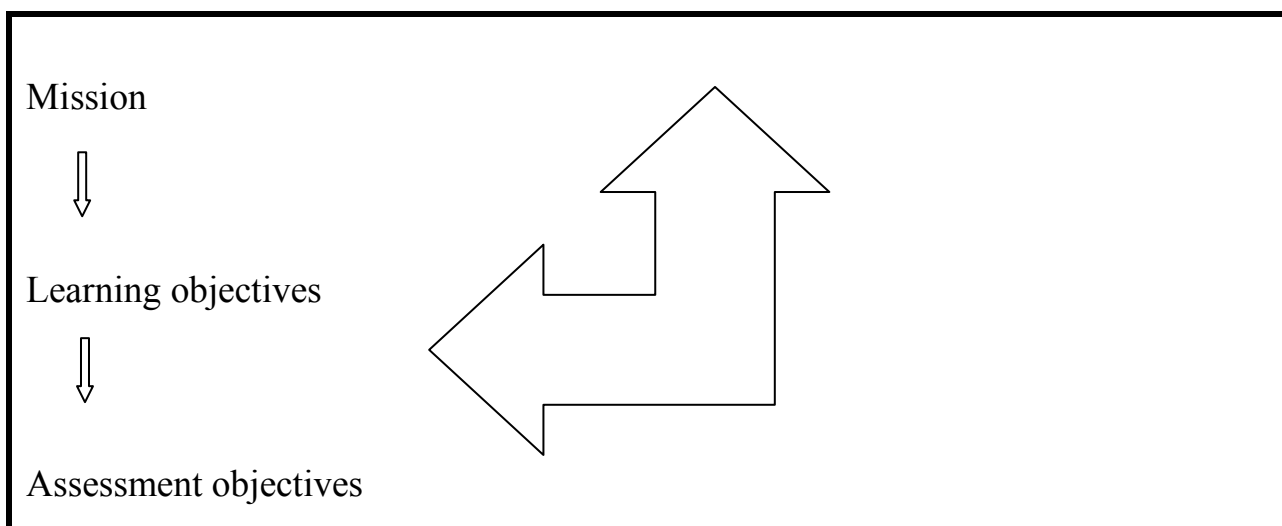


Figure 8: Achieving congruence in teaching and assessment (Houghton and Warren, 2004).

In Pro400 the learning outcomes are clearly outlined in the course, while the clinical tests as an assessment method is aligned with the ILO's. However, the existing "gap" indicates that the teaching activities included in the course are neither sufficient nor appropriate to enable students to attain the outcomes. The lectures need to consider teaching activities that will oblige students to engage with their learning. Further development of appropriate teaching activities should be explored to align this course constructively.

Alignment is a matter of honesty and fairness, establishing the trust and confidence that students need for managing their own learning (Houghton and Warren, 2004). The alignment matrix (Cowan, George and Pinheiro-Torres, 2004) could be used in the Pro400 module to evaluate whether the learning outcomes, learning and teaching activities and the assessment are aligned. The purpose of the alignment matrix (Figure 9) is to encourage professionalism, especially with regard to applying systematic and interactive design. This would enable course or module designers to identify for themselves those aspects of their designs that need further attention or refinement (Cowan, George and Pinheiro-Torres, 2004).

<u>Learning outcomes</u>	<u>Learning and teaching activity</u>	<u>Assessment</u>

Figure 9. Alignment matrix

Ultimately the clinical tests were designed to benefit the student rather than being viewed as yet another examination. Fortunately, assessments do not need to be perfect to give worthwhile information about student abilities (Howley L, 2004). The researcher anticipates that the results of this research will be useful for the Department of Prosthetics to review their clinical assessment tools that apply to the assessment of all undergraduate dental students.

5.4 Limitations of this research

This research highlights the following areas for future research: longitudinal research and specific module research.

5.4.1 Longitudinal research

As data for this research was collected over a period of one year only, it would be valuable to do a longitudinal research. The findings from the longitudinal research could be compared with the findings of this research, making it possible to motivate changes not only to the Pro400 module, but also to other similar dental clinical modules.

5.4.2 Specific module research

This research was specific to the PRO400 module therefore it was difficult to generalize the findings to other modules or programmes. In future it could benefit the rest of the dental faculty if a similar research could be conducted in other modules.

Reference

Albino J, Young S, Neumann L, Kramer G, Andrieu S, Henson L, Horn B and Hendrickson W. 2008. Assessing Dental Students' Competence: Best Practice Recommendations in the Performance Assessment Literature and Investigation of Current Practices in Predoctoral Dental Education. *Journal of Dental Education*, **72**(12):1405-1431.

Brabrand, C. 2007. Constructively alignment for teaching model-based design for concurrency (a case study on implementing alignment). brabrand@daimi.au.dk. BRICS/DAMI, *Department of Computer Science STENO, Department for studies of Science and Science Education University of Aarhus, Denmark. Invited paper for Invited Talk for TeaConc.*

Berthold, P. 2002. Competency based curriculum: An avenue to a realistic oral health curriculum in developing countries. *Conference proceedings from WHO Consultative Meeting: New Approaches in Oral Health Training and Education in Africa, Cape Town, South Africa.*

Biggs, J. 2002. Aligning the curriculum to promote learning. *Constructive Alignment in action: Imaginative Curriculum Symposium. LTSN Generic Centre.*

Biggs, J. 2003. *Teaching for Quality Learning at University*. What the student does. United Kingdom: Open University Press (Second Edition).

Bowen, J. 2006. Educational Strategies to Promote Clinical Diagnostic Reasoning. *The New England Journal of Medicine*, **355**(21):2217-2225.

Brown, S and Knight, P. 1994. Assessing learners in higher education. London: Kogan Page, London.

Bruner, J. 1966. *Toward a Theory of Instruction*. Cambridge, MA: Harvard University Press.

Collins Concise Dictionary of the English language, 1989.

Crafford, S and Bitzer, E. 2009. Consumer learning for university students: a case for curriculum *Higher Education Research and Development*, **28**(4):443-455.

Creswell, J. 2003. *Research Design: Qualitative, Quantitative and Mixed Methods Approaches. (Second Edition). London, Thousand Oaks: Sage.*

Cowan J, George, J and Pinheiro-Torres A. 2004. Alignment of developments in higher education. *Higher Education*, **48**:439-459.

Darke, P, Shanks, G and Broadbent, M. 1998. Successfully completing case study research: combining rigour, relevance and pragmatism. *Information Systems Journal*, **8**:273-289.

Denscombe, M. 2002. *Ground rules for good research: a 10 point guide for social researchers.* Philadelphia, Pa.: Open University.

Duffy, T and Cunningham, D. 1984. *Constructivism: Implications for the Design and Delivery of Instruction.*

<http://iris.nyit.edu/~kkhoo/Spring2008/Topics/Cons/ConstructivismImplications.pdf>.

Education Association of South Africa. 2002. A (heuristic) map of research traditions. Annual conference: University of Port Elizabeth. January.

Epstein, R. 2007. Assessment in Medical Education. *The New England Journal of Medicine*, **356**(4):387-396.

Fugill, M. 2005. Teaching and learning in dental student clinical practice. *European Journal of Dental Education*, **9**:131-136.

Gilgun, J. 2004. Qualitative Methods and the Development of Clinical Assessment tools. *Qualitative Health Research*, **14**(7):1008-1019.

Gillham, B. 2003. *Case study research method. Second edition.* London; New York: Continuum.

Gravett, S and Geysler, H. 2004. *Teaching and learning in higher education.* Pretoria: Van Schaik.

Gultig, J. (Ed.). 1997. *Understanding outcomes-based education. Knowledge, Curriculum & Assessment in South Africa. Learning Guide*. South African Institute for Distance Education and the National Department of Education.

Harden, R. 1979. Assess Clinical Competence- An Overview. *Medical Teacher*, **1**(6):289-296.

Hawthorne K, Wood F, Hood K, Cannings-John R and Houston H. 2006. Learning to mark: a qualitative study of the experiences and concerns of medical markers. *BMC Medical Education*, **6**(25):1-8.

Hays, R. 2008. Assessment in medical education; roles for clinical teachers. *The Clinical Teacher*, **5**:23-27.

Henzi D, Davis E and Hendrickson W. 2006. North American Dental Students' Perspectives About Their Clinical Education. *Journal of Dental Education*, **70**(4):361-377.

Hossam Handy. 2006. Blueprinting for the assessment of health care professionals. *The clinical teacher*, **3**: 175-179.

Houghton, W. 2004. Engineering Subject Centre Guide: Learning and Teaching Theory for engineering Academics. *Loughborough: HEA Engineering Subject Centre*.

Howley L. 2004. Performance assessment in Medical Education. *Evaluation and the Health Professions*, **27**(3):285-303.

Huitt, W. 2003. Constructivism. Educational Psychology Interactive. *Valdosa, GA: Valdosa State University*. <http://chiron.valdosa.edu/whuitt/col/cogsys/construct.html>

Jervis, M and Jervis, L. What is Constructive Alignment? Available at <http://www.bioscience.heacademy.ac.uk/journal/vol6/beej-6-5.aspx> Date consulted: 15 September 2010.

Learning Theories Knowledgebase, 2008. *Constructivist Theories at Learning –Theories.com*. <http://www.learning-theories.com> Date consulted: 22 September 2010.

Macluskey M, Hanson C, Kershaw A, Wight A and Ogden G. 2004. Development of a structured clinical operative test (SCOT) in the assessment of practical ability in the oral surgery undergraduate curriculum. *British Dental Journal*, **196**(4):225-228.

Manogue M, Brown G and Foster H. 2001. Clinical assessment of dental students: values and practices of teachers in restorative dentistry. *Medical Education*, **35**:364-370.

Merriam, S. 1998. *Qualitative research and case study applications in Education*. San Francisco: Jossey-Bass Publishers.

Miller, G. 1990. The Assessment of Clinical Skills / Competence / Performance. *Academic Medicine*, **65**(9):63-67.

Moffatt, S, White, M, Mackintosh, J and Howel, D. 2006. Using quantitative and qualitative data in health services research-what happens when mixed method findings conflict? Available at: <http://www.biomedcentral.com/1472-6963/6/28>. Date consulted: 26 July 2010.

Morrison, J. 2003. ABC of learning and teaching in medicine: Evaluation. *British Medical Journal*, **326**:385-387.

Morse, J. 1991. Approaches to qualitative-quantitative methodological triangulation. *Nursing Research*, **40**(2):120-123.

Mossey P, Newton J and Stirrups D, 1997. Defining, conferring and assessing the skill of the dentist. *British Dental Journal*, **182**(4):124-125.

Newble D, Dawson B, Dauphinee D, Page G, Macdonald M, Swanson D, Mulholland H, Thomson A and van der Vleuten, 1994. *Teaching and Learning in Medicine*, **6**(3):213-220.

Norcini, J. 2005. The Mini Clinical Evaluation Exercise (mini-Cex). *The Clinical Teacher*, **2**(1):25-30.

Norcini J and McKinley D. 2007. Assessment methods in medical education. *Teaching and Teacher Education*, **24**:239-250.

Race, P. 2007. The art of Assessing. *The New Academic* 4(3).

Rust C, O'Donovan B and Price M. 2005. A social constructivist assessment process model: how the research literature shows us this could be best practice. *Assessment and Evaluation in Higher Education*, **30**(3):231-240.

Shumway J and Harden R. 2003. AMEE Guide No.25: The assessment of learning outcomes for the competent and reflective physician. *Medical Teacher*, **25** (6):569-584.

Sofaer, S. 1999. Qualitative methods: What are they and why use them? *Health Services Research*, **34**:5 Part II (December).

Sofaer, S. 2002. Qualitative research methods. *International Journal for Quality Care*, **14**(4):329-336.

Pellegrino W, Chudowsky N and Glaser R. 2003. Knowing what students know: The science and design of educational assessment. Washington.

Plasschaert A, Manogue M, Lindh C, McLoughlin J, Murtooma H, Nattestad and Sanz M. 2007. Curriculum content, structure and ECTS for European dental schools. Part II: methods of learning and teaching, assessment procedures and performance criteria. *European Journal of Dental Education*, **11**:125-136.

Taleghani M, Solomon E and Wathen W. 2004. Non- Graded Clinical Evaluation of Dental Students in a Competency- Based Education Program. *Journal of Dental Education*, **68**(6):644-655.

Tashakkori A and Teddlie C. 2003. *Handbook of mixed methods in social and behavioral sciences*. Thousand Oaks, CA:Sage.

Tellis, W. 1997. Application of a case study methodology. *The Qualitative Report* (On-line

serial), 3(2). Available at: <http://www.nova.edu/ssss/QR/QR3-2/tellis1.html> . Date consulted: 10 September 2009.

Tennant M and Scriva J, 2000. Clinical assessment in dental assessment: A new method. *Australian Dental Journal*, **45**(2):125-130.

Terwel, J. 1999. Constructivism and its implications for curriculum theory and practice. *Journal of Curriculum Studies*, **31**(2):195-199.

Val Wass, Cees Van der Vleuten, John Shatzer and Roger Jones. 2001. Assessment of clinical competence. *Medical Education Quartet. The Lancet* 357:945-949

Winning T, Lim E and Townsend G. 2005. Student experiences of assessment in two problem-based dental curricula: Adelaide and Dublin. *Assessment and Evaluation in Higher Education*, **30**(5):489-505.

University of Stellenbosch.1999. Workshop on OBE 1999. *Faculty of Education*.

Yin, R. 1994. *Case study research* . Second edition. Thousand Oaks : Sage.

Yorke, M. 2003. Formative assessment in higher education: Moves towards theory and the enhancement of pedagogic practice. *Higher Education*, **45**:477-501.

Annexure 1

INFORMED CONSENT FOR CLINICAL RESEARCH

TITLE: Aligning assessment practices in a Prosthetic Dentistry curriculum.

This research is being conducted by Dr R. Maart at the University of the Western Cape's Faculty of Dentistry. The purpose of this mixed method study is to compare the relationship between the students' performance in the clinical tests with their theoretical performance in the Prosthetic 400 module. The second part of the study will explore the views of the academic staff involved with the clinical examinations, as well as those of the dental students at the UWC Dentistry Faculty.

I need your participation in this study to explore your views on students' performance in the clinical examinations and their theoretical performance in the Prosthetic 400 module. There are no known risks associated with participating in this study. The study involves an interview with the researcher and the results will be used to improve the Prosthetic 400 module and any articles to be published in medical education journals.

Your personal information will be strictly confidential and your identity will be protected at all times. You also have the option to refuse to participate in the study, or to withdraw from the study at any stage.

If you have any further queries or need any more information about this research, please contact Dr Maart at 021 9373157. Alternatively, you can e-mail us at: rmaart@uwc.ac.za.

Thank you in anticipation.

Regards,

Dr R Maart

TITLE: Aligning assessment practices in a Prosthetic Dentistry curriculum

IF YOU WILLINGLY AGREE TO PARTICIPATE IN THIS RESEARCH, please complete and sign the form below:

I agree to participate in this research. I also understand that the results will be used to improve the Prosthetics 400 module, and presented at educational and scientific meetings or in future publications of a medical education journal.

Name:

Address:

Telephone number:

Cell number:

E-mail:

Date:

Signature:

Annexure 2



**Prosthetic Study Guide:
Pro400: Prosthetic II
Removable complete dentures & Removable
partial prosthesis – Clinical**



Pro 400: Prosthetic II

Removable complete dentures & removable partial prosthesis – Clinical

Table of content:

1. How to use the learning outcomes
2. Module Descriptor
3. Lecturers' information
4. Attendance
5. Module evaluation
6. Assessment
7. Graduate Attributes
8. Lectures: content summaries and learning outcomes
9. Clinical: content summaries and assessment
10. Prescribed text and other recommended reading material

1. HOW TO USE THE OUTLINE AND LEARNING OUTCOMES

This study guide was designed as a **guide** to help you achieve the required competencies upon the completion of this module. These competencies include cognitive knowledge and clinical skills.

Before reading the outcomes, attention should be paid to the following general comments:

- The learning outcomes should provide students with a useful *aide memoire* when revising the content dealt with in the lectures. This serves to clarify what you should know and what you should be able to do upon completing a particular topic.
- As the outcomes have been prepared some months in advance, they may be provisional in some instances.
- Learning outcomes should be used in conjunction with all other handouts issued to students during lectures, etc.
- If a lecturer does not, in your opinion, cover the learning outcomes as outlined for a particular lecture, please ask her/him for a more detailed explanation
- Keep the learning outcomes with you during all classes, tutorials and when consulting lecturers. Add any other information the lecturer or tutor may communicate to you regarding the expected outcomes of particular activities.
- Please note that for self-assessment you can convert each of the outcomes below into questions and answer them orally or in writing, or by means of an annotated diagrammatic sketch.

2. MODULE DESCRIPTOR

Module name	Removable complete dentures & removable partial prosthesis
Home Department	Prosthetic dentistry
Module code	Pro400
Credit value	20 credit points
Duration	1 Year
Module type	Programme module
Level	Level 8.1
Main outcomes	<p>On completion of this module, the student will be able to:</p> <ul style="list-style-type: none"> • manage patients who present with advanced complications as a result of their edentulous state • describe jaw relations and movements • describe and evaluate the biomechanical aspects of tooth arrangement • identify and demonstrate the use of alternative occlusal schemes and techniques • demonstrate the use of complex articulators • identify and correct complex post-insertion problems • evaluate and describe the principles, rationale and technique in the placement of relines and resilient liners • identify and describe the biological aspects, principles and techniques in the construction of single dentures. • define and describe the changes in form and function of the mouth and jaw, brought about by the loss of some teeth • identify the possible social, behavioural and functional consequences of tooth loss • design an appropriate treatment plan • evaluate and justify the use of acrylic- / metal-based major connector • evaluate and recommend the appropriateness of treatment.
Main Content	<ul style="list-style-type: none"> • Special clinical procedures • Establishment of jaw relations • Use of advanced articulators • Alternative methods and materials in denture construction • Occlusion • Aesthetics

	<ul style="list-style-type: none"> • Tissue conditioning, relining, rebasing procedures • Single dentures • Denture failures • Assessment of individual needs and abilities of patients and monitoring of patients' levels of plaque control
Prerequisites	BChD I, II, III
Co-requisites	None
Prohibited combinations	None
Breakdown of learning time	<p>Contact with lecturer / tutor: 30 hours</p> <p>Assignments & tasks: 6 hours</p> <p>Tests & examinations: 7 hours</p> <p>Self-study: 10 hours</p> <p>Practicals / Clinicals: 145 hours</p> <p>Other (audiovisual aids): 2 hours</p> <p>Total learning time: 200 hours</p>
Methods of student assessment	<p>Achievement of minimum clinical quota (subminimum = 50%)</p> <p>Clinical assessment: Clinical examination (minimum 50% pass)</p> <p style="padding-left: 40px;">Continuous clinical assessment</p> <p>Written assessment: Scheduled tests</p> <p style="padding-left: 40px;">Assignment</p> <p>End of year assessment (for promotion)</p> <p>Clinical assessment 60 %</p> <p>Final year-end examination: 40 %</p>

3. LECTURERS' INFORMATION

Name	Office no	e-mail address	Tel. No.
Prof VJ Wilson	5.78 Mitchell's Plain	vwilson@uwc.ac.za	370 4415
Prof GAVM Geerts	3022 Tygerberg	ggeerts@uwc.ac.za	937 3133
Dr R Ahmed *	2006 Tygerberg	rahmed@uwc.ac.za	937 3080
Dr R Maart *	2120 Tygerberg	rmaart@uwc.ac.za	937 3197
Dr S Khan	3006 Tygerberg	skhan@uwc.ac.za	937 3000
Dr J. Cupido	Mitchell's Plain	jcupido@uwc.ac.za	370 4400
Prof Exner	Mitchell's Plain	vexner@uwc.ac.za	370 4400
Dr M Stuhlinger	A Level	mstuhlinger@uwc.ac.za	9373156

- Module co-ordinator

4. ATTENDANCE

Attendance at all lectures, practicals, clinical sessions, seminars, tutorials, etc. is compulsory. An attendance register will be kept for lectures. Students who do not comply with at least a 80% attendance figure will be allocated an incomplete coursework mark and will not be allowed to write the final examination in Pro400. Every lecture is regarded as a preparation for the clinical work that is to follow.

5. MODULE EVALUATION

The primary purpose of the module evaluation is to measure the effectiveness of our teaching and student learning. Feedback on the module provides valuable information for developing the design and delivery of this module for the future. Past module evaluations have been used to improve the module with regard to teaching and assessments. End-of-module evaluations will be done on the completion of the module, and used to review the module and for future developments. In addition, continuous evaluations will be done to evaluate innovative teaching strategies and clinical sessions.

6. ASSESSMENT

Date	Event	Content covered	Venue & time
1 st semester	Written test*/OSCE Clinical test	As per main outcomes	Exam venue, Tygerberg Campus
Assignment/Case-report	Term 1 & term 2		
2 nd semester	Written/OSCE* Clinical test	As per main outcomes	Exam-venue Tygerberg Campus
Clinical - refer to the "CLINICAL: CONTENT SUMMARIES AND ASSESSMENT"			

Semester marks are calculated as follows:

1st Semester: Written test / OSCE 30%
 50% / 50%)
 Assignment 10%
 Clinical mark 60%:
 (Clinical test 60%
 Continious clinical assess: 40%)

2nd Semester : Written test/OSCE 40%
 50% / 50%
 Clinical mark 60%:
 (Clinical test 60%
 Continious clinical assess: 40%)

The clinical mark comprises a minimum of 2 clinical tests. This test will be conducted during a clinical session. The students will be notified at the start of the clinical session. If a student patient is absent during a clinical session, she/he may be required to participate in the clinical test by doing peer assessment.

Clinical year mark

Only when all the minimum criteria have been met, will the clinical year mark be calculated as follows:

1 st Semester	40%
2 nd Semester	60%

Final examination

- To qualify for the final examination a **minimum of a 50% clinical year mark** is required, before all other promotion requirements are considered.
- In order to qualify for the final examination the student needs to obtain at least **50% in one of the semester tests** (Combined mark of Written and OSCE).

Final year-end exam mark is calculated as follows:

Written Exam -	50 %
OSCE -	50%

Final promotion mark:	Final examination mark	40%
	Year mark	60%

Supplementary examination:	Written	70%
	OSCE / Oral	30%

Final promotion mark:	Supplementary mark	40%
	Year mark	60%

7. GRADUATE ATTRIBUTES

Graduate attributes can be understood as qualities, values, attitudes, skills and understandings that a particular university sets out as being important for students to develop by the end of their studies. These attributes are intended both to equip students for future employment and their role as critical and responsible citizens, contributing to the social and economic well-being of society. At UWC the following graduate attributes have been identified:

1. Scholarship: An attitude or stance toward knowledge
2. Citizenship and the social good: A relationship and interaction with local and global communities and the environment
3. Lifelong learning: An attitude or stance towards themselves.

These overarching graduate attributes translate into the following six overlapping clusters of skills and abilities:

1. Inquiry: focused and knowledgeable
2. Critical and relevant literature
3. Autonomous and collaborative
4. Ethically, environmentally and socially aware and active
5. Skilled communicators
6. Interpersonal flexibility and confidence to engage across differences

The Pro400 module will strive to develop and support some of these skills and graduate attributes. Specific examples are the following:

i) Assignment

Learning outcomes related to the graduate attributes:

- The student must be able to create new knowledge and understanding through the process of research and inquiry
- The student must be able to seek, discern the use and apply relevant literature

ii) Clinical assessments

Learning outcomes related to the graduate attributes:

- The students must be able to work independently under the supervision of clinical supervisors, in a way that is informed by a desire to meet new challenges
- The students should be able to demonstrate good interpersonal communication skills with their patients, peers and supervisors

8. LECTURE OUTLINE AND OUTCOMES

THEME I: *Advanced Clinical Procedures.*

LECTURE 1: Special impression procedures

LECTURE 2: Diagnostic dentures

LECTURE 3: Single dentures

LECTURE 4: Immediate dentures

LECTURE 5: Pre-prosthetic surgery

LECTURE 6: Atrophic ridge

THEME II: *Management of complex post-insertion problems*

LECTURE 1: Denture soft liners incl. tissue conditioning

LECTURE 2: Relining and rebasing dentures

LECTURE 3: Denture failures

THEME III: *Occlusion & aesthetics*

LECTURE 1: Use of advanced articulators

LECTURE 2: Occlusal schemes

LECTURE 3: Aesthetics

LECTURES: LEARNING OUTCOMES

Theme I: Advanced clinical procedures

Learning outcomes: the student should be able to

- describe and demonstrate the alternative clinical steps and techniques pertaining to the construction of removable prostheses
- recognise and describe indications for alternative clinical steps and techniques in the construction of removable prostheses
- describe and demonstrate alternative impression techniques for recording the complete and partially edentulous ridge
- describe the rationale and indications for preprosthetic surgery
- discuss and describe the biological aspects, principles and techniques in the construction of single dentures
- describe appropriate occlusal adjustment during the construction of removable partial prostheses and single dentures

LECTURE: Immediate dentures

Learning outcomes: the student should be able to:

- examine the patient for an immediate denture, make a diagnosis and draw up a treatment plan specific to the needs and circumstances of this particular patient
- explain the indications and contra-indications of immediate dentures
- explain the advantages and disadvantages of immediate dentures
- perform the clinical and laboratory steps pertaining to the construction of an immediate denture
- adapt the basic principles of prosthodontics to the specific circumstances of the immediate denture patient
- provide post-operative instructions and care for the patient

LECTURE: Diagnostic dentures

Learning outcomes: the student should be able to:

- describe the types of diagnostic procedures and dentures
- describe the indications for diagnostic dentures
- explain the value of diagnostic dentures

LECTURE: Single dentures

Learning outcomes: the student should be able to:

- discuss and describe the biological aspects, principles and techniques in the construction of single dentures
- explain and demonstrate the jaw registration for a maxillary single denture opposing natural teeth
- describe appropriate occlusal adjustment during the construction of removable partial prostheses and single dentures
- discuss the constraints of constructing a single denture opposing natural teeth
- explain the clinical considerations when constructing a single denture opposing natural teeth
- discuss the advantages and disadvantages of various occlusal materials used in single denture construction

Theme II: Management of complex post-insertion problems

Learning outcomes: the student should be able to:

- recognise and manage complex post-insertion problems

- identify and describe the management of errors that result in the construction of removable prostheses
- recognise appropriate referral of the patient
- discuss the principle and rationale of relines, rebases and resilient liners
- describe the laboratory techniques for relines and rebases
- describe the technique in the placement of chair - side relines, tissue conditioners and other resilient liners

Theme III: Occlusion

Learning outcomes: the student should be able to:

- describe the components of the masticatory system, namely the teeth, periodontium and articulatory systems (TMJ, muscles of mastication and occlusion)
- explain the fundamental concepts of occlusion
- distinguish between an ideal and a normal occlusion
- discuss the occlusion in the dentate patient and compare that to the occlusion in the edentulous patient
- distinguish between occlusal contacts and occlusal interferences
- identify the border movements of the mandible in a sagittal and coronal plane
- perform an assessment of an occlusion / occlusal analysis and identify occlusal disharmonies
- perform occlusal adjustments / equilibrations

LECTURE: Articulators

Learning outcomes: the student should be able to:

- classify articulators
- describe the advantages and disadvantages of the different articulators
- explain the indications for the use of each articulator
- select an appropriate articulator for a specific procedure
- Perform a face-bow recording
- Transfer records to and demonstrate the use of a semi-adjustable articulator
- Demonstrate the setting of artificial teeth in balanced articulation on a semi-adjustable articulator
- Describe and demonstrate the correction of occlusal errors in the completed Prosthesis
- Perform a remounting procedure of completed prostheses

Lecture Schedule - BChD IV

Day: Monday

Venue: A1, A level, Tygerberg Campus

Lecture:

Department rules & clinical assessment system

Special impression procedures (1)

Partial denture block lectures(4)

Denture related complications (1)

Atrophic ridge (1)

Occlusal schemes (2)

Denture soft liners incl. tissue conditioning (2)

Relining and rebasing dentures (1)

Single dentures (1)

Preprosthetic surgery (1)

Aesthetics (1)

Use of advanced articulators (1)

Occlusion (3)

Immediate dentures (2)

9. CLINICAL: CONTENT SUMMARIES AND ASSESSMENT

Please note: this system supersedes and replaces all previous systems and documentation for this Department

9.1. Introduction

Clinical assessment for each semester is based on a number of factors:

- the number of sessions performed
- the clinical grading marks
- the quota requirements
- clinical tests

Minimum requirements are laid down for each of these assessments, as detailed below. It is the *student's* sole responsibility to ensure that she/he meets these minimum requirements. Failure to achieve *all* these basic minimum requirements will mean that a 50% clinical mark cannot be awarded. ***A 50% clinical mark is required for promotion.***

9.2. Semester weeks — minimum number of sessions to be worked

- Each semester is taken to have ± 20 clinical weeks available. A clinical session is defined as any 2-hour session in which a procedure in removable prosthetics is carried out.
- Not all these weeks are available for clinical work, because of examinations, block courses, illness, patient non-attendance, etc.
- Nevertheless, you are expected to have a mark recorded for a minimum number of sessions per year, as set out in the list of quota requirements. Failure to achieve this will result in a clinical mark of less than 50%, even if all other minimum requirements are met.

Students wishing to undertake further sessions may only do so after obtaining the written consent of their class and of the Department. However, the department **does not** encourage this practice.

9.3 Clinical grading mark

Clinical grades are awarded for both sessions and procedures carried out.

9.3.1 Session marks

A mark is awarded at the end of each session performed. This session mark grades the student for work carried out for the whole session, regardless of the number of procedures carried out in that session, or the number of patients seen. Consideration is given to:

- the *preparedness* of the student to undertake the work to be done in that session
- the student's *perseverance* in terms of the care and interest shown in achieving the highest possible standards
- the student's *willingness* to accept advice and instructions from the supervisors
- the *amount* of advice and help required.
- the student's communication skills when dealing with their patients and clinical supervisor

The session mark is modified by an evaluation of the procedure(s) to be carried out during this session. The assessment criteria that apply in this regard are detailed below.

9.3.2 Procedure marks

A procedure mark is an objective assessment of the finished prosthesis. Because this has gone through several procedures, more emphasis is placed on the session marks. This emphasis occurs naturally when all marks are considered together, as there will always be a larger number of session marks awarded.

When laboratory work is carried out, this should be assessed *at least one day prior* to the clinical session, and a mark awarded according to the assessment criteria set out below.

9.3.3 Criteria for the assessment of prosthetic sessions and procedures

9.3.3.1 Guidelines for the allocation of a mark for the session code (1100)

The degree of conformity to the following criteria will contribute to the session mark:

During the clinical session, the student:

- is fully prepared for the session, with the correct instrumentation and clinical guidelines at hand
- shows a willingness to accept advice and instructions from the supervisor
- works with perseverance in terms of care and interest shown in achieving the highest possible standards
- maintains a clean and tidy work area throughout the session
- displays a good student-patient relationship with obvious rapport
- conforms to the Faculty's guidelines for professional appearance and behaviour
- Possesses knowledge and understanding of the procedure carried out

A mark of 75% or more is awarded when the student conforms to the said criteria in all respects.

A mark of 50-74% is dependent on the relative degree of conformity to the said criteria.

A mark of less than 50% will be awarded whenever the student fails to conform to these criteria or displays an unprofessional demeanour.

A mark of less than 50% may also be awarded whenever the student fails to book a patient for a clinical session at least one day prior to that particular session; or when a booked patient presents for treatment and the student is absent, or when a booked patient is absent and the student refuses to carry out a procedure determined by the supervisor.

During each session, certain procedures are carried out, and the session marks will be modified by the guidelines for the procedure(s) carried out during the clinical session.

9.3.3.2 Guidelines for the allocation of a mark for procedures

See Table 1

9.3.3.3 Guidelines for the allocation of a mark for laboratory procedures

See Table 2

Table 1

GUIDELINES FOR THE ALLOCATION OF MARKS IN THE DEPARTMENT OF PROSTHETIC DENTISTRY

These guidelines are related to the procedure(s) or stage(s) of a procedure carried out during a clinical session. Apart from being used to assess the mark for a procedure code (when applicable), these guidelines also serve as **modifiers** to the mark given for the session code. The guidelines for session codes will still apply in either case.

On first presentation of a procedure or a required stage of a procedure, then:-

YEAR	MARK			
	75% and above	60-74%	50-59%	<50%
5	No fault is found.	A correction is required, which is then carried out without any difficulties or assistance. Also, student knows and understands what is required.	A correction (or more than one) is required but is not carried out satisfactorily the first time. Also, or alternatively, the student does not know or understand the correct procedure.	Student is obviously unprepared for the procedure and lacks knowledge and understanding of the procedure to be carried out. The fault/problem is not solved without assistance. <i>R.P.D. patients:-</i> The diagnosis misses caries, and/or treatment plan is obviously inappropriate. Excessive tooth destruction when preparing teeth.
4	No fault is found, or a correction is required which is then carried out without any assistance. Student readily understands what is required and knows the procedure to be carried out.	A correction is required which is then carried out satisfactorily. Student recognises the problem, and understands what is required. Student may not have carried out the procedure before.	A correction (or more than one) is required but is not carried out satisfactorily the first time. Student does not have the knowledge or an understanding of the procedure. <i>Second semester:</i> The fault/problem is not solved without assistance.	Student is obviously unprepared for the procedure and lacks knowledge and understanding of the procedure to be carried out. The fault/problem is not solved without assistance. <i>R.P.D. patients:-</i> The diagnosis misses caries, and/or treatment plan is obviously inappropriate. Excessive tooth destruction when preparing teeth.

Table 2

GUIDELINES FOR THE ALLOCATION OF MARKS FOR LABORATORY PROCEDURES

The work must be presented for evaluation *at least one day prior* to the appropriate clinical session, to allow for any corrections to be made without compromising patient treatment.

MARK			
75% and above	60-74%	50-59%	<50%
<p><i>Primary models & special trays</i> No fault is found.</p>	<p>Models do not conform to guidelines, but student aware of problems and knows how to overcome similar problems.</p> <p>A correction is required to special trays which student carries out without assistance.</p>	<p>Models do not conform to guidelines, student unaware of problems and does not know how to avoid similar problems.</p> <p>Trays do not conform to guidelines, are poorly finished, student needs assistance to correct any problem.</p>	<p>Models and trays unacceptable, student unable/lacks knowledge on how to correct problem(s).</p>
<p><i>Final models and record blocks</i> No fault is found.</p>	<p>Models do not conform to guidelines, but student aware of problems and knows how to overcome similar problems.</p> <p>A correction is required to the record blocks which student carries out without assistance.</p>	<p>Models do not conform to guidelines, student unaware of problems and does not know how to avoid similar problems.</p> <p>Record blocks do not conform to guidelines, are poorly finished, student needs assistance to correct any problem.</p>	<p>Model shows signs of the impression not having been boxed in or not correctly boxed.</p> <p>Record blocks clinically unacceptable.</p>
<p><i>Trial bases</i> No fault is found.</p>	<p>A correction is required which is carried out satisfactorily. Student knows and understands what is required.</p>	<p>A correction (or more than one) is required, but student is uncertain how to make the appropriate corrections.</p>	<p>Clinically unacceptable, e.g. untidy set-up; poorly finished wax surfaces; most posteriors set on the ridge; incorrect arch form, incisor inclinations, etc.</p>

9.3.3.4 Guidelines for the assessment of laboratory work

9.3.3.4.1 Complete dentures:

Primary models

- base 10-15mm
- land 2mm in width and trimmed flush with deepest part of sulcus
- no scratch marks on alveolar ridge
- model once trimmed should conform to the shape of the arch
- base parallel with alveolar ridge
- no porosities

Special trays

- must be clean and smooth, i.e. no sharp, rough edges, but not polished
- even thickness of material, particularly at the peripheries
- 3 small handles to be placed, one over each molar area, and one anteriorly, which is angled at no more than 45°
- periphery rounded
- upper tray to have relief holes in palate
- stops should not have sharp edges
- periphery conforms to line picked up from the impression or to line drawn on the model by the student, under supervision
- lingual flange not to be extended beyond the mylohyoid line

Final models

- as primary models BUT land 2-3mm occlusal to deepest part of sulcus, indicating that impression has been boxed

Record blocks

- good tissue detail within the base and an accurate reproduction of the sulcus depth and width indicating intimate adaptation to the cast
- no blackened, pitted areas or presence of fingerprints indicating a thin or stretched area due to overheating
- no instability, that is rocking or movement on the cast
- no areas of excess material beyond the land of the model
- wire strengtheners should be present
- no air bubbles trapped in wax
- no wax residues on fitting area

- occlusal rim should conform to the shape of the expected tooth arch, not the alveolar ridge
- width of occlusal rim:

anteriorly	6-8mm
premolar area	8mm
molar area	10mm
- labially upper rim should be 8mm anterior to incisive papilla
- height of upper occlusal rim: 18mm from depth of sulcus
- height of lower occlusal rim: level with base of retromolar pad, and parallel to the ridge
- length of upper occlusal rim: to first molars only

Trial base

- teeth to be placed where original teeth were most likely to have been, so that the arch form should follow the original arch of the teeth
- on average:- upper anteriors are 8-10mm anterior to the incisive papilla
 - incisal inclination is related to the anterior ridge inclination — it is helpful to imagine roots of the teeth
 - a tangent to the labial surface of lower incisors passes through the sulcus
 - a perpendicular through the buccal cusp of the lower first molar meets the buccal side of the crest of the ridge
- generally only the lower premolars are set directly over the ridge, because of the pattern of resorption

9.3.3.4.2 Partial dentures

- models to show no signs of bubbles, especially on occlusal surfaces of teeth
- models to be trimmed posteriorly so that they can be hand articulated
- special tray to have stops unrelated to teeth which will receive rest preparations
- model to be surveyed correctly, with locating grooves correctly placed
- design to be presented with correct details (there will be no penalty if design is not correct first time)

9.3.3.4.3 Repairs

- no excess repair material on fitting surface
- external surface to be finished correctly

9.3.4 Grading mark

9.3.4.1 Overall mark

It should be noted that grades are given for two reasons. The first is to provide a record of student ability and progress. The second (more important) is to provide feedback on performance to the student. For this reason, when grades are allocated, they should be allocated by the supervisor *in conjunction and in consultation with* the student. In fact, students should first grade themselves, and then discuss the grade with the supervisor.

Grades are allocated as follows:

75% and above	- Excellent
60-74%	- Acceptable / Competent
50-59%	- Acceptable / Competent
50%	- Unacceptable
PA	= Patient absent
SA	= Student absent (e.g. due to illness)

Failure to achieve an average mark of 50% for sessions, *and* for procedures and sessions combined, will result in a clinical mark of less than 50%, even if all other minimum requirements are met.

9.3.4.2 Patient procedure mark (code 1119)

In addition to the minimum average mark as set out above, each procedure code carried out on a given patient must also achieve an average mark of at least 50%, which will include all the sessions involved in that particular procedure. This is calculated in the same manner as above, by first selecting out all entries as per patient file number. *It is thus imperative that the patient file number be recorded at all times.*

Failure to achieve an average patient procedure mark of at least 50% will result in the cancellation of the quota for that procedure, so that it must be repeated until carried out satisfactorily. If more than one procedure is carried out on the same patient during the same sessions, all quotas will be cancelled if the minimum mark is not achieved.

9.4. Clinical requirements (quotas)

Due to the limited time available it is not possible to experience a large variety or number of procedures. Our aim is to equip students with the armamentarium to enable them to acquire knowledge and skills that they can build on and continually improve throughout the rest of their lives. Careful consideration has been given as to the type and number of procedures to be carried out.

There are minimum requirements for the qualitative aspects as set out above, and Table 3 specifies the cumulative minimum quantitative requirements for each year of study. Figures *not* appearing in brackets represent these minimum requirements.

A failure to meet these requirements will result in a clinical mark of less than 50%, even if all other minimum requirements are met.

Students are responsible at all times to ensure that they are organising their work and patients to conform to all these requirements. Students will receive a quarterly statement of the work that has been carried out, and are allowed one month to make any corrections. **Corrections will not be made later than one month after receipt of the statement.**

With reference to Table 3, please note:

1. The figures *not* appearing in brackets are the minimum quotas required for each year of study. The figures in brackets are additional procedures that students are encouraged to carry out.
2. All treatment plans must include a financial quote. **With the "new" Clinicom System, follow-up visits for the patient must be written down and booked at the prosthetic clinic – failure to do so will result in the student not being able to work in the clinical session as Reception will not issue patient folders without pre-booking.**
3. The treatment completed code (1128) is obtained normally only after the last recall visit. However, should a patient not turn up for this visit, i.e. at the recall visit after delivery of a denture, or after a previous recall visit, the treatment completed code can then be obtained. This code does **not** apply to repairs.
4. A single denture made to one existing complete denture in the opposite jaw qualifies for a code, not for a single denture, but for half the value of a complete denture. i.e. the mark entered will be 0.5 opposite code 8231.
5. The procedure not completed code (1126) applies if a patient fails to turn up for any further visits from the try-in stage onwards. This is to acknowledge work done by the student and may, at the discretion of the Department, be taken into consideration, should the student not achieve the required quotas.
6. If at the delivery / final visit the prosthesis does not fit, and has failed, (and needs to be remade), the student will not obtain the quota!

7. Laboratory work for all repairs (codes 8269, 8270, and 8271) must be carried out by all students.
8. Laboratory procedures for the codes 1122 and 1116 must be carried out by the student. **Lingualised occlusion:** students must carry out the set-up for the lingualised occlusion. This procedure must be signed off by the supervisor and recorded in the patient's file as well as on the laboratory sheet. Lingualised occlusion is to be done on an average movement articulator (Freeplane). The final Hanau code (1116) will be signed off at the delivery (8231) visit for the complete dentures.
9. The laboratory procedure code (1112) applies to the following:
 - all repairs (see point 5)
 - 4th year lab work for complete dentures:
 - primary models and special trays
 - secondary models and record blocks
 - trial bases and try-in
 - completed denture after processing (which will be carried out by the technicians)
 - 4th year lab work for partial dentures for primary models, special tray, survey, and design.
10. Procedures 1123 (Double alginate final impression) and 1124 (Compound & ZOE impression): **are to be carried out on bona fide patients.**
11. Procedure code 8245 (Immediate denture) applies to complete dentures (F/F, Single upper or lower) only and not to partial dentures! In addition to the immediate denture code, the student will also get the complete denture (8231) or single denture code (8232)
12. **No immediate dentures to be finished and delivered in the last month of the clinical year (October)! All immediate dentures to be finished and delivered in September.**
13. Examination and treatment plan must include a financial quote.
14. **No prostheses are to be finished and delivered during the last week of clinics!**
15. **All previous quota tables and requirements for this evaluation system are rescinded with the publication of this current version.**

PROSTHETIC DENTISTRY
CUMULATIVE MINIMUM CLINICAL REQUIREMENTS

CODES	PROCEDURES	2011 Cumul.	5th Yr	4th Yr	3rd Yr
1112	Laboratory procedure	16	4	8	4
1116	Use of Hanau Articulator	(1)	(1)	(1)	0
1115	Examination and treatment planning	16	9	6	1
1117	Bite plane (Michigan-type splint)	1	1	0	0
8231	Complete dentures	6	3	2	1
8232	Single dentures	2	1	(1)	0
8236 – 41	Acrylic partial dentures	4	3	1	0
8244;8245	Immediate denture	1	1	0	0
8259;61	Rebase / Reline	2	1	1	0
8265	Tissue conditioner (per denture)	3	2	1	0
8267	Soft base / Resilient liners	0	(1)	(1)	0
8269	Repair: fracture	2	1	1	(1)
8270/1	lost tooth	2	1	1	(1)
8270/1	addition of tooth or flange	1	1	(1)	0
8281	Partial denture, metal base	3	1	1	0
1118	Distal extension metal partial denture (altered cast)	(1)	(1)	(1)	0
1100	Clinical sessions	78	36	36	6
1119	Patient procedure mark	-	-	-	-
1106/7	Duplication	0	(1)	0	0
1120	Geriatric denture case	0	(1)	0	0
1121	Diagnostic denture	0	(1)	0	0
1122	Lingualised occlusion	2	1	1	0
1123 or 1124	Double alginate impression Compo and ZOE final impression	2 2	2 2	(2) (2)	0 0
1125	Oral case presentation	-	-	-	-
1126	Procedure not completed	-	-	-	-
1127	Implant supported overdenture	0	(1)	-	-
1128	Treatment completed	18	11	6	1
1129	Remounting procedure	1	(1)	(1)	

NB: The minimum clinical quotas **MUST** be **COMPLETED ONE WEEK**
PRIOR TO THE END OF THE CLINICAL YEAR.

**Students who fail to meet this requirement will not qualify to sit for the Final
Promotion Examination**

10. PRESCRIBED TEXTS AND OTHER RECOMMENDED READING MATERIAL

1. Prosthetic Treatment of the edentulous patient. *Basker RM, Davenport JC. 4th Edition* London: *Blackwell Munksgaard*, 2002. ISBN 0-632 05 998 -2
2. Boucher's Prosthodontic treatment for the edentulous patients. *11th Edition. Zarb*
3. *George A, Bolender Charles L and Carlson Gunnar E*, 1997, Mosby Year Book Inc : Missouri. ISBN 0-8151-9899x
4. Fundamentals of Removable Partial Dentures, *Owen CP (UWC)*. Printing Dept, Cape Town, 1998. ISBN 1- 919 713 - 58 - 1
5. Dental Materials and their Clinical Applications, *Wilson H, McLean J and Brown D*. London: Williams Clowes Ltd, 1988. ISBN 0-904588-19X.
6. Prosthodontic Treatment for Partially Edentulous Patients. *Zarb George A., Bergman BO, Clayton Joseph H, and MacKay Hugh F*. CV Mosby Company.
7. McCracken's Removable Partial Prosthodontics, (10th Edit), *Glen P McGivney, Alan B Carr* Mosby Co : St Louis, Missouri, 2000. ISBN 0-323-00678-7
8. Dental Treatment of the Elderly. *Bates JF, Adams D and Saunders GD*. Dental Practitioners Handbook Series No.35. Bristol : Wright.

Notes: