Introducing Portfolio Assessment as an alternative assessment method in the Department of Biomedical Technology at Mangosuthu Technikon: The perceptions of staff and students.

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DECLARATION

The work presented in this document was carried out in the Department of Biomedical Technology at Mangosuthu Technikon, in my capacity as a lecturer in the department. This study represents my own original work and has not been submitted to any other University. Staff members in the Department of Biomedical Technology at Mangosuthu Technikon, laboratory supervisors (who train students during experiential training) and final year group of students agreed to take part in the process with a view to improving teaching, learning and assessment practices in the workplace.

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ABSTRACT

The assessment procedures utilized in the Department of Biomedical Technology at Mangosuthu Technikon were critically reviewed. This revealed a rather narrow approach with an emphasis on traditional assessment methods such as tests and examinations that provide limited feedback that does not necessarily determine whether learning has taken place.

This study was prompted by the realization that the existing traditional methods of assessment promote or encourage a surface approach to learning which makes it difficult for the students to transfer the theoretical knowledge that they have attained into the practical performance that is required in the workplace.

The study was conducted over a period of four years using an action research approach, which revolved mainly around the use of the existing assessment methods and an evaluation of the participants' perceptions regarding the introduction of portfolio assessment in the Department of Biomedical Technology at Mangosuthu Technikon. During the study a group of students in the Department of Chemical Pathology was exposed to an in-course portfolio assessment as well as an experiential training portfolio assessment. A number of variables in the in-course portfolio assessment was tested. These variables were related to the concerns raised in the workplace. The introduction of the in-course portfolio showed some improvement in the way students performed their basic duties in 2005. The 2006 group of students was not exposed to the in-course portfolio assessment therefore this provided a better comparison of students by the employers.

The study also involved the lecturers in the department who had different opinions regarding portfolio assessment. It was found that some of them supported the idea whereas others felt that the time allocated for lecturers' duties did not permit them to introduce such a time-consuming assessment format.

Employers involved in the study clearly indicated which areas or skills students needed to develop before they could come to the workplace for experiential training. However, the researcher concluded that some of those skills could be accumulated with further years of work experience.

The study revealed that a significant portion of the students realized that, by integrating assessment in the learning process, they are able to be more critical of their own work, thereby putting more effort into understanding what they learn through the use of formative assessment. This in turn should pave the way for students to understand that learning is no longer teacher-centred, but learner-centred. This approach means that they are expected to work in more reflective and independent ways in the future.

The study highlighted a number of issues that need to be addressed in assessment strategies. The lecturers were accustomed to assessment system that was time-efficient and yielded the scores required by the system. However, the way this assessment system related to learning was not so clear to either lecturers or students. Particularly, students felt that a mark did not necessarily reflect what they knew about the subject matter. They argued that if the same subject content had been assessed in other ways, a different performance outcome might have been achieved. This means that the actual awarding of marks is an intimidating process for some students and that ways should be found to render assessment less intimidating or threatening. A critical finding of the study is that assessment requires not only a high level of critical reflection, but also active engagement and discipline-specific knowledge by the lecturers to make the necessary changes for an assessment method where students' learning is the centre of focus.

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CHAPTER 1

1. INTRODUCTION

1.1 Background Information to the study

Assessment is viewed by the researcher as an integral part of the teaching and learning process. Assessment procedures can take many forms and have many purposes. Traditionally, assessment has had a summative, accreditation function, which essentially judges the extent to which certain skills and knowledge have been mastered (Cox, 1996). The academic merit of this approach to assessment has been constantly questioned and in recent years there has been a general, worldwide shift in education practice, due to both external and internal pressures, towards integrating assessment with learning. There is thus a move away from the traditional, summative approach to assessment to one that tends to be more formative with an emphasis on integrating assessment with learning, which as a result has greater educational value.

The use of formative assessment is mainly to provide feedback for the improvement of learning. Formative assessment is the assessment that is focused on the improvement of learning rather than on the judging of final achievement. In fact, Stobart and Gipps (1997) stress that assessment can only be formative if it "feeds back into the teaching-learning process". They argue that in order for students to improve, effective feedback should enable them to know exactly what they would have to do to close the gap between actual and desired performance which cannot be achieved by mere grades or marks. The feedback as well has to be meaningful and adequate but brief comments.

Assessment should also serve the purpose of providing feedback to improve institutional objectives, as a means of reporting students' performance, and in the selection of students for further and higher tasks, challenges and responsibilities. Its goals also include monitoring progress, accountability to stakeholders, certification, diagnosis of learning outcomes and motivation. According to Webb (1992) and Torrance and Pryor (1998) three major purposes of assessment are: improvement of teaching and learning, making students accountable for learning partly through issuing certificates, and accountability of

institutions and lecturers (teachers). Crooks (1998) and Black and William (1998) stress in particular, the improvement goal of assessment: assessment must improve students' own learning and the quality of teaching. In doing so, this assessment must describe or diagnose the nature of student performance, and assessment information must be a valid, reliable and accurate description of student performance (Brown, 2004).

A regular review and improvement of teaching and learning practices should be done and should also include a review and improvement of assessment principles and procedures. An assessment is a measurement of students' knowledge, both during a course and at the end of a course. Judgments are made (usually expressed as a percentage) about the extent to which a student has achieved the course outcomes. Every effort is usually made to ensure that methods of assessment are objective, valid and reliable, although it is recognized that human judgments are prone to subjectivity. The information below gives background information on the assessment practices at Mangosuthu Technikon.

Tests and examinations have been used at Mangosuthu Technikon continuously to assess whether students have passed the grade or not. The tests (formal and informal) that are determined by continuous evaluation of a student's achievements per semester or per year constitute the course mark (which is considered as formative assessment). A student has to obtain a final course mark of at least 50% in order to gain entrance to the examination (Mangosuthu Technikon Examination Manual, Section 15: 2002). The student is subjected to a sub-minimum of 40% in the examination mark. In determining the final mark for a subject, the course mark based on the evaluation of the relevant subject during the academic year of study, and the examination mark, which is the student's achievement in the examination, are taken into consideration provided that the course mark and examination mark shall be used jointly to determine the final mark in the ratio of 40% (course mark) to 60% (examination mark).

This system has been followed within the institution since it was established 26 years ago. However the researcher believes that this type of assessment does not consider the diverse styles of learning for different students in different courses. The system has

resulted in the majority of students developing a tendency to be only interested in learning what they think they need to know in order to pass a test or an examination and not in whether or not they understand the content of what has been taught and be able to apply it accordingly. A few days before the tests or examinations are written, the students have a tendency of asking lecturers the scope of the test or examination. Thus students eventually decide to memorize all that they feel might come out of the test or examination within the scope supplied. This type of learning is viewed by the researcher as being extrinsically motivated and follows a superficial learning approach since it does not allow students to reflect on what they have learnt and apply this knowledge according to their understanding.

It is within this context that there exists a need to adopt a student-centered approach to assessment which will enable students to exercise a reasonable degree of responsibility for managing their own learning programme. Tests and/or examinations present a small proportion of class marks but these count for a great deal in representing a bias towards summative assessment, as well as a bias towards understanding the content. It is very important to remember that any classroom assessment affects students in many ways. For instance, it guides the student's judgment of what is important to learn, affects their motivation and self-perceptions of competence, structures their approaches to and timing of personal study, consolidates learning, and affects the development of learning strategies and skills. Herman (1992) states that good assessment is built on current theories of learning and cognition and is grounded in views of what skills and capacities students will need for future success. Since tests and examinations intend to summarize student attainment at a particular time, it is viewed as a summative form of assessment by higher education institutions and employers. However most importantly lecturers need to decide whether the assessment implemented actually does facilitate the learning process.

Based on the above explanation, the researcher decided to look at how assessment practices within the department assist students in their learning so that the students who graduate will possess the workplace's expected competencies. Through the researcher's

experience as a lecturer, the researcher has identified the following problem areas in the Department of Biomedical Technology:

- The current approach to assessment is insufficient in terms of directing students to a deep approach to learning.
- The existing traditional methods seem to be insufficient in assessing the students' abilities to relate theory with practices in the workplace.
- The traditional methods of assessment do not assist the students in learning medical concepts with understanding. This does not allow them to apply the knowledge in real-life situations.
- Feedback from assessments needs to be more thorough, as well as timeously implemented, for effective student learning.
- Students are not made aware of the assessment criteria.

Based on the above area of concern, there is a need to integrate assessment with the learning process. This means that assessment needs to be used as a learning strategy itself.

Biomedical Technology is a profession that has earned a lot of respect because of the responsibility it requires. It is the study of life sciences where technologists play a crucial role in the detection, diagnosis and treatment of diseases. This is done by examining and analyzing body fluids, tissues and cells. Personnel trained as medical technologists need good analytical judgment and the ability to work under pressure. Close attention to detail is essential, because small differences or changes in test substances or numerical reports can be crucial for patient care. Highly skilled-trained personnel are required to meet the demands of medical technology.

There has been some comments in the *Medical Technology News (MTN)* in August 2004 (a national newsletter for Medical Technologists) about the fact that students who come to them for experiential training are poorly prepared. This assumption was made because the majority of experiential training students were unable to perform basic procedures expected of them in the laboratory (Appendix 7: Advisory Committee Meeting Minutes

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of 21 May 2004).

These concerns call for lecturers in the department to re-evaluate their selection criteria as well as their teaching and learning strategies vis-à-vis the workplace requirements. As a consequence a number of factors should be reviewed in the Department of Biomedical Technology to lessen the problems of students' inability to perform adequately in industry. Those factors include the following:

- Entrance requirements for selection of students

The entrance requirements have not been changed at all since the Professional Body of Medical Technologists prescribed them and the Convenor Technikon agreed to standards set in 1998 and distributed them to all Technikons offering Biomedical Technology. The academics are still following those that are outlined in the Mangosuthu prospectus (2005) for the Faculty of Natural Sciences, which are nationally defined. Firstly, students are selected based on their performances on the senior certificate (matriculation) where English, Mathematics, Physical Science and Biology, should all be in Higher Grade with the minimum of E or Standard Grade with a minimum of D in Mathematics, Physical Science and Biology.

Candidates who have satisfied these minimum admission criteria have to avail themselves of further entry requirements by writing the psychometric tests conducted by an external company which assess candidates in Science, Numeracy and English. The results of these tests are taken into consideration as they are believed to give an indication of the potential of students in those core subjects. Thereafter all those candidates selected based on their performances in both the matriculation and psychometric tests are expected to come for the informal process. A panel of staff members conducts the interviews as appointed by the Head of the Department with one member representing the government sector and another representing the private sector. These interviews are conducted in order to ascertain whether these applicants understand what the course entails.

- Curriculum development

The curriculum in Biomedical Technology is reviewed annually by the Subject Committees (members who are experts in that particular subject) which include members from industries (state and private sectors) and Technikon lecturers. The curriculum review is also done nationally once every two years. At the time of the study the latest proposed model for future training of Biomedical Technology was in circulation for everyone involved to respond to as soon as possible.

- Continuous Professional Development

Most lecturers who are teaching in the Department of Biomedical Technology were practitioners in industry without any teaching background. However, these staff members are experts in the Medical Technology field. Mangosuthu Technikon developed in-house courses that, when completed, prepare them for teaching. In addition, lecturers are also periodically evaluated by the students on their performance as lecturers. This is done by means of an evaluation form that each student has to complete. These evaluations also help the lecturers to recognize the strengths and weaknesses prevalent in their lecturing approaches.

To keep themselves abreast with the latest technologies and methodologies, the lecturers are continuously or periodically expected to visit their respective laboratories in industry. This allows them to obtain the Continuous Professional Development (CPD) points which keep the staff abreast with the technical work.

Industry requires a competent, careful and critical graduate who understands what he /she has been taught in order for him or her to be able to identify, analyze, synthesize and apply knowledge and skills in the workplace appropriately. This is very important in Medical Technology since it is a field that deals with human life. Currently the perception among lecturers is that the students that qualify are competent considering the marks that they obtain in the summative assessment processes. However, industry's view of the students' competence is vastly different, as mentioned in the introductory paragraph**.**

The most fundamental problem with examinations or tests as perceived by the researcher is that they distort students' motivation and learning by over-emphasizing the importance of the scores as outcomes and measures of students' abilities. Research by Entwistle (1988) on academic motivation indicates that a focus on extrinsic goals (such as examination or test scores) and task completion (such as getting through the examination) undermines intrinsic motivation, interest and persistence.

Generally speaking, each student prefers different kinds of assessment depending upon his or her own learning style and opportunities. Entwistle (1988) illustrates the orientations that students demonstrate when learning. These orientations have the following characteristics:

- *Meaning orientation*. This is where a student tends to take a deep approach to learning and where he/she tries not just to learn facts, but to understand what they mean, how they relate, and what they have to do with the experience. The meaning-oriented learner is characterized by an "intrinsic motivation" to learn and a tendency to question conclusions offered in lectures and readings.

- *Reproducing orientation.* This student takes a "surface approach" to learning. He/she follows routine solution procedures, but does not try to understand where they come from, memorizing facts but not trying to fit them into a coherent body of knowledge. These students are characterized by an "extrinsic motivation" to learn, for example, they say they have to learn to pass the course, to graduate, to get a good job. These students have an unquestioning acceptance of everything offered in lectures and readings.

- *Achieving orientation.* This is where a student takes a "strategic approach" to learning, which involves finding out what the lecturer wants and delivering it. They dig deep when they have to, but stay superficial when they can get away with it.

The main goals of teaching in Biomedical Technology at Mangosuthu Technikon are to develop students' ability to communicate scientific concepts accurately; write effectively; relate principle concepts to real-world applications; synthesize and integrate information

and ideas; be reflective and effectively conduct self-assessment; and finally think creatively and critically.

These goals can only be achieved by means of relevant teaching and learning styles and commitment from both the lecturer and the student. Moreover, these goals have to be embedded through teaching and learning with understanding and evaluated through different tools and assessment methods. For example, it is very important for a Medical Technologist to communicate results or scientific findings accurately, because sometimes results may have to be given telephonically, and failure to communicate correctly may result in false diagnosis of the patient. Effective writing is also important because results need to be transferred to the requisition forms, therefore they should be written in a way that is legible to everyone.

Teaching in Biomedical Technology becomes most appropriate and relevant when students are able to integrate a number of complex ideas, procedures, and relationships. Therefore learning and assessment have to be moved from the lecturer to the student if the learner is expected to demonstrate and provide evidence that he or she has mastered a given set of learning objectives.

The most useful form of assessment would be the one that will allow students to compose their solutions to multifaceted tasks, where such solutions may be unique to the individual student. Such tasks may be typically complex or somewhat undefined and may involve problems that will require students to apply, synthesize and evaluate various problem-solving approaches.

These goals in Medical Technology are also in line with the "critical outcomes" required for every qualification or programme of study as prescribed by the South African Qualifications Authority. These critical outcomes demonstrate students' ability to communicate effectively using visual, mathematical and/or language skills in the modes of oral/or written presentations; identify and solve problems by using creative and critical thinking; organize and manage themselves and their activities responsibly and

effectively; work effectively with others in a team, group, organization and community; collect, analyze, organize, and critically evaluate information; use science and technology effectively and critically, showing responsibility towards the environment and the health of others; understand that the world is a set of interrelated systems and recognizing that problem-solving contexts do not exist in isolation; and finally, show awareness of the importance of effective learning strategies, responsible citizenship, cultural sensitivity, education and career opportunities and entrepreneurial abilities (*Department of Education*, 1997).

Apart from students being perceived as not workplace competent, the throughput rate in the department is low. For example:

Table 1: 2001 Students statistics

Year	Number of students enrolled	Drop-outs	Students graduated in record time (3 years)	Students graduated after 4 years of study	Students still in the system in 2005
2001	41	17	17	1	6

This is the picture of what happened in students graduated in 2001. Below is also a three-year record of students enrolled and graduated within the specified time.

Table 2: Statistics obtained from the Academic Registrar's office for the Department of Biomedical Technology at Mangosuthu Technikon from 1999 - 2001

Year	Number of students enrolled	Number of students graduated
1999	30	9
2000	30	17
2001	41	17

This drop-out rate of students has an impact on the subsidy that an institution receives from the Department of Education. An article "Alarming drop-out rate" in the *Sunday Times* (02/07/2000) drew attention to the fact that "one in three students at some South African universities or Technikons are dropping out costing the government about R1.5 billion a year in subsidies and draining the institutions of millions. Some institutions reported drop-out rates from 10% to 27% and up to 40% for 1999 first year students. The reasons included wrong career choices, a poor school system and financial hardship". Not only do tertiary institutions have relatively high drop-out rates; they also have relatively high failure rates. This does not only affect tax payers whose money is used to subsidize students but it also has negative consequences for the unsuccessful students as it may affect chances of finding lucrative employment. This article raised a concern in the mind of a committed lecturer in a higher education institution to such an extent that it prompted this study. It is essential that strategies be found to improve students' throughput and completion rates.

Research studies that identified students' approaches to learning appeared in the mid-1970s, mainly in the works of Marton and Saljo (1976), Entwistle and Ramsden (1983), and Biggs (1987). These studies identified qualitatively different ways in which students approach learning; approaches that have become known as "deep" and surface". In teaching over the past 20 years, there has been a move towards teaching methods that

encourage deep, rather than surface approaches to learning. However, how students approach their learning is still undervalued in higher education, as it is assumed that by the time a student enters higher education, he or she has already learnt how to learn/study (Fourie, 2003).

It was in this context that this study was undertaken in order to determine students' and staff members' perceptions regarding assessment in the Department of Biomedical Technology at Mangosuthu Technikon. The focus was on the introduction of the portfolio assessment method as an alternative assessment method which can be more informative in comparison to traditional assessment methods (tests and examinations) that take a more summative approach to assessment.

A portfolio "is a systematic collection of students' work" (Popham, 2002). Portfolio assessment provides an authentic evidence of students' learning experience, enabling the integration of teaching, assessment and learning (Klenowski, 2002). A portfolio measures each student's achievement while allowing for individual differences between students; addresses improvement, effort, and achievement, and represents a collaborative approach to assessment (Tierney, Carter and Desai, 1991). It is a veritable vehicle of building capacity to learn and engagement with learning.

1.2   Origin of the Study

The study was self-initiated as a result of the observations of students in Biomedical Technology who did not perform as expected in the workplace. These students had been found to perform very well in their academic years in the institution as evident in their assessment results, in contrast to their performances in the workplace. This concern was raised a number of times during the Advisory Board meetings (August 2004 minutes) by a number laboratory supervisors (in control of students' training in industry).

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1.3   Aim of the Study

The aim of the study was to analyze the attitudes and perceptions of staff and students in the Department of Biomedical Technology at Mangosuthu Technikon regarding assessment for the purpose of gauging the possibility of introducing portfolio assessment as a means of enhancing what students learn at the Technikon and their awareness of what is required of them in the workplace.

1.4   Objectives of the Study

The objectives of the study were to establish, whether the existing traditional methods of assessment that were used actually assist students in their learning; how effectively these existing assessment methods enhance students' understanding of concepts in Biomedical Technology; how portfolio assessments could improve on students' learning; how portfolio assessment could assist staff to reinforce their teaching; and finally to provide more clarity on how portfolio assessment can be used in order to encourage a student-centred deep learning approach.

1.5   Research Question

What are the perceptions of staff and students towards the introduction of portfolio assessment as a formative assessment method in the Department of Biomedical Technology at Mangosuthu Technikon?

1.5.1   Sub-questions

- What are the perceptions of staff and students regarding the existing assessment methods in the Biomedical Technology environment?

- What are the perceptions of staff and students regarding the existing assessment methods with reference to the requirements of Good Laboratory Practices?

- What are the students' perceptions on portfolio assessment when used as a formative type of assessment?

- What are the perceptions of staff in using portfolio assessment to reinforce their teaching?

- How do employers rate our students' skills and competences at an experiential training level?

1.6 Hypotheses

- The first hypothesis was that students who have been exposed to portfolio assessment will recognize the value of this method as it will prepare them for more efficient application of knowledge and skills in the workplace.

- The second hypothesis was that the members of staff in the Department of Biomedical Technology will have a clear and unambiguous concept of what portfolio assessment is and what it entails, and that they will be adequately prepared to introduce it with ease.

- Finally, it is also hypothesized that students, who have been exposed to portfolio assessment in their years of study at the Technikon, will perform more effectively in the workplace than those who had no portfolio experience.

1.7 Structures and Approach

Chapter 1 states the rationale of the problem being researched as well as the background with respect to the investigation. Chapter 2 outlines the theoretical review of literature in respect of assessment, especially formative and summative assessments. Chapter 3 addresses the research methodology and research design that this study employed. This study was viewed as an action research study. Chapter 4 deals with the research tools employed in this study. This chapter also addresses the underlying rationale, sets out the planning, subjects identified for the study and also discusses the administration of the questionnaires as well as some limiting factors. Various analytical techniques were employed in processing the data.

Chapter 5 presents the analyses of data of the various study groups. The findings are discussed in the final chapter (6), which places the investigation into context. The findings are outlined and recommendations are made regarding possible objectives for encouraging diverse methods of assessment. The appendices of items referred to in the study appear at the conclusion of the study.

CHAPTER 2

2. CONCEPTUAL FRAMEWORK: ASSESSMENT IN EDUCATION

2.1 What is assessment?

The practice of assessment has long been firmly rooted in the positivist and reductionist paradigm in which assessment was viewed as an objective and authoritarian process that assumed that intelligence is a fixed, measurable entity (Lunt, 1993). A shift in thoughts in the last forty years, has offered alternative approaches to teaching and learning. In this context assessment tends to be more subjective than objective and more non-authoritative than authoritative based on human interactions and judgments. It is from this critical theory paradigm that the researcher has chosen to define assessment, using Rowntree's (1987) definition.

> 'Assessment in education can be thought of as occurring whenever one person, in some kind of interaction, direct or indirect with one another, is conscious of obtaining and interpreting information about the knowledge and understanding, or abilities and attitudes of that other person. To some extent or other it is an attempt to know that person. In this light, assessment has to be seen as a human encounter'.

This definition is observed as emphasizing the subjectivity and judgment which need to be involved in assessment (Luckett & Sutherland, 2000), and is discussed in more detail in this chapter in an effort to unpack the reasons why this study was undertaken.

The move towards using learning outcomes to define and structure the learning and assessment of students has been widespread in education in the United Kingdom. Much emphasis has been placed on the role of assessment in student's learning (Biggs, 1996, 2003). The results of the researcher's phenomenographic study into student conceptions of assessment, using learning outcomes in the design project (Shreeve, Baldwin, & Farraday, 2003), indicated that within a body of students there will be a variation in the way that assessment itself is conceived, and such variation can affect the way students approach learning (Laurillard, 1984).

2.2   The influence of assessment on learning in higher education

In higher education learning is certainly a journey of discovery. The process of education needs to bring remarkable changes into the lives of the adult students. Through the journey of gaining a higher level of education, adult students must be able to learn that learning is tied up with assessment. Learning and assessment are life-long processes that everyone has to embark on and, as long as you are a student, this journey never ends.

Assessment is fundamental to the way in which students learn. It places a premium on what is to be learnt, is signaling that lecturers should place value on what is being assessed. The form that assessment takes also dictates the way in which students approach the assessment task; students perceive that certain assessment can afford either a deep learning approach or a surface learning approach (Laurillard, 1984). The design of the assessment task is then central to the way in which students approach learning.

The way in which students learn has been the focus of research for some time. Three different approaches to learning that have been identified and widely accepted in the educational literature are deep, shallow (or surface) and strategic approaches to learning (Ramsden, 1992; Entwistle, 1988; Entwistle & Ramsden, 1983).

Surface approaches to learning describe an intention to complete the learning task with little personal engagement, seeing the work as an unwelcome external imposition. This intention is often associated with routine and unreflective memorization and procedural problem solving, with restricted conceptual understanding being an inevitable outcome (Entwistle & Ramsden, 1983; Trigwell & Prosser, 1991; Entwistle, McCune, & Walker, 2001).

Deep approaches to learning, in contrast, lead from an intention to understand, to active conceptual analysis and, if carried out thoroughly, generally result in a deep level of

understanding. A student who adopts a deep approach to learning seeks to understand what he/she is learning; is actively interested in the learning material; tries to relate ideas in a subject to ideas from other areas; and attempts to base conclusions on evidence and reasoned arguments (Ramsden, 1988; Kember, 1996). The motivation associated with a deep approach is essentially intrinsic: the student seeks to satisfy personal curiosity. Such a student is more aware of more aspects of his/her learning situation and of his/her experiences of similar situations than a student who adopts a surface approach to learning (Trigwell & Prosser 1998). The deep learning approach usually entails discussion, reading and reflection, resulting in a broad understanding of the subject. Learning in this case involves meaning and understanding, and it is the student who constructs the knowledge rather than a lecturer.

The third approach is the strategic approach where a learner transpires when the main motivation is achievement of high grades and revolves around optimizing effort and time to achieve this end. This approach can involve both deep and surface approaches to learning. The learner adopts it because it is significantly related to a student's intellectual development and conception of learning, along with the learning context.

Underlying conceptions are linked to the actions or approaches which lecturers and students will adopt (Kember, 1996; Trigwell & Prosser, 1998). Where conceptions do not extend to the highest or broadest category of conceptions, the approaches adopted will be limited. Students who only conceive of assessment as being something which is done to them for the purpose of correction will be unable to see their role in assessment as a partnership to develop their understanding of the project tasks. To them learning is seen as a banking system of knowledge that does not enhance participation of learners.

2.3 Teaching approaches

It is a fact that the quality of teaching and the attitude of lecturers influence students in their approach to learning (Gow & Kember, 1990). There is ample evidence to confirm that good teaching encourages a deep approach to learning (Gow & Kember, 1990). The generic aim to good teaching should therefore be to encourage students to adopt a deep approach to learning and to discourage the use of surface approach (Biggs, 2001). Unfortunately, most teaching practices and courses induce students towards reproductive forms of learning (Kember, 1996).

Perhaps the most significant influence on student's learning is their perception of assessment (Ramsden, 1988) rather than what they are being taught. The nature of assessment clearly has an influence on students' approaches to specific tasks (Gow & Kember, 1990). Teaching and assessment methods may very often encourage a surface approach to learning when they are not aligned to the aims and objectives of teaching the subject (Biggs, 2001). Students could, for example, set out with the intention to use a deep approach and understand the material in the course, but they could find that the assessment requires of them to reproduce defined bodies of knowledge. After trying to understand the material, they then learn it by heart so that they can reproduce it in tests or examinations, and obtain good marks (Kember, 1996). Thus, assessment may encourage passive, reproductive forms of understanding to which such forms of learning inevitably lead (Ramsden, 1988).

Beyond percentage scores many students have little knowledge of what is involved in assessment and why they are assessed. Research has shown (*Consumer Guide,* November 1993) that students at all levels see assessment as something that is done to them on their class work by someone else... or as something that they have to go through as students. Creating portfolios may show students what they are good at and what they need to work on. According to the Northwest Evaluation Association, a portfolio is "a purposeful collection of student work that exhibits the student's effort, progress and achievements". Self-assessment is an important skill that is learnt through the use of portfolios. In this

case, apart from students being rated either "good" or "bad", students learn how to look for specific criteria that will render their work acceptable or not.

2.4   Principles of good assessment

There are important values to take into consideration when contemplating assessment strategies (Race, 1998). Validity of the assessment method ensures that what is being assessed is actually being measured, so it is important that assessments such as portfolio assessment clarify exactly what is being assessed.

The criteria for assessment should also be clear and well defined thus allowing staff to assess fairly to ensure reliability of measurement.

Transparency also has to ensure that links between learning outcomes and assessment criteria are obvious to the student. Fairness is encouraged when all students have equal opportunity to succeed and when these opportunities are seen to be fair. Equity in assessment must show that no discrimination between students will occur and that no individual will be disadvantaged.

Assessment should allow for formative progress and feedback to be provided to the student continuously to aid in student learning. Assessment should show opportunities for redemption from failure if things go wrong and should stretch the student to ensure quality.

Based on the above values, it is important that diversity exists in the assessment process of a course to ensure that the same students are not repeatedly disadvantaged by the use of similar procedures. Assessment must be fair, accurate and comprehensive (Brown & Glasner 1999). Assessment should be equitable in that it should not discriminate between student groups or individuals. Brown and Race (1996) emphasized that there is a need to broaden the range of assessment methods beyond the written account that is the customary basis of most essays and unseen time-constrained written examinations.

According to Race (1998), the most important thing lecturers do for their students is to assess their work.

Many traditional assessments provide only a snapshot of a student's ability at a single point in time but this may not be enough to assure the lecturer of a student's fitness to practice or of his/her professional competence. Fletcher (1992) argues for a flexible approach to the timing of assessment and the researcher would argue for approaches that enable lecturers to assess students when they feel ready to demonstrate competence rather than when it suits their system. At Mangosuthu Technikon there are dates that are actually set per semester to "test" students. As a result students are so accustomed to taking tests on those fixed dates only, that if one wants to assess them by any other means at any other time, they show resistance. One negative effect of traditional assessment methods (tests or examinations) on learning is test or examination anxiety.

Black & William (1998) provide strong evidence from an extensive literature review to show that classroom "formative" assessment, properly implemented, is a powerful means to improve student learning. But summative assessments such as standardized examinations can have a harmful effect on learning. It is very important to make students understand assessment and learning. Courses which are assessed summatively mainly at the end of the semester do not allow the teachers enough opportunities to gauge how the learning is proceeding (Mbali, 1999). Continuous assessment which is a series of summative tests and assignments spread through the term, also often miss the opportunities for formative feedback, reflection on criteria and re-writing or re-submitting of the work.

2.5 Traditional assessment and its influence on learning

Traditional forms of assessment, usually in the form of formal tests and examinations, tend to be more summative and are mainly used for accreditation purposes. The focus is on content and the final product of learning. The criteria for traditional assessment tend to be implicit and marking as a result is within structured references. The basic assumption in traditional assessment is that intelligence is a fixed, objectively measured entity and that testing should be context-free (Jacob; Luckett, & Webbstock, 1999). This is based on the behaviourist education theories which assume that behaviour can be accurately pre-determined and brought to others in a rational, straightforward way. Again this behaviour is often a summation of individual experiences (Zuber-Skerritt, 1992). Furthermore, the student is assumed to be a passive receiver of knowledge and the educator is the knowledge expert with the necessary skills and techniques to transfer knowledge to the students. Again it is emphasized that the assessment process usually follows from the transmission mode of teaching.

The following problems are associated with traditional forms of assessment. They are presented here as separate issues:

- Since there are no transparent criteria when they (students) are assessed, the process appears, from the students' point of view as a secret process. This may lead to high levels of anxiety (Jacob *et al. 1999*).
- Since students tend to revise at the last minute for examinations and/or tests (summative assessment), they rely on memory and rote learning (Jacob *et al, 1999*).
- Students tend to focus on what will be assessed at the expense of gaining broader understanding of the topic or subject matter (Elton & Laurillard, 1979).
- A good pass does not necessarily mean that the student has understood the key concepts (Dahlgreen, 1984).
- Traditional assessment provides little or no feedback to students (Lund, 1995).
- With staff being in control of the aims, objectives, tasks, criteria and outcomes of the

assessment, this discourages students from becoming autonomous learners who can take responsibility for their own learning process (Boud, 1990).

- Since the nature of the assessment task influences the approach to learning (Ramsden, 1997), traditional forms of assessment encourage a passive, surface approach to learning.

Race (1998) argues that the most common advantages of summative assessment (tests and/or examinations), making them popular as they are, are that they are time efficient, cost-effective, easy to achieve equality of opportunity, less prone to plagiarism, staff and students are familiar with them and they also encourage students to learn certain subject matter.

Today, it is generally recognized that the commonly used series of examinations can only provide the lecturer with a quick and limited/random view of the knowledge a student has actually achieved during a semester course (Slater, 1997). Examinations can help eliminate plagiarism, but they only give the student one chance to show her/his capabilities, because they tend to measure particular types of knowledge, and can favour those who can withstand stress and have good recall skills.

The traditional methods do not provide the lecturer with enough information to ascertain why the student gave a particular response. Brown & Glasner (1999) have found that 90% of a typical degree depends upon unseen time-constrained written examination. These examinations require students to perform under pressures and time constraints. As a result students develop strategic capacity in respect of the topics studied and the questions answered, and selectivity in the material presented.

One of the primary purposes of assessment is to be summative. In its summative role, the purpose of assessment is to judge the quality and characteristics of the student and summarize these in a clear and acceptable format. Traditionally, the principal mechanism for summative assessment is the end-of-module examination. A summative assessment is assumed to help employers by providing "costless" information on the productive

potential of job applicants. It is also a mechanism for selecting students for post-compulsory education, and may be a factor in the reputation and financial security of institutions in higher education. Students care most about the results of summative assessment, as this impact on their employability and prospective earnings.

2.6   Formative and Continuous assessment, their influence on learning

There is evidence showing that high quality formative assessment does have a powerful impact on student learning. Black and William (1998) recognize that standardized tests compared to formative assessment are very limited measures of learning and that most classroom testing encourages rote and superficial learning. By contrast, formative assessment occurs when the lecturer feeds the information back to the students in ways that enable the student to learn better, or to engage in a similar, self-reflective process. If the primary purpose of assessment is to support high-quality learning (principle one *in Principles and Indicators for Student Assessment Systems*), then formative assessment ought to be understood as the most important assessment practice.

Moreover, formative assessment should strictly be to provide feedback to the student on their learning. It provides students with advice on how to maintain and improve their progress, but should not form part of their summative grade or mark. Continuous assessment usually involves a series of tasks that are individually assessed, though sometimes it is appropriate to add a final assessment to continuous assessment. It is best used when there are several distinct module-learning outcomes which are achieved at definable stages during the module.

Formative assessment is intimately linked with students' learning processes, helping to guide them in their studies, motivating them, providing feedback on areas of learning requiring further work, and generally promoting the desired learning outcome. While most assessments are both continuous and formative, it is argued that their function increasingly predominates in a way that affects student learning as follows:

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- It provides feedback to students.
- It motivates students.
- It diagnoses students' strengths and weaknesses.
- It helps students to develop self-awareness.
- It contributes to evaluating the strengths and weaknesses of modules and improves the quality of learning and delivery.

Continuous assessment can provide a more reliable estimate of students' capabilities and can indirectly measure a student's capacity to manage time and handle stress. With continuous assessment, the total assessment workload on both staff and students may seem greater than that experienced with one-off final assessment, but this workload is more evenly distributed. Timely feedback is an important part of continuous assessment as it informs the learner on how well he/she is progressing and how he/she can improve.

2.7 The guiding principles for assessment in higher education

2.7.1 A holistic approach

Assessment strategies in a course ought to be congruent with the aims for student learning in the course. It is also, however, important that assessment procedures be in harmony with the lecturer's educational approach. The aims of the course should emphasize deep understanding and scientific thinking, and the lecturer may focus on these aims during lecturing, but if students are only expected to reproduce or rearrange information on tests or examinations, the majority of students focus their learning on the reproduction of facts despite the aims and teaching approach in the course. Most of the assessment procedures that are used by lecturers frequently encourage memorization and regurgitation of facts, formulas and theories (Crooks, 1998). A clear connection between aims, teaching approach and assessment procedures is imperative for the promotion of the aims of higher education.

2.7.2 Assessment as students' reward for their activities and outcomes

In view of the important role which students play in their learning, Ramsden (1988) states that "the goal is easily stated but difficult to achieve, is to make the pleasing of teachers and demonstrating of understanding as closely overlapping as possible". Therefore, assessment procedures should discourage the reproduction of facts and theories and the manipulation of formulae, but should require of students to demonstrate deep understanding of important principles and concepts and how these issues interrelate, as well as the application of knowledge in unfamiliar situations. Furthermore, assessment procedures sometimes implicitly encourage fragmented thinking when tasks do not require an overall view of students. This happens when assessment tasks focus only on subsections or modules of the subject content which eliminates the need for an integrated view.

2.7.3 The choice of assessment methods

The selection of an assessment method should be guided by the aims and objectives of students learning. An important guideline in this respect is the unlikelihood of any single method to be suitable for the assessment of all objectives of the course. A variety of assessment methods should be employed because multiple aims demand multiple methods and different assessment methods call forth different kinds of qualities from the students (Rowntree, 1987). Therefore it is important that lecturers explore variety of assessment methods and that they do not adhere to a single traditional method (Brown & Knight, 1994; Gravett, 1996).

The communication of assessment criteria should include the nature of assessment procedures, the materials that must be prepared or studied (content specifications), and the evaluation criteria. It is important to discuss the nature of assessment methods with students to help them understand how the assessment procedures relate to the course aims and objectives.

2.7.4   Assessment and feedback

A very important function of assessment, which often does not receive adequate attention in higher education, is that assessment should provide feedback to students in order to assist them in rectifying and consolidating their learning. Rowntree (1987) considers feedback so vital that he calls it "life-blood of learning". However, only constructive feedback can be the life-blood of learning. There are several requirements if feedback is to be constructive. Constructive feedback is mainly consistent with the assessment criteria which were communicated to students and should thus reward what is valued in a course, it should identify areas of strength and weakness clearly, is phrased as positively as possible so as not to damage student motivation, it should indicate ways of improving and future performance, and it should be rapid (Brookfield, 1990).

While explicit personal feedback to each student is the ideal, it is not easy to provide individual feedback to large groups. Detailed feedback can nevertheless be provided to a large group by using an assessment information sheet which may consist of criteria used to judge the work, together with the ratings and comments on students' performance on each criterion (Brown & Knight, 1994; Gravett, 1996).

When providing feedback, it is essential to consider students' present understandings. Brown and Knight (1994) highlight this issue as follows:" feedback, ideally, ought to involve the interplay of the lecturer's understanding with that of the student". A dialogue is also essential, and it should focus on typical strengths and weaknesses and should be initiated in such a way that students will perceive the exchange as supportive of their learning processes. However, after supplying general feedback to students in class, students should also be encouraged to discuss their progress personally with the lecturer.

2.7.5   Self-assessment as a self-reflection opportunity

Boud and Falchikov (1989) state that self-assessment refers to involvement of learners in making judgments about their own learning, particularly about their achievements and the outcomes of their learning. In a slightly later work, Boud (1991) extends this definition by stating that in self-assessment students need to be able to identify criteria or

standards themselves, and make judgements on the extent to which they have met these criteria.

Boud (1990) stresses that, there is evidence that students are able to make sound judgments about their own learning. If students are provided with opportunities to do reflect on themselves, independence and responsibility can be enhanced. Self-reflection also helps students to develop those skills which they need to continue to pursue learning outside educational institutions (Candy & Crebert, 1991).

A further reason why students should be involved in assessing their own work is that self-assessment is a valuable tool for effective learning. Self-assessment provides learners with an opportunity to take responsibility for their own learning and it gives learners greater ownership of the learning which they undertake. Assessment is then not a process in which students are subjected to but it becomes a participative process in which they become involved.

According to Race (1998) the most important thing lecturers can do for their students is to assess their work properly. Assessment is the general term used for the purpose of finding out how well students have mastered the curriculum. This means that it is a form of checking whether learning has taken place. Altman (2000) concludes that students learn best when they are actively engaged in thought-provoking work. He argues that more basically, assessment in education can be thought of as occurring whenever one person, in some kind of interaction directly or indirectly, is conscious of obtaining and interpreting information about the knowledge and understanding, abilities and attitudes of the other person. To some extent or other it is an attempt to know that person. In this light, assessment can be seen as a human encounter (Rowntree, 1987). In education, academics are mainly conscious of this human encounter thus finding out about their students' evidence of knowing.

Unfortunately, many factors do not allow lecturers to dedicate their time in class to stimulate students to take a deep learning approach: they usually give them tricky tests to

see if they can "do more plugs in," and then gripe that they are either competent or incompetent. With the pressures to delivery in education the onus is upon lecturers to do justice to students because at the end the institution is blamed for not performing when students cannot cope in the workplace. This calls for students-perceived relevance of the subject matter, clearly stated instructional objectives, practice and feedback and appropriate assessment which will promote a deep approach to learning. A deep approach allows for the learner to relate the task at hand to what is already known, to read widely, to discuss with others, to find the task as personally involving and to find learning emotionally satisfying (Biggs, 1999). Such students want assessments that demonstrate their own thinking and lecturers who can encourage the discussions and interactions with their ideas (Entwistle, 1991).

The researcher argues for re-evaluations of assessment practices that are in place in the Department of Biomedical Technology at Mangosuthu Technikon. The researcher feels that assessment procedures deserve much more thoughtful attention than is currently the case in the institution, however, it is acknowledged that assessment is fundamental to teaching and learning which in turn impacts very greatly on competencies expected in the workplace. Despite many other types of assessment method, the researcher wishes to explore whether portfolio assessment can improve students' learning in the department of Biomedical Technology.

2.8   Why portfolio assessment?

The overall goal of the preparation of a portfolio is for the learner to demonstrate and provide evidence that he or she has mastered a given set of learning objectives. Portfolios are more than thick folders containing student's work. They are personalized, longitudinal representations of a student's own efforts and achievements. Additionally, portfolios have an important impact in driving student learning and they have the ability to measure outcomes such as professionalism that are difficult to assess using traditional methods.

The main purpose of this research was to apply the concept of continuous improvement to students' learning by enhancing the best methods of assessing students formatively in the course, thus addressing the lack of performance of students in the workplace. Most academic departments of the institution engage in periodic self-reviews as part of institution's three-year program review process. The reviews have also required that the department should come up with the assessment plan that will balance the student's theoretical performance with practical expertise.

In general terms, portfolios provide a means by which students can record their learning activities and achievements in a comprehensive manner that encourages individuality. In summary, a portfolio in this respect is described as a summary of students' accomplishments, self-reflective statements which describe the students' learning practices and also as a collection of information and materials which provide a record of the range and quality of teaching and learning activities.

Portfolios may be compiled to include both formative and summative assessments. Students and lecturers may use portfolios for self-development purposes, in which the focus is on the improvement of teaching and learning practices, i.e. formative assessment. Portfolios can also be used as an evidence-based document describing a student's development and accomplishments. Feedback is in the form of identifying each student's weaknesses and strengths and also offering alternative, corrective measures to ensure that deep learning takes place.

2.8.1 Feedback in portfolio assessment

Feedback that is comprehensive, timely and of good quality is a very important factor in driving students' learning. Assessment should provide feedback to students on their progress towards the achievement of learning outcomes. Feedback enables students to realize where they have done well and it indicates what they could improve on, as well as justifying the grade/mark of summative assessments.

It is important that feedback is timely. If provided too soon, it may disrupt the student's reflective process. However, it is far more common that feedback is provided too late when it is no longer salient to the student. The benefits of successful feedback are as follows:

- It builds confidence in the student;
- It motivates students to improve their learning;
- It provides students with performance improvement information;
- It corrects errors;
- It identifies strengths and weaknesses in the student's understanding of the work.

2.8.2   Reducing Anxiety through portfolio assessment

The researcher prefers portfolios because they seem to remove the students' perceived level of test or examination anxiety. This reduction shows up in the way students attend to class discussions, relieved of their traditional vigorous note-taking duties. Students think that they are learning much better because they internalize the material while working with it, think about principles and applying concepts creatively. This has been evident with the in-course portfolio that the researcher introduced to one group of students.

2.8.3   The in-course and experiential training portfolios

The in-course portfolio required students to revisit the work that they had done in their first semester in the department. This section was done in order to assist students to revise the work that is done routinely in the laboratory. The researcher realized that students forget this important piece of their learning done at the Technikon two years. During their last semester at the Technikon, the Chemical Pathology III syllabus mainly covers the specialized tests that are not routinely done in the laboratory. This section required them to perform laboratory calculations as well as solution preparations and dilutions (See appendix 1- guidelines for the in-course portfolio assessment). Students were also given the opportunity to reflect on any learning unit in Chemical Pathology III

which they felt was important for them to understand and why that was the case. According to students this exercise assisted them a lot in understanding portfolio requirements of the experiential training portfolio.

Guidelines to be followed on experiential training portfolios were laid down (see Appendix). Following up of the experiential raining portfolio guidelines was simplified by the previous engagement to portfolio assessment at the Technikon.

2.9   Conclusion to the Chapter

Thus the portfolio assessment was chosen as a focus for this research because it seems to enhance student learning in all aspects explained above:

- Increasing opportunities for self-reflection on their learning.
- Reduces anxiety
- Improves validity and reliability of assessment
- Encourages students adopt deep approach to learning with the intention to understand and actively analyze concepts.
- Encourages transparency fairness in assessment
- Encourages students to work on feedback provided by lecturers.
- Connects with the workplace competencies

CHAPTER 3

3.   RESEARCH METHODOLOGY

3.1   Introduction

In order to address the research methodology and the research design of the study in a logical, programmatic manner, this chapter opens with a consideration of the research problem, the main research question and the derived sub-questions.

The literature review and conceptual framework presented in Chapter 2, together with adherence to a particular research paradigm outlined in this chapter, inform the way in which the research problem and research questions were approached. The approach thus adopted informed the choice of strategy to follow and the design of the actual research process. The selection of a particular research design implied the use of certain sampling and data collection methods. These are discussed in detail below. This discussion leads naturally to a discussion of data capturing, data editing and data analysis techniques selected for this specific study. Finally, shortcomings and sources of error will be addressed.

3.2   Action research

Hopkins (1985) and Ebbutt (1985) suggest that the combination of action and research renders that action in a form of disciplined enquiry in which a personal attempt is made to understand, improve and reform practices. Action research is concerned equally with changing individuals on the one hand and, on the other, the culture of the groups or institutions to which they belong. Proponents of action research argue that traditional educational research failed to impact significantly on educational practice (Robson, 1993 and Zuber-Skerritt, 1992) and that an effective way of promoting change should be used as an appropriate and effective means to integrate educational research and teaching practice.

3.3   What is action research?

Action research is known by many other names, including participatory research, collaborative inquiry, emancipatory research, action learning, and contextual action research, but all are variations of the same concept. In its simplest term, action research is "learning by doing" – an individual or a group of people identify a problem, do something to resolve it, see how successful their efforts are, and if not satisfied, try again. While this is the essence of the approach, there are other key attributes of action research that differentiate it from common problem-solving activities that we all engage in every day. What separates this type of research from general professional practices, consulting, or daily problem-solving is the emphasis on scientific study which is to say the researcher studies the problem systematically and ensures that the intervention is informed by theoretical considerations.

The more widely accepted definitions of action research include the following:

'Action research is the systematic study of attempts to improve educational practice by groups of participants by means of their own practical actions and by means of their own reflection upon the effects of those actions (Ebbutt, 1985).

'Action research is critical collaborative enquiry by reflective practioners who are accountable for making the results of their enquiry public, they are self-evaluative in their practice, and engaged in participative problem-solving and continuing professional development' (Zuber-Skerritt, 1982)

'Action research is a form of self-reflective enquiry by the participants in social situations, undertaken in order to improve understanding of these practices in context, with the view to maximizing social justice' (Carr & Kermis, 1986).

Action research in our own teaching practice is an important source of learning for a group of students. Here, the researcher describes the nature of action research, and

describes its use in the on-going development and evaluation of assessment practices. The researcher hopes to show that an action research approach to teaching can be used to improve teaching and learning practice. Action research has been used in many areas where an understanding of complex social situations has been sought in order to improve the quality of life.

3.4   Action research paradigm

The purpose of action research includes professional understanding, and personal growth (Noffke, 1997). Professionally its purpose includes staff development and that also adds to the knowledge base for teaching. The action leads to shared knowledge and to the improvement of the academic and social curriculum.

The personal purpose for engaging in action research includes teachers to become more familiar with research methods and develop personal knowledge and theories. The action involves understanding self and others. As educators respond their struggles, they place issues of personal meaning alongside issues of professional growth, their changing attitudes, and the transformations they are going through in journals and oral histories.

Kurt Lewin used an 'action research' approach in his work with people affected by post-war social problems (Lewin, 1948). Action research was brought into the education settings in the late 1960's and early 1970's with the teachers taking on the role of researchers; particularly in the secondary education sector (Riding, Fowell & Levy 2001).

Cohen and Manion (1994) define action research as 'a small-scale intervention in the functioning of the real world and a close examination of the effects of such intervention'. The rigour of action research is attested by Corey (1953) who argues that it is a process in which practitioners study problems scientifically so that they can evaluate, improve and steer decision making and practice.

Hopkins(1985) describes action research as an informal, qualitative, formative, subjective, interpretive, reflective and experiential model of inquiry in which all individuals involved in the study are knowing and contributing participants. Other authors (Zuber-Skerritt, 1992; Ebbutt, 1985) consider action research as bringing about practical improvements and innovations and also for the professional development of educators (Winter, 1996; Zuber-Skerritt, 1992). The approach by these authors is located better within the interpretivist paradigm in which the aim is some practical improvement.

In contrast to the emancipatory and practical interests, action research may also be implemented to improve the effectiveness and efficiency of educational practice, in which case it can be known as technical action research and this is located within the positivists paradigm defined by Cohen and Manion (1994). Carr & Kermis (1986) suggests that technical action research is the least powerful and emancipatory action research is the most ideal.

It is believed that an action research approach contributes very positively to activities within the institution because it is concerned with teaching quality issues, and with national Teaching Quality Assessment initiatives. Action research methodology offers a systematic approach to introducing innovations in teaching and learning. Stenhouse (1979) suggests that action research should contribute not only to practice, but to a theory of education and teaching which is accessible to other teachers, making educational practice more reflective (Elliot, 1991).

Regardless of the ultimate purpose, the concept of reflexivity is central to action research. Whereas technical action research can be regarded as reflection-in-action, practical action research can be related to reflection-on action. In this context emancipatory action research is based upon critical reflection resulting in a change in the system itself.

Since this study shows an explicit agenda of changing society as well as practices within education, the researcher considers it as emancipatory action research (Cohen, Manion & Morrison, 2000). Emancipatory action research seeks to develop in participants their

understandings of illegitimate structural and interpersonal constraints that are preventing the exercise of their autonomy and freedom. This research aims not only at the technical and practical improvement of assessment in the Department of Biomedical Technology at Mangosuthu Technikon but also aims at the participants' better understanding, transformation and change within the existing boundaries and conditions which impede the desired improvement in the system or organization.

3.5   Limitations encountered with action research

Apart from the benefits the notion of reflexivity can bring to the research process, the researcher also needs to be aware that some problems can still be encountered with the approach.   Cohen and Manion (2000) state that reflexivity requires 'self-conscious awareness of the effects participants as practitioners and researchers have on the research processes and how their values, attitudes, perceptions, opinions, actions, feelings can feed into the situation being studied'. The participants as practitioners and researchers need to critically scrutinize their own interpretations in this light.

Furthermore, practical considerations for action research are that the extent of the research needs to be limited as the researcher is usually required to do the research at the same time as the normal work.

Lastly, for action research to be successful, an environment in which democratic processes are encouraged needs to be in place, otherwise it will be difficult to implement changes where the study reveals the need for such changes.

3.6   Action research in this study

The main aim of this study was to introduce an alternative assessment method that will assist students to synthesize and apply knowledge gained to the workplace situations in order to address the existing problem raised by industry of students' inability to link theory with practicals in the workplace.

This study had two iterations of essentially exposing students to the same type of unusual assessment practice, one which was an in-course portfolio assessment and secondly an industry-type of portfolio assessment. This provided what seemed to be a perfect framework for an action research approach. It was assumed that after planning, acting and observing trends in the students' performance, critical reflection would lead to a measurable understanding of how students perceive portfolio assessment. This measurement was coupled to the views given by staff members and laboratory supervisors on the introduction of portfolio assessment and the way they understood portfolio assessment.

In order to identify the paradigm in which the study is located, the following guiding factors must be noted:

- The aim of the study was practical as it attempted to improve students' approach to learning by broadening their assessment base;
- The approach of the study was descriptive (rather than prescriptive);
- The approach is also holistic in the sense that on attempt made to gain insight into and an understanding of staff members' students' and employers' attitudes and perceptions regarding portfolio assessment;
- The study attempted to focus on and gain insight into a group of selected individuals in a specific environment;
- The approach also allowed the researcher who is a lecturer in the department under study to participate actively in the process.

Because comprehensive information addressing issues of interest to assessment is difficult to obtain from a single source, the general approach of assessment is described as one of 'triangulation'; that is, arriving at an understanding of the best assessment practices that can be followed in Medical Technology at Mangosuthu Technikon. This was achieved by determining students', staff members' and employers' perceptions about portfolio assessment when used as an informative and reflective assessment method.

By the nature of their composition, experiences and expectations, these groups would

bring somewhat different information and perspectives on available assessment tools to the study. Therefore the information was obtained separately from three study groups and a series of analyses were conducted to address the main objectives of the study. The research methodology used in this study focused primarily on the following data collection efforts:

- A questionnaire was administered to the final year Medical Technology students;
- A semi-structured interview was conducted with the academic staff members in the Department of Biomedical Technology;
- A questionnaire was administered to employers offering experiential training to Medical Technology students.

All participants were informed of the research purpose of the study, and they were assured that their participation would be anonymous and voluntary.

CHAPTER 4

4. RESEARCH TOOLS

4.1 Students' Questionnaire

Part of this study was conducted by eliciting the participation of final year students from the Department of Biomedical Technology at Mangosuthu Technikon. These students had been engaged in portfolio assessment used as a formative assessment method in the course Chemical Pathology III (Appendix 1 – Guidelines for the in-course portfolio assessment). After consultation with the students, the portfolio contributed 20% towards their final course mark. The same group of students was exposed to portfolio assessment in the Chemical Pathology discipline during their experiential training (Appendix 2 - Guidelines for portfolio assessment in industry).

A questionnaire (Appendix 4) was designed in order to allow students to establish whether the introduction of the portfolio assessment as an alternative assessment method to the existing assessment methods employed in the department of Biomedical Technology.

The focus of the survey included the following:

- Firstly, the researcher was interested in ascertaining whether the existing assessment methods would assist students in understanding the major concepts in Medical Technology, and whether they would apply this knowledge effectively when they reached the workplace environment. The researcher devoted Section C to determine students' perceptions by comparing traditional and portfolio assessment methods. Section (D) required students' opinions on in-course portfolio as well as the experiential training portfolio assessment. At the same time, the researcher was interested in determining the extent at which students are familiar with the importance of assessment in their learning.

- Secondly, a number of statements on assessment and learning were composed and students were tasked to select the three that they consider most important in their

learning (Section B). Underpinning this section, of course, were questions on whether or not students could relate assessment to learning (Section B: 4 and 5). Examples of statements included: *'I try to learn facts to understand how they are related, 'assessment allows me to understand practicals better'.*

- Finally, Section A (9) and (10) were open-ended questions asking students to explain activities that motivate and make them increase their performance in the classroom.

Students have to go through experiential training before qualifying as Biomedical Technologists. This training in Medical Technology is done in the sixth semester of training. The experiential training carries 60 credits in the qualification and it is only done at the Accredited Pathology Laboratory.

This study seems to have been done on a small number of students, but that was the actual number of students who was at the level of experiential training in 2006. These students were exposed to traditional forms of assessment such as tests and examinations and to portfolio assessment both in their final 2005 semester at the Technikon and also in industry during their experiential training.

4.2 Staff survey: Semi-structured interview

During interviews staff members can provide information about their perceptions or attitudes regarding a specific issue, and a researcher is able to identify a number of feelings of the respondents through, for example, the tone of voice, facial expressions. However, such interpretations by the researcher may be highly subjective.

The use of interviews as a data collection method begins with the assumption that the participants' perspectives are meaningful and knowledgeable, that they are able to make their responses explicit, and that their perspectives will affect the success of the project. The researcher felt that an interview, rather than a paper and pencil survey would be

more effective with staff members because of the importance of interpersonal contact, and it would also allow for opportunities to follow-up on interesting comments. Moreover, an interview was preferred by the researcher because of the manageable number of participants in this group.

4.3 Procedure for the Interview

Before the start of the interview the following points were stressed to the participants: the interview was strictly anonymous, and no one other than the researcher would know who said what. The participants were asked to try to be as open and honest as possible; there were no right or wrong answers to the questions. The participants were advised by the researcher to feel free to discontinue their participation in the study or halt the interview at any stage. Participants also requested the researcher not to use the tape recorder because they feared a form of retribution should their anonymity be compromised.

Each lecturer in Biomedical Technology was given a brief, verbal explanation of the research, and were asked to indicate their interests by signing up the consent form (Appendix 6 – Staff members consent form). Written information about the interview session, including instructions, a consent form and a list of the questions to be asked was distributed to interested lecturers. This questions used are presented in Appendix 7 – semi-structured interview questions. After a week, the lecturers were asked again if they were still interested in taking part in the study. The interviews took place privately in the participants' offices. An informal atmosphere was maintained at all times to avoid intimidating the participants.

Each interview session did not last more than 60. The researcher took the notes by hand. At the end of the session, each participant was also given the same questionnaire (Appendix 7) that had been discussed during the interview to fill it up. This was done in order to reconnect the points that the researcher might have not picked up during the interview since it was agreed that the tape recorder should not be used. The respondents were given the option of completing the questionnaire immediately at the end of the

interview session or taking it away to complete over the next day. However, all of them preferred to complete the questionnaire at the same time and handed over to the researcher immediately. Participants were thanked for taking part and a brief explanation was given of my future plans regarding the research. Participants were not paid for taking part.

The researcher was able to interview only four staff members because the fifth one was on sick leave.

4.4 Employers' survey

The researcher felt that the employers' survey would assist in providing information on which kills could they recommend to the Technikon lecturers to vigorously engage their students on. To explore the employers' opinions, a questionnaire was administered. A copy of the questionnaire is presented in Appendix 5. The questionnaires were given to 6 laboratory supervisors from the Accredited Pathology Laboratories in KwaZulu-Natal. There was no misunderstanding identified in any of the questions. Supervisors clearly stated their ratings on the skills that students should acquire at the Technikons to be able to perform to the expectations during their experiential training.

4.5   Analysis of responses

4.5.1 Students' questionnaire

Only 20 students of 24 final year students participated in the study, because that was the final number of students who made it through to the experiential training. Four students left out of the study because they still had some courses to complete at the Technikon before they could be able to go for experiential training. The quantitative data obtained from the students' questionnaire assisted the researcher to draw some valuable conclusions.

The answers to closed questions in the questionnaire were analyzed in a semi-quantitative manner using frequency distributions curves and tables. However, the open-

ended comments provided additional and equally valuable insight into students' perceptions regarding the assessment methods they had been exposed to. They were not coded but were utilized in quotations during the discussion at the end of each questions' responses.

4.5.2   Staff members' and employers' surveys

Since this was an action research project, the reflections of staff and employers (laboratory supervisors) were taken into consideration and were utilized extensively to guide the process. The nature of these reflections was not easily quantified, but a record of them was well managed. As mentioned in the research methodology section, the researcher was continually mindful of the fact that her views, values, attitudes, feelings and perceptions, (Cohen *et al.,* 2000) could possibly influence the process.

CHAPTER 5

5.   ANALYSES OF DATA

5.1   Student questionnaire

The students participated willingly and constructively in the process. The mere fact that the students had been exposed to both the Technikon education and experiential training informed their judgments on the issue of assessment methods. It was sometimes difficult to contact the students during their experiential training, but the strategy to visit them in the workplace, explain the whole process and wait for them responding on the questionnaire made a high turnover of responses.

The majority of the students (80%) used IsiZulu as their home language, whereas 15% of students use IsiSotho and 5% used IsiSwati as their home language (Section A, Q1).

The gender and age range of participating students (Section A, Q3 & Q4) is presented in figure 1 below:
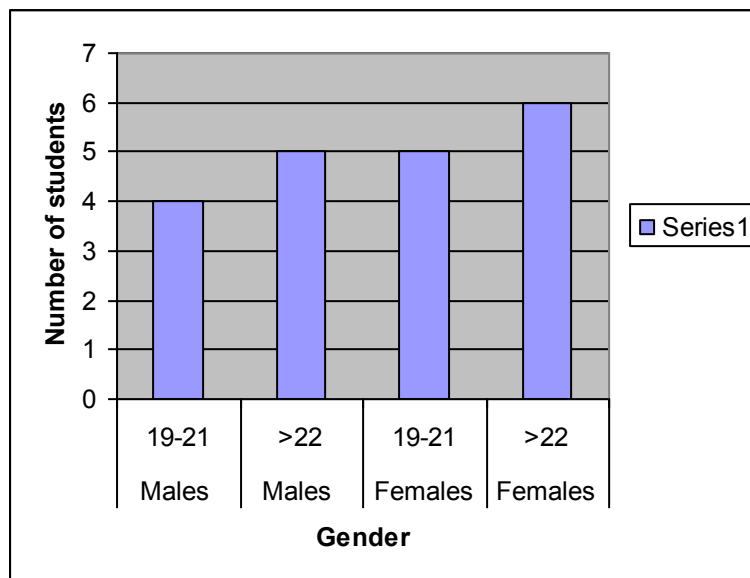
Figure 1: The gender and age range of students

Figure 1 above indicates that the majority of students in Biomedical Science for the year

2006 were females in the age group above 22 years.

The psychometric test (Section A Q6) was done by 85 % of the students. Psychometric testing is one of the criteria for students' selection but the Head of the Department may also use his own discretion if a student with very good matriculation symbols wishes to enroll after the psychometric test has been written. One with an A Standard Grade and B Higher Grade symbols in Mathematics and one with a B Standard Grade in Mathematics and a B Standard Grade in Physical Science were admitted.

Section A Q7 revealed that 50% of the students had been exposed to a science laboratory before they came to Mangosuthu Technikon whereas 50% saw a science laboratory for the first time when they arrive at the institution. This is viewed by the researcher as a problem that needs to be rectified in high schools rather than in a higher education institution because students need to have a basic knowledge of laboratory equipment and apparatus before coming to the institution if they have been doing Physical Science as a subject at school.

The Department of Biomedical Technology at Mangosuthu Technikon selects its students based on four subjects as outlined in Chapter 1, Mathematics, Physical Science and Biology with the minimum requirement an E Higher Grade or a D Standard Grade. The findings obtained based on their matriculation results were as follows:
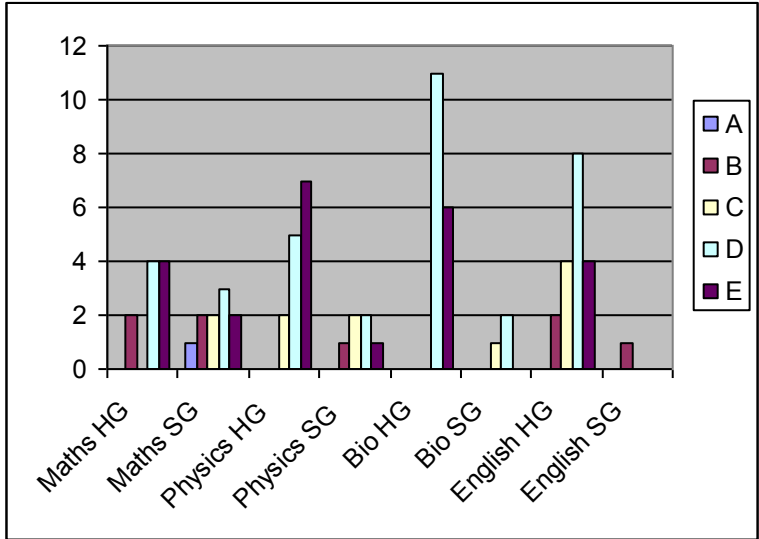
Figure 2: Distribution of Matriculation results of participating students

It was envisaged that the matriculation results would be compared with the students' performance in the psychometric test but this was beyond the scope of this study.

Table 3: Most frequently repeated subjects by students (Section A Q8)

Subjects	Number of students
Pathophysiology II	4
Cellular Pathology II	4
Anatomy & Physiology	3
Physics I	3
Haematology II	2
Microbiology I	2
Microbiology II	2
Biochemistry II	1
Blood Transfusion II	1
Chemistry I	1
Cellular Pathology III	1
Chemical Pathology III	1

This table aims at identifying which subjects were repeated the most by the students in an effort to find the root of the problem. The department experiences problems in this regard because some of these subjects that are repeated are pre-requisite subjects that enable a student to proceed to the next level. If the subject is not passed, the student cannot proceed.

From the table above it becomes clear that students find Pathophysiology II and Cellular Pathology II most difficult to pass. The reason for this could not be determined but may be can in another study as a comparison between achievement in subjects, and between matriculation achievement and tertiary education achievement. This comparison was beyond the scope of this study.

Tables 2, figure 3 and Table 3 below show the distribution of students' responses to two open-ended questions. Table 2 and figure 3 indicate the different activities that motivated

students to take part in the classroom and Table 4 shows the activities that would make them increase their performance in class. The practical sessions seemed to be the most liked classroom activity. The researcher thought this was the case because the fact that they were on experiential training they have realized how important the practicals that we do at the Technikon to make them understand what is required of them in the workplace.

Table 4: Activities that motivate students in the classroom (Section A Q9)

Activity	Number of students
Practical sessions	11
Group discussions	8
Presentations	6
Feedback from lecturer after assessment	5
Positive comments from the lecturer	3
Tutorials	3
When given a chance to correct errors	2
Peer discussions	2
Individual study	1
Portfolio discussion	1
Being asked probing questions	1
Assignments	1
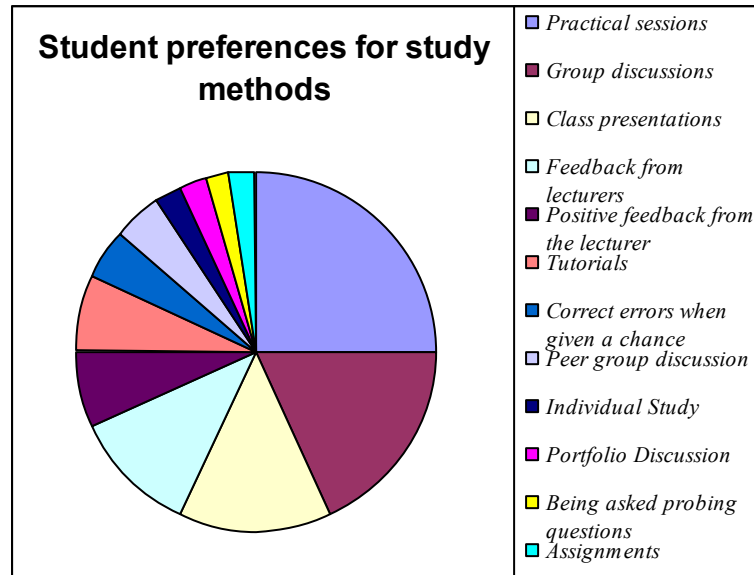
Figure 3: Activities that motivate students in the classroom [Section A (9)]

Table 4 and Figure 3 show that practicals and group discussion seemed to be the students' favourite activities in the classroom. This is the case because this group of students have gone through the experiential training and realized how important those practicals done at the Technikon are. During their Technikon experience the students used to dodge the practical sessions until a ruling was made in the department that each student had to attend at least 85% of the practicals per course.

Table 5: Activities that make students increase their performance [Section A (10)].

Factors increasing Performance	Number of students
Self study and lecturer consultation	6
Individual attention by the lecturer	6
Immediate response from the lecturer	5
Competition	5
Failing an assessment	4
Working on the previous assessment	2
Setting high standards for yourself	2
Group Discussion	1
Class Representation	1
Reworking on what has been marked	1
Availability of bursaries	1
Not obtaining distinction	1
Question and answer session	1
Peer interaction	1
Reading prior to lecture	1
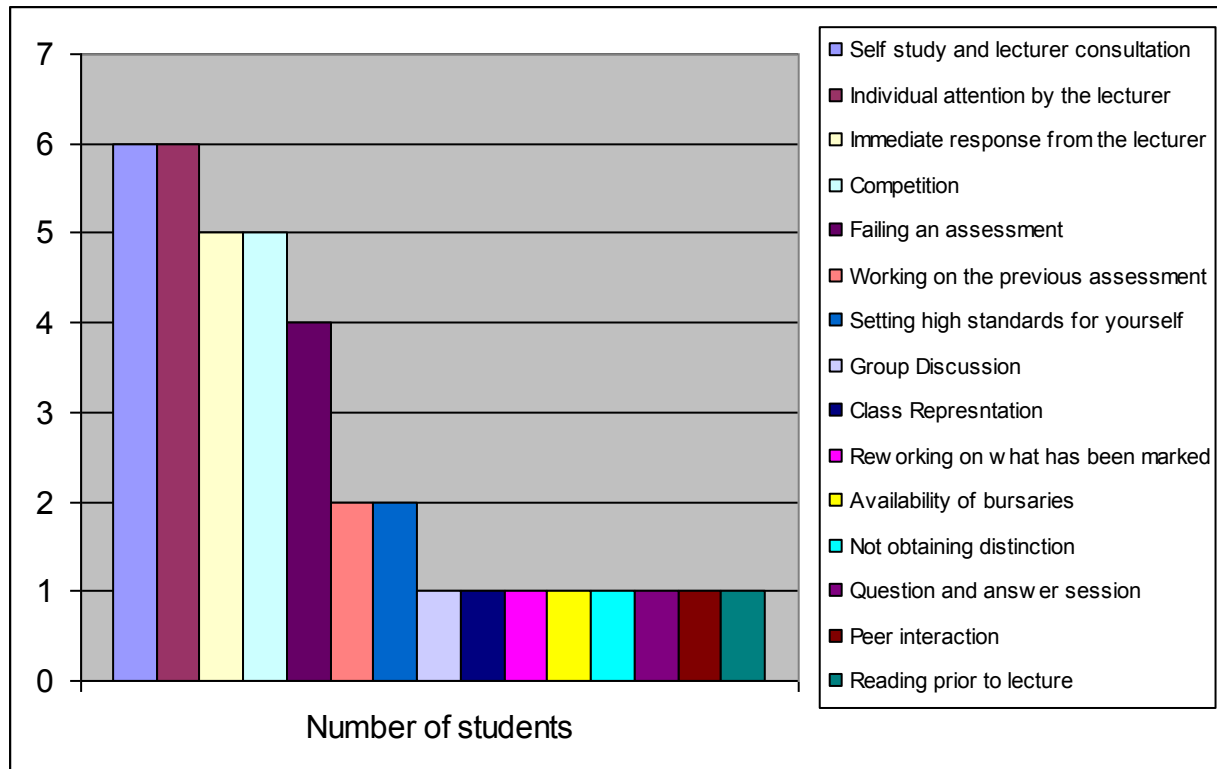
Figure 4: Activities that make students increase their performance

Section B (1) required of the students to select what was the three most important statements for them their. One student spoilt the question by ticking all the statements, and his result is not included in the table of results below:

Table 6: Students' rating of important statements

Important Statements	Number of Students
When learning I focus on understanding the subject matter	14
I learn to get employment at the end of my academic year	11
I learn to understand the content taught.	10
If I have an assessment due, it limits my concentration of understanding other content in class	7
When learning I concentrate on what I think will come out of the test or examination	6
I compete with my peers in the classroom	5
I learn to pass a test or examination	4

The table above shows that the three most important statements to the students when they are learning are firstly, to focus on understanding the subject matter, secondly, to get employment at the end of the academic year and finally, to understand the content of what has been taught.

Table 7: Students' ratings of what they consider when learning (Section B Q2):

	Statements	Strongly Agree	Agree	Not Sure	Disagree	Strongly disagree
1	I try to learn facts to understand what they mean	12	9	0	0	0
2	I try to learn facts to understand how they are related	9	10	2	0	0
3	I learn by memorizing the facts even if they do not fit into a coherent body of knowledge	6	6	5	3	1
4	I do find out what the lecturer wants and deliver it	8	7	5	0	0
5	Tests help me find out how well I have learnt	13	6	1	1	0
6	The mark that I obtain on the test always reflects what I understood of the sections	5	7	4	4	0
7	Using a variety of assessment methods may help me to learn more.	12	5	3	0	0
8	Assessment allows me to understand practicals better	10	4	5	1	0

According to Table 7 above it was indicated that students strongly agree with the fact that they learn facts to understand their meaning (12 students). Tests also help them find out how well they have learnt (13 students) They prefer using a variety of assessment methods (12 students) and they also agree with the fact that assessment allows them to understand practicals better (12 students) The minority (1 student) of students strongly disagreed with the statement that they learn by memorizing the facts even if they do not

fit into a coherent body of knowledge. Only 5 students strongly agreed with the fact that the mark that they obtain on the test always reflects what they understood of the sections. This shows they can gauge how much learning has taken place when writing a test but there are areas of serious shortcomings when considering only tests and examinations as the form of assessing students' knowledge of facts and content because they feel the mark is not a good reflection of what they know.
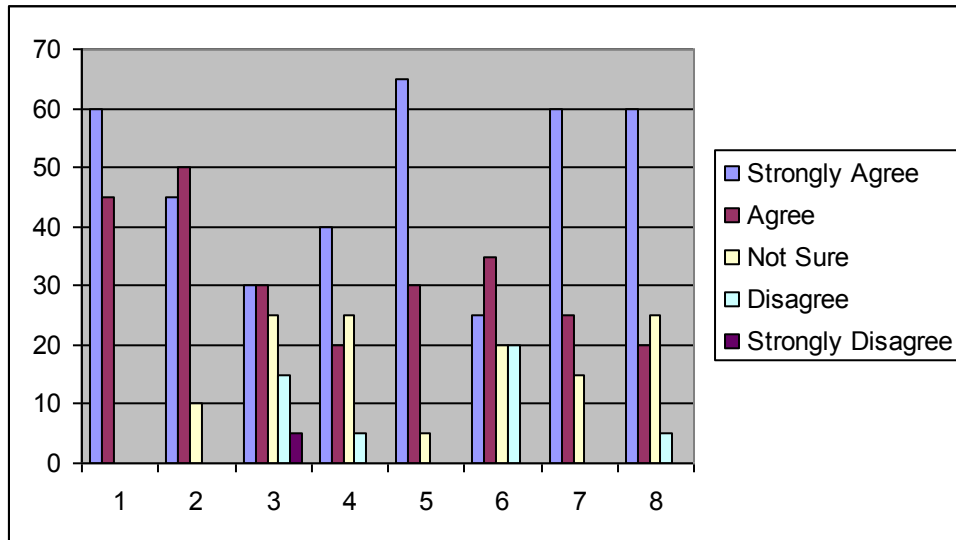
Figure 5: Bar graph showing the highest percentage of students agreeing with a certain statement.

KEYS for figure 5 above

1 = I try to learn facts to understand what they mean.

2 = I try to learn facts to understand how they are related.

3 = I learn by memorizing the facts even if they do not fit into a coherent body of knowledge.

4 = I do find out what the lecturer wants and deliver it.

5 = Tests help me find out how well I have learnt.

6 = The mark that I obtain in the test always reflects what I understood of the sections.

7 = Using a variety of assessment methods may help me to learn more.

8 = Assessment allows me to understand practicals better.

Table 8: Students indicating the extent to which they believe teaching in the programme has assisted them [Section B (3)]

Statements	Great deal	Fair amount	Little	None at all	No opinion
Communicate scientific concepts accurately	13	5	1	0	0
Write effectively	11	7	1	0	0
Relate principle concepts to real-world applications	11	5	3	0	0
Think creatively	9	7	1	2	0

The students indicated that they were taught a great deal of how to communicate scientific concepts accurately, but 2 students felt that they were not taught to think creatively at all. This feeling might be caused by the fact that there is no assessment method that allows them as individuals to express their knowledge at their own pace, improve on what went wrong and also identify their strengths and weaknesses. Only 11 students felt they could write effectively and relate principle concepts to real-world applications a great deal.

Section B Q4 was an open-ended question where the students had to explain what they would change in the assessment methods that are used in Biomedical Technology. Three participants did not respond to this question. The responses are shown below:

1. *All courses assessed in portfolio – allow for more interaction between lecturer and student……………………….13 students*
2. *Portfolio assessment should be included as another assessment method……………………….13 students*
3. *More assessments or tests before examination……………………….12 students*

4. *Basing assessments on tests and examinations only is unfair because you may develop a panic attack or you may just blackout during the time of writing a test……………………………………………………………………..13 students.*

5. *Increase assessments, including class presentations and assignments………..12 students.*

6. *Prefer portfolio assessment, then examinations later…………………13 students*

7. *Tests on Fridays take away concentration; a course on communication skills should be included……………………………………………………….9 students*

8. *The criteria of repeating a subject that costs students a whole lot of money to recover, instead of making them carry on with other subjects and having to do that subject within that semester………………………………….3 students*

9. *The subjects that are being failed by students, having to wait the whole 6 months then having to start later on. This however delays time for students. External programmes such as studying on your own but writing exams and tests with other students while you are doing the next level subjects. Hope this will be of great recognition to the system………………………………………….1 student*

10. *In addition to two scheduled tests, I will add 2 assessments modes that are different to the first two. Assessments modes like class presentations, practical tests, and I will also recommend that they become compulsory. I think this will boost the understanding and professional skills of the students……….1 student*

11. *Change to continuous assessment so that I will be able to correct myself before examinations……………………………………………………………….1 students*

12. *Practical tests, presentations that will require researching the information…1 student.*

13. *Subjects should be assessed in relation to each other- not tested individually so that when we go out to the practical working environment, it does not become a problem to relate results………………………………………………1 student*

14. *Include more practical work………………………………………..1 student*

15. *More interactions between workplace and the Technikon to understand new trends…………………………………………………………………..9 students*

The fact that the in-course portfolio and the experiential training portfolios allowed for more interaction between the student and the instructor, seemed to be favoured by the students. The researcher believes that this could easily be achievable in Biomedical Technology because the department usually enrolls a manageable number of students per lecturer. The students were also concerned with the fact that only the control tests are used to determine their course mark whereas there are a number of factors that might contribute to their poor performance when writing tests, for example, panic, blacking out etc. A reasonable number recommended that more assessment methods should be included, for example, portfolio assessment, practical tests, presentations (to include research component).

Table 9: Students' comparison between the traditional assessment method and portfolio assessment method.

	TRADITIONAL ASSESSMENT	PORTFOLIO ASSESSMENT
a) Gives students equal opportunities to succeed	0	20
b) No individual is disadvantaged	2	18
c) Provide adequate feedback to allow me to work on my weaknesses	10	10
d) Feedback is continuous and will thus help me learn.	10	10
e) It gives me an opportunity to re-do if something goes wrong.	3	17

Section C requested students' opinions when comparing traditional assessment methods (tests and examinations) to the portfolio assessment method. This group of students

understood what portfolio assessment entails because they did the in-course portfolio as well as the work-based/ experiential training portfolio. The fact that portfolio assessment offers students an opportunity to re-do what went wrong made 85% of students prefer this form of assessment.

All students in table 9 above believed that portfolio assessment would give students equal opportunities to succeed, maybe because it allows for students to reflect on what s/he understood, and to work on it according to her/his pace and understanding. 18 of 20 students indicated that no students were disadvantaged by portfolio assessment. This ties very well with the first answer because of the variety of activities that are performed using portfolio assessment as evidence to demonstrate students' understanding of the subject content. 50% of the students believed that both traditional and portfolio assessment methods provided adequate feedback to allow them to work on their weaknesses, and that the continuous nature of providing feedback allowed them to learn. Therefore based on this analysis the researcher believes that the students believe that portfolio assessment method can also be used with other traditional assessment methods.

Section D – Open-ended question on students' opinions regarding portfolio assessment in the Chemical Pathology module and in industry. Two students did not respond to this question.

1. *It helped me to understand portfolio assessment…………………………………………x7*
2. *Both were excellent, they helped me understand Chemical Pathology III more…….x7*
3. *Loved it, because I could see where got wrong and I could correct myself ………....x 2*
4. *5. All departments should start them in level III…………………………………………... x 2*
6. *The industry one is too long for us to finish in 6 weeks …………………………………..x2*
7. *They both helped me understand what I was doing at my own pace………………….x1*
8. *Chemical Pathology I was very useful for me to understand the industry portfolio and what was required of me……………………………………………………………….x1*
9. *It made me understand Chemical Pathology more because of the information I collected myself, based on what I understood – feedback also helped me……………….x1*

10. The portfolio done at the Technikon helps in that some of the things included are not done in the laboratory (industry) but information about them assists you to interpret results………………………………………………………………………………......x1

11. They show strong correlation between things done in industry and Chemical Pathology

III module as taught at the Technikon…………………………………………………..x1

12. Both portfolios correlate and the Chemical Pathology I gives you more confidence when you work with the industry one…………………………………………………..x1

13. There was a close correlation in the sense that the Chemical Pathology I imparted a lot of information on the practical work done in industry especially the Levey-Jennings graph for running controls…………………………………………………..x1

This open-ended question gave students the opportunity to express themselves on how useful did they consider the use of portfolio assessment in Chemical Pathology III (in-course portfolio). They felt that the in-course portfolio assessment assisted them to understand and follow guidelines that were laid forward to them for the experiential training portfolio.

5.2   Staff survey – semi-structured interview

The interview was based on 6 questions and below is the staff responses during the interview and in the questionnaire given.

QUESTION 1

What is your opinion about the existing assessment methods?

Respondent 1

The standardized assessment methods are two tests, which are basically performed by all lecturers. Thus far, the general course mark can be obtained. However, if this method is used exclusively then, other types of intelligence are not assessed, e.g. verbal, emotional, skills etc. therefore; mechanisms should be introduced to incorporate other types of assessment.

My feeling is that the methods that we are using to assess students are failing to assist students in their learning because most of the time they are aware about when they are writing that test and they look for the scope. In my opinion once they get the scope on how much to be covered in the test, they tend to memorize the work without understanding the content of what they are learning. The reason why I think this is the case is because I rarely get students coming to consult (for clarification) with me on issues to be covered before the test but afterwards I receive several comments stating that certain principles were not clearly understood, therefore, it became difficult for them to apply those principles. But this does not help because they had already written the test and sometimes failed.

Respondent 2

The existing methods do not provide me with formative assessment and information about the student comes very late in the stage of learning as little can be done in terms of addressing weaknesses. I would accept the final examination but tests, 'NO'. In my opinion there should be a recommendation for a lecturer to conduct continuous

assessments that will be very much formative in terms of giving feedback to students timeously before the date of the final examination. This will assist students to follow-up their performances and improve as individuals because they can certainly see where they need to pay more attention.

Respondent 3

Tests and examinations as we are so used to them here in our institution make life easy for us in terms of marking but if you think about what a student has gained out of knowing whether he/she has passed, you think twice about whether the student has benefited or not. These methods of arriving at a final mark are satisfactory to me. What is questionable, however, is the conducting of meaningful formative assessment.

Respondent 4

We are so used to tests and examinations here in our institution but I think they do not help the students that much because what I have noticed is that students are only interested in their mark not on the feedback that you provide on the script. Others would even ask you to comment with the remarks: good, excellent, bad or poor result, which I don't believe can help the student enhance his or her knowledge.

The responses provided by the lecturers on this question about the existing methods at Mangosuthu Technikon showed the following concerns:
- They are very much prescriptive to the lecturers.
- They lack assessment of other types of intelligence, for example, verbal expression, emotional skills, practical skills, etc.
- They encourage students to learn only when they are about to write to be assessed
- They encourage the students to memorize their work in order to be able to answer questions.
- They do not encourage students to work on the feedback provided by lecturers.
- They are not formative in terms of allowing the lecturer enough time to observe the growth or improvement of students in time for remedial action to be put in place, should anything go wrong.

QUESTION 2

How would you explain the role played by assessment in your teaching?

Respondent 1

Assessment within my subjects is fairly widespread. Assessment includes tests, assignments, tutorials, practical tests, post practical tests, peer review assessment and portfolio presentations. It has assisted me in obtaining an overall performance capacity of all students. Assessment for me is the way to find out whether the students have understood what I have taught them, and also see whether a student can move to another level.

Respondent 2

Assessment enables you as the facilitator to get more feedback as to the knowledge and depth of the concepts understood by students. I do feel that assessment should play a role in my teaching by enhancing the students' learning. It should not encourage surface learning because our courses are dependent on the knowledge application, not on memorizing. That is why I feel assessment method should be on the lecturer's discretion because really you cannot divorce assessment and teaching.

Respondent 3

Assessment is an integral part of teaching through self-assessment and lecturer assessment. Assessment plays a role in my teaching because it informs me of different types of students that I have in my class in terms of their performances but I don't have a way of catering for each student in terms of letting her understand issues according to her pace of learning. But still I don't see time permitting me to do that because our courses are semester courses.

Respondent 4

To me assessment plays an important role in letting me know if I need to change my teaching style or method in order to allow all students in my class to follow up on what I am teaching them. In fact, it should not only tell me to change my teaching method but should also inform students on how they could learn effectively with understanding.

The lecturers responded very positively on how they perceive as the role played by assessment in their teaching. They felt that it, assists them in obtaining the overall performances of students in their classes, gives feedback on the depth of knowledge and skills gained by students per section assessed, informs them of individual student's capabilities and abilities and it also inform them on whether their teaching styles allow all students to engage themselves in learning.

QUESTION 3

Do you think the assessment has an effect on how the students learn?

Respondent 1

Yes, students became aware that their performances are constantly monitored and documented. This encourages them to improve their performance, if they receive regular feedback. Basically, two tests, do not allow them sufficient time to adjust their performance levels. However, I think when considering assessment and students learning, the students are guided by the way questions are asked by each lecturer. The students have a tendency of only learning the things that the lecturers keep on emphasizing during the lectures. That is why sometimes if what students have thought would come out and it does not, then you find a high failure rate.

Respondent 2

Yes, I believe that sections need to be assessed as you move along with the subject and we should not wait for summative assessment, which can be disastrous. I do think that students do relate learning with assessment because you can observe that students learn a lot towards the test or examination. But the fact that they start very late towards the assessment, it becomes difficult for them to remember everything read in the last minute, hence they prefer to spot the things that can possibly come out of the test.

Respondent 3

Yes, if too much emphasis is placed on summative assessment, rote learning is encouraged. If more emphasis is placed on smaller sections of work – not referring to class tests which are regarded as a form of formative assessment in the sense that a mark that it provides gives a lecturer a certain information about the student. Assessment can play a big role especially when questions are well set and understandable to allow the student to give out all what she understood when she was preparing for the test or examination.

Respondent 4

I think when the students learn for the test, they only do it for a better mark that will give him or her good course mark but NOT for understanding. I say this because you may administer a test today and students may answer them with ease, but if you give them the same test just for revision the following week or two, but still administer it as a test, that is when you realize that the student has forgotten most of the questions that she may have answered correctly previously. Maybe we also need to look very carefully at the assessment tools that we are using as a department.

All lecturers in this question believe that assessment does have an effect on how their students learn because it:

- Allows for constant monitoring of learning process to take place.
- Allows students to improve their performances and encourages students to work harder in the next assessment.
- Encourages rote learning for those students who have a tendency to learn towards the date of embarking on the assessment.

There was a recommendation to re-look into the existing assessment methods to see if they really produce the type of future Medical Technologists that are required in the world.

QUESTION 4

Do you think you offer enough feedback to help students understand the subject matter?

Respondent 1

Yes, a weekly tutorial session before presenting the next learning unit, acts as a benchmark for assessing the level of comprehension from previous lectures. I am very happy with the way I follow up on the theory part of my courses but I am worried about our practical sessions because we do not have time allocated to repeat practicals that were not fully understood by the students. The only thing that you do is to give them feedback theoretically, which might still not make any sense to the student.

Respondent 2

No, one has to wait for the control tests to get feedback, which comes late to make any positive feedback on the areas of concern. This becomes a matter of concern for me as a lecturer because I realize that the students cannot tell me before the test if they did not understand anything during my lecture until I observe it through the way that they perform in the control tests.

Respondent 3

Input and immediate feedback should help students better understand the subject matter. But the system does not allow us to give feedback from the first lecture that you present. Thus the weaknesses are only identified towards the end of the semester which might not be that helpful in terms of assisting the student to improve on his or her learning for further assessments to prepare for examinations.

Respondent 4

For any assessment it is very important to offer enough feedback that would assist students in understanding what they have been learning, but it also depends on whether the student has gone through the feedback that you have offered or not. Sometimes students do not even worry about the comments that you have made on their scripts but

they only worry about the mark obtained.

The above responses on feedback offered to students encompass the following:

- Tutorial sessions, where lecturers provide feedback, assist students to prepare for control tests.

- For Biomedical Technology students, theoretical feedback always need to be re-enforced with practical sessions, although to provide the practical component is very difficult in the department due to lack of resources (enough budget for consumables and relevant equipments).

- The system followed at Mangosuthu Technikon does not allow for lecturers to provide feedback as much as they would love to because they only have two chances to understand the exact level of understanding of students' capabilities and then sometimes there is not enough time provided to work on the improvement strategies to assist students when there is a lack of understanding of issues.

- Even if feedback is provided to students there should be mechanisms in place to ensure that students do act on that feedback.

QUESTION 5

Given a chance, would you introduce portfolio compilation as another form of assessment in your subject?

Respondent 1

I am currently using portfolio assessments in my subjects although it is not formally done. But on the years that I have started to use it I have noticed an improvement in the way I identify students' weaknesses and strengths. If I have a large class I do request the students with certain strengths on particular sections to assist those students who do not follow. This seems to work for the students and me because each student eventually receives the individual attention that he/she deserves.

Respondent 2

Yes, because it will give me immediate response and understanding of how students understand the subject matter. To add, I still feel it will be easy to identify students' abilities and inabilities timeously and to work on them before summative assessments are conducted.

Respondent 3

No, portfolio compilation is largely an administrative exercise of collecting papers/certificates of achievement that are difficult to evaluate in terms of significance/relevance. Unless certain criteria or guidelines are set for portfolio compilation it will not assist but it will create more work for the lecturer.

Respondent 4

Yes, I would prefer to use portfolio assessment especially to address the formative part in assessment. Portfolio assessment when used formatively and continuously, will assist and benefit students when learning because they will be given a chance to reflect on the work that they have done on the portfolio, thus, giving you as a lecturer an idea on how the student has understood his/her work.

Three out of four respondents preferred to use portfolio assessment provided it will be the informative type of assessment, not a suitcase to store information pertaining to a particular subject. One felt that portfolio assessment is just an administrative exercise that may accumulate their functions unnecessarily, but he also mentioned that when certain criteria or guidelines are set out, its introduction might be of great importance.

QUESTION 6

What would affect you and/or your teaching when using portfolio assessment?

Respondent 1

The process is time-consuming. However, students benefit from diverse opportunities presented to them to improve on their performance.

Respondent 2

Putting down guidelines and ensuring that what you put in the portfolio would reflect what the student knows and understood, thus it becomes a true reflection of his individual effort.

Respondent 3

There will be difficulty in determining the importance of the contents of a portfolio unless specific guidelines are laid down.

Respondent 4

Time to manage the portfolio will be difficult to obtain, especially when it will be recommended in all subjects, but it is a very good tool to use to assist students in their learning.

When the staff was asked on whether they would introduce portfolio assessment in their course, the majority responded that although the process is time-consuming but they feel that portfolio assessment may benefit from the diverse opportunities that might be provided by portfolio assessment. It was also felt that proper guidelines should be laid down and be clear to both staff and students. Time management of portfolios by students was questionable when introduced in all courses within the department.

5.3   Employers' survey - questionnaire

The results were distributed as in Table 7 below to show how the employers rated the abilities or skills of students' in Biomedical Technology when they arrive in the workplace for experiential training. The skills included are the basic skills that a Medical Technologist should possess. Again these are the basic skills specifically required to be possessed by a person working in a chemical pathology laboratory. The indications given by the employers would give the lecturers an opportunity to improve their teaching by addressing those skills that were poorly rated by the employers. For example, employers felt that the majority of students (83%) still fail to calculate properly to obtain the correct factor to use when preparing sample dilutions. This implies that the lecturer of Chemical Pathology should liaise with the lecturer who teaches Calculation and Statistics at a lower level. This might sometimes be a problem in the department because the subject Calculation and Statistics is offered by the Department of Mathematics. Maybe they do not place sufficient emphasis on laboratory statistics.

Table 10: Employers' rating of students' skills

Skill/ Ability	Rating scale	%
1. Adherence to safety procedures	Good	83
	Excellent	17
2. Thorough check on specimens' suitability before analysis	Satisfactory	50
	Good	50
3. Knowledge of handling different types of chemicals	Satisfactory	50
	Good	50
4. Store chemicals according to the laboratory rules	Excellent	67
	Satisfactory	13
5. Criteria for specimen rejection	Good	83
	Satisfactory	17
6. Quality control concepts	Good	33
	Satisfactory	67
7. Knowledge of quality control procedures	Good	33
	Satisfactory	67
8. Solution preparation	Poor	17
	Unsatisfactory	17
	Satisfactory	66
9. Appropriate sample dilution when needed	Unsatisfactory	83
	Satisfactory	17
10. Action to be taken into account when receiving urgent specimens	Satisfactory	33
	Good	67
11. Action to be taken on feedback	Unsatisfactory	33
	Satisfactory	50
	Good	27
12. Willingness to take on extra tasks assigned to them	Unsatisfactory	33
	Satisfactory	50
	Good	27
13. Communicate effectively	Unsatisfactory	33

	Satisfactory	50
	Good	27
14. Compile a required portfolio of evidence	Satisfactory	33
	Good	67
15. Write effectively	Satisfactory	33
	Good	67
16. Identify and solve problems independently	Unsatisfactory	33
	Satisfactory	33
	Good	17
	Not sure	17
17.Organise and manage themselves appropriately	Unsatisfactory	33
	Satisfactory	33
	Good	17
	Assistance required	17
18. Work with others as a team	Satisfactory	33
	Good	67
19. Relate theory done at the Technikon with practice	Unsatisfactory	17
	Satisfactory	67
	Good	16
20. Their work performance relates well with their performance at Mangosuthu	Poor	50
	Unsatisfactory	17
	Satisfactory	33
21.Any other skills/abilities you would like to include	Satisfactory on computer skill	67

23% did not identify any other skill/ability that they would like to include.

The two open-ended questions (Q2 – 3) allowed the laboratory supervisors to express their recommendations on how the industry portfolio could be improved. They also had to give their opinions on whether the portfolio could be used in Biomedical Technology to determine students' competencies.

Question 2 was answered as follows:

- *Portfolio should allow for more hands on (concentrate more on practicals) than asking the depth of knowledge.*
- *Portfolios should allow students to work in the laboratory but not to observe.*
- *Portfolio should not ask theory questions but rather concentrate on practicals only.*
- *Portfolios should have more problems on solution preparations and laboratory statistics.*
- *Portfolio should decrease theory and test more practicals that they are expected to do in the laboratory.*
- *Portfolios are too long; there is a need to revise the specified outcomes.*

Question 3 looked at comparing the way 2005 students handled the portfolio assessment to the 2006 students. This was done because 2006 students had not been exposed to the in-course portfolio at the Technikon like the 2005 group of students. Based on the responses below, it was concluded that the in-course portfolio assisted students a lot. Its official implementation would assist in improving the performances of students in the workplace.

 The responses were as follows:

- *2005 students understood portfolio assessment better than 2006 students.*
- *2005 did most of their work without assistance whereas 2006 students were very unsure of what was going on.*
- *2005 students did not need much attention on portfolio compilation.*
- *2005 students seemed to understand and manage their portfolios well.*
- *There was a remarkable improvement in the 2005 group of students- they did not need more assistance from me when working with their portfolios. A lot of work*

was needed in the last group.

- *More emphasis should be placed on solution preparation and calculations – 2005 students were much better in this module.*

Question 4 was a 'Yes' or 'No' question where they had to indicate whether portfolios could be used as means of determining the students' competencies. All supervisors felt that portfolio assessment can be used and one of them even went so far as explain that it will be much better if they started with portfolios from the beginning of their studies at the Technikon. I think they felt this way because portfolios can also assist them in looking at the students' weaknesses, strengths and improvements during all the years of study at the Technikon.

CHAPTER 6

6. DISCUSSIONS

6.1 Key question 1: Staff members' and students' perceptions regarding the existing traditional methods of assessment (Sub-problem 1:13).

Despite the growth in emancipatory conceptualization of classrooms that embrace a constructivist epistemology, forms of assessment and specific assessment tasks utilized higher education institutions are overwhelmingly decided by teachers and administrators according to time efficiency. Furthermore, even though reports like *The Status and Quality of Teaching and Learning in Australia* (Goodrum, Hackling, & Rennie, 2001) have asserted that assessment is a key component of the teaching and learning process, teachers tend to utilize a very narrow range of assessment strategies on which to base feedback to parents and students. In practice, there is little evidence that teachers actually use diagnostic or formative assessment strategies to inform planning and teaching (Radnor, 1996). This could be due to lecturers' feeling that they need to 'sacrifice learning with understanding for the goal of drilling students in the things for which they will be held accountable' (Hobden, 1998) by their institution but that they do not consider what industry wants.

In this study the staff members agreed that these traditional methods made their lives easy in terms of marking and providing feedback but the majority of staff felt that this method when used exclusively might ignore the assessment of other types of intelligence and skills. They felt that this method failed to provide formative assessment of student because it is done at a very late stage of student's learning when there was very little that could be done to assist the student to improve. Staff members believed that students were also interested in getting a better mark that really did not show their strengths. Another lecturer felt that the existing methods that were used to assess students failed to assist students' learning to such an extent that the majority failed to integrate their knowledge with practicals.

The vast majority of students felt that assessments in the Department of Biomedical Technology were based only on tests and examinations and they viewed this as an unfair practice, implying that there was a need to change to continuous assessment so that they would have an opportunity to identify their weaknesses and address them in time before commencing with examinations. When traditional methods were compared with the portfolio assessment method (Table 7), 10 students indicated that traditional assessment provided adequate feedback to allow them to work on their weaknesses as well as providing help for them to learn. This finding is a good indicator that traditional methods do disadvantage some of the students. The same table indicates that only 3 students believed that traditional assessment method gave them opportunity to re- do the work if something went wrong.

6.2 Key question 2: Staff members 'and Students' perceptions regarding the existing assessment methods with reference to the requirements for good laboratory practices (Sub-problem 2:13).

This discussion is centred around the assessment practices in order to address the outcry about the performance of our students in the workplace. If one unpacks what is being assessed in the workplace, one finds that it should include components such as practical skills, application of theoretical knowledge, competence, attitudes, personal development and experience (Mathews, 1995; Cuthberth, 1996; FEU, 1994). These are the requirements for good laboratory practice. However, when looking at the responses of the laboratory supervisors, one important consideration about this set of components is that the assessment of 'experience' in particular, is problematic since "mere activity" at the workplace does not constitute experience (Dewey, 1933). Other assessors in the workplace require students to develop experience with immediate effect, without taking into consideration that experience is a long-term process. This is indicated by their responses about the skills that they expect from the students when they come to them for experiential training.

Regarding an individual's personal approach to learning, it unfortunately seems that firm evidence of how students go about their learning in the workplace is hard to come by. However, one may speculate that in the educational settings generally, students display basically three different approaches to learning which may also be of relevance to learning in the workplace; these approaches have been described respectively as "deep", "surface" and "strategic" (or achieving) (Marton & Saljo, 1984; Richardson,1993; Biggs, 1990). Unfortunately it seems very difficult to instill a deep learning approach in students, apart from the way that you assess them. This is the approach that seems to address all the concerns in Biomedical Technology, since students are required to apply their theoretical knowledge that they gained more at the institution, than what they are expected to do in the workplace.

Staff members' responses clearly indicated that they viewed assessment as a way to find out whether students have understood what lecturers have taught them, thereby determining whether or not they are in the position to move to the next level. One lecturer said that assessment played a major role in her teaching because it informed her how each and every student performed, but it failed to inform her to what extent each student understood issues that had been discussed. The main constraint is the large number of students that each lecturer has to attend to as well as time constraints.

6.3 Key question 3: To determine the students' perception of portfolio assessment as a formative type of assessment in order to improve their learning (Sub-problem 3:13).

This question was found to be a very easy for students to answer because they were engaged with portfolio assessment both in industry and in Chemical Pathology III course. Students were quite clear on portfolios used formatively to improve their learning. Students felt that if the purpose of the portfolio is clearly defined, (for example, as was the case in the in-course portfolio and the experiential training portfolios that students had been exposed to) they would enjoy using portfolio assessment as it reflects their own work and capabilities.

6.4 Key question 4: To determine the perception of staff in using portfolio assessment to reinforce their teaching in order to improve the capacity of students to integrate what they learn in the Technikon and what they are expected to do at the workplace (Sub-problem 4:13).

As indicated in the responses of staff, there were different opinions about portfolio assessment. The majority of staff members seem to reject hypothesis two. For example, one lecturer also admitted that he thought portfolio compilation was largely an administrative exercise of collecting papers/certificates of achievement which were difficult to evaluate in terms of their significance / relevance.

The main constraint observed in their responses is that staff members' lack of motivation and understanding of using this tool. This may be addressed by organizing a workshop on portfolio assessment where the concept can be dissected in such a way that everybody understands the main objective of opting for type of portfolio assessment as a formative type of assessment.

6.5 Key question 5: To determine how employers rate our students' skills at an experiential training level (Sub-problem 5:13).

The employers' responses clearly indicated their expectations in terms of skills and knowledge from students who are at experiential training level. These findings may assist lecturers when reviewing the curriculum and also improve on the way they (lecturers) impact knowledge to students in order to address the workplace requirements.

The 2005 group of students who had been exposed to the in-course portfolio assessment methods were found competent by the laboratory supervisors than the 2006 group of students in terms of skills that they demonstrated during their experiential training, as well the their portfolio presentations.

6.6 Concluding Comments and further research

This action research study was designed to track students as they went through two types of portfolios, that is, the in-course portfolio assessment and the industry type portfolio assessment. The research into the perceptions of students, staff and laboratory supervisors was designed to investigate the potential of portfolios for students to better achieve the outcomes of Biomedical Technology.

What transpired from the research findings was that a measurement of outcome was achieved. For example, the fact that the student groups (2005 and 2006) were assessed differently actually facilitated comparison of their performances in the workplace. Employers' comments clearly favoured the students from the group that had been exposed to the in-course portfolio assessment. This finding alone guided the researcher towards the conclusion that portfolio assessment contributes towards more effective performance in the workplace. Based on the employers' comments hypothesis three is accepted.

From the staff's point of view, based on what they stated in the interview, for example, one said it is '*largely an administrative exercise of collecting papers/certificates of achievement which are difficult to evaluate in terms of significance/relevance'.* It is concluded that hypothesis two is rejected. However it is recommended that courses should be conducted to inform staff members regarding portfolio assessment.

Students who have been exposed to portfolio assessment recognized the value of this method as it prepared them for more efficient application of knowledge in the workplace. Based on this finding hypothesis one is accepted.

The students also suggested a number of alternative assessment strategies like assignments, project presentations. The findings in this study suggest that the assessment practices that would assist students in their learning are when feedback is provided promptly and timeously. Students and staff have to discuss the purpose and outcome of

assessment before its implementation. There definitely should be the conceptualization of assessment as part of a student's work, which can be produced as evidence of what has been understood when learning. Flexibility and individual consultations should be encouraged in order to accommodate the diversity of students' approaches to learning. It is important that a lecturer should ensure that assessment informs the instructions to help them improve their teaching and also address the way students apply their knowledge in real life situations. The use of more than one measuring tool to assess students' learning has also been encouraged in this study.

An investigation into other novel and creative form of assessment can be undertaken in the future studies, either by this researcher or other academics in the field. Assessment strategies should also be explored in other departments as holistic approach to teaching and learning in the institution.

The reviewed studies evidenced those students' perceptions about assessment and their approaches to learning are strongly related. The perceived characteristics of assessment seem to have considerable impact on students' approaches, and vice versa. These influences can be both positive and /or negative, however the study of Trigwell and Prosser (1991) suggests that deep approaches to learning are especially encouraged by assessment methods and teaching practices which aim at deep learning and conceptual understanding, rather than by trying to discourage surface learning approaches to learning. The researcher felt that the students' perceptions about traditional and alternative assessment could equip the lecturers with valuable ideas and interesting tip-offs to bring deep conceptual learning into practice so as to allow students to improve in applying their knowledge gained at the Technikon to the workplace settings.

Learners experienced portfolio assessment mode, think positively about embarking on new assessment strategies because they feel it has a positive effect on their learning and is fair when it:
  ▪ Relates to authentic tasks.
  ▪ Represents reasonable demands

- Encourages students to apply knowledge to realistic contexts,
- Emphasizes the need to develop a range of skills, and is perceived to have long-term benefits (Sambell, McDowell and Brown, 1997).

The literature and research on students' perceptions about assessment is relatively limited. Besides the rational and semi-experimental studies on students' approaches to learning and studying in relation to students' expectations, preferences and attitudes towards assessment which is well known, especially the research on students' perceptions about particular modes of assessment is restricted. Further research can elucidate the results and provide with additional information and evidence on particular modes of assessment in order to gain more insight in the process of student learning.

This review and study has tried and hopefully succeeded to provide lecturers with an important source of inspiration, namely, students' perceptions about portfolio assessment and its influence on learning, which can be an important guide in their reflective search to improve their teaching and assessment practices, and as a consequence, to achieve a higher quality of learning and education.

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APPENDICES

Appendix 1: Guidelines for in-course portfolio assessment: Chemical

Pathology III

OBJECTIVES

SECTION 1   **40%**

Safety

- Discuss your personal health and safety when working in the clinical chemistry laboratory.
- Briefly describe how chemical spills are treated in the laboratory.
- Briefly discuss how you would dispose of chemical wastes.
- Explain the emergency procedures and reporting of accidents in the laboratory.
- Explain how you would dispose of contaminated materials, sharps and biohazard containers.

Handling of specimens

- Identify different types of anticoagulants commonly used in the clinical chemistry laboratory as well as their modes of action, considering their colour stoppers.
- Explain the precautions necessary for reacting to the exposure to needle-stick injury.
- Explain when the specimen is rejected in the laboratory.
- How is haemolysis introduced in the laboratory.
- Draw a flow diagram showing the workflow in the laboratory from specimen collection to the reporting of results.

Handling / storage of chemicals

- How would you identify, handle and store toxic, irritant, corrosive, flammable and explosive chemicals in the clinical chemistry laboratory?
- How are the chemical injuries treated in the laboratory?

Quality Control

1.   Describe the following quality control terms:

- Analytical sensitivity   Detection limit
- Blank readings   Reagent blanks
- Sample blanks   Analytical specificity
- Interference   Recovery
- Precision   Systematic error concept of accuracy
- Random and systematic errors

2.   Calculate the mean, standard deviation(SD) and coefficient of variation (CV) for
      the following urea results in mmol/L.:-

8.7	8.6	8.2	9.2
6.9	9.1	7.2	6.9
9.0	8.9	8.9	9.1
7.3	8.3	9.8	9.3
7.9	8.1	8.8	9.0

3. Draw a Levey-Jennings graph using the following glucose results obtained in 20 consecutive days, with axes labelled with correct scale and showing the mean, ±1, ±2 and ±3 SD.

4. Differentiate between control and reference ranges.

DAYS	RESULT (in mmol/L)
1	8.6
2	9.2
3	8.8
4	6.9
5	9.1
6	7.2
7	6.9
8	9.0
9	8.9
10	8.9
11	9.1
12	7.3
13	8.3
14	9.8
15	9.3
16	7.9
17	8.1
18	8.8
19	9.0
20	8.6

5.   Differentiate between a shift and a trend.

6.   Explain how the internal and external quality control programmes are run and also explain the types of controls that are used.

Solutions preparations

7.   Calculate the amount of sodium chloride to weigh out when preparing an isotonic saline and also explain how you would prepare it.

8.   You are given sodium hydroxide pellets. How would you prepare a 2L solution of 0.15M NaOH solution? Show all your calculations.

9.   Explain how you would make 6 different solutions using old serum and distilled water accurately and correctly. ($\frac{1}{2}$, $\frac{1}{8}$, $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{32}$, and $\frac{1}{50}$)

TESTS PERFORMANCE

10.   List the precautionary measures you need to take into consideration when receiving specimen 1 for electrolytes and urea (U/E) and specimen 2 for glucose analysis.

11.   You are given specimen 3 for cholesterol and triglycerides estimations in blood. Explain exactly what would you do until you obtain your results.

SECTION 2:   **20%**

12.   Carbohydrates metabolism tutorials.   (25)

13.   Cerebrospinal fluid questions.

14.   Where is CSF found and where is the fluid formed?   (3)

15.   Describe a normal CSF.   (2)

16.   What is the function of CSF?   (2)

17.   What substances are found in the CSF?   (3)

18.   CSF analysis is to diagnose medical disorders that affect the central nervous system. List some of these conditions.   (6)

19.   What are the three main chemistry tests analysed on CSF specimens and state their reference ranges.   (6)

20.   Describe the principle of the Pandy's method for globulin estimation.   (4)

21.   How would you report globulin results?   (2)

22.   Would you do globulins on bloodstained CSF? Why?   (2)

23.   In TB meningitis, will the following tests on a CSF specimen be increased,
        decreased or normal?

    ▪ Total protein

    ▪ Chloride

    ▪ Glucose

    ▪ Globulin   (4)

24.   In bacterial meningitis, will glucose be increased or decreased? Why?   (2)

25.   What is the differential count for a normal CSF result?   (3)

26.   Describe a blood brain barrier.   (2)

27.   Describe a three- tube- test and a bloody tap.   (5)

28.   Discuss xanthochromia.   (2)

29.   Discuss the presence of clots in CSF.   (2)

30.   State why chloride is higher in CSF than in plasma.   (2)

SECTION 3:   **20%**

  31.   Select 1 learning unit in Chemical Pathology III and reflect on what you liked the most
         about it and why do you feel it is important for you to clear understand it as a Medical
         Technologist.

SECTION 4:   **10%**

    ▪ Portfolio Contents

    ▪ Title page

    ▪ Table of contents

    ▪ Best -written creative piece / learning unit

    ▪ Perfect self-reflection on your strengths.

SECTION 5:   **10%**

▪ Action taken on feedback

▪ Completion of portfolio within the time frame.

Appendix 2: Work-based / experiential training portfolio guidelines

A portfolio must be handed in with the completed assessment form (see assessment form i.e. appendix 3).

The portfolio (even if incomplete) must always be available for inspection by the Technikon supervisor during his/ her monitory visit.
The portfolio contains the following: numbering according to the assessment form.

1.3 Safety protocols pertaining to handling, disinfectant and disposal of specimens.
1.4 Safety protocols pertaining to handling and storage of chemicals and gas cylinders.

2.1 Calculations of the mean, SD and CV
2.2 Plot a Levey-Jennings chart.
2.3 Interpretation of three Levey-Jennyngs Charts.
2.4 Written explanation of internal and external quality control programmes.

3.1 Diagram of the workflow
3.2 Labelled diagram.

4.1 Calculation, preparation and analysis of isotonic saline
4.2 Calculation, preparation and analysis of a standard solution
4.3 Calculation and preparation of dilutions

5.1 A brief description of an automated instrument
5.2 Compulsory analytes:
    5.2.1 Explain criteria for specimen collection procedure and suitability of sample.
    5.2.2 State the principle of each analytical method
    5.2.3 Run appropriate control(s) with every test analysed and report control results
        together with their ranges.
    5.2.4 The print-out of control and test results must be included and any action taken or

out-of control results must be shown. Test results must be reported and interpreted correctly.

6.1.1   State the principle of the analytical method and methodology employed.

6.1.2   Report control results and their ranges

6.1.3   Explain criteria for correct specimen procedure and suitability of the specimen.

6.1.4   Test and control results are calculated, reported and interpreted

6.2   As for 5.2

7.9   Laboratory rules and protocols must be included in the portfolio. A student may be questioned on this document to ensure that they are aware of laboratory rules and protocols.

Appendix 3: <u>**Laboratory Practice 3 – Experiential Training**</u>

<u>**Chemical Pathology Assessment form**</u>

STUDENT ....

TECHNIKON..

LABORATORY...

TRAINING PERIOD..

SUPERVISOR...

QUALIFICATION...

TITLE OF INTEGRATED LEARNING PROJECT

....

NO. OF DAYS ABSENT ……………………………

LABORATORY SUPERVISOR'S ASSESSMENT FORM	
1. PRACTISE SAFETY ACCORDING TO S.O.P.'s	**% Mark**
ASSESSMENT CRITERIA	
1.1 Laboratory rules regarding personal health and safety are observed.	
1.2 Safe handling, disinfection and disposal of specimens is carried out.	
1.3 Safety protocols pertaining to 1.2 are presented in writing.	
1.4 Safe handling and storage of chemicals and compressed gas cylinders are demonstrated.	
1.5 Safety protocols pertaining 1.4 are presented in writing.	
Total % Mark	
÷ 5 = Average % Mark	
2. APPLY QUALITY CONTROL ACCORDING TO S.O.P.'s	**% Mark**
ASSESSMENT CRITERIA	
2.1. The mean, SD and CV for control values obtained are correctly calculated.	
2.2. A simple Levy-Jennings graph plotting the values in 2.1 according to the SD is drawn.	
2.3 Quality control charts, including that drawn in 2.2, are correctly interpreted and commented on.	
2.4 Principles of Quality Control programmes used in Clinical Chemistry laboratories are explained in writing.	
Total % Mark	
÷ 4 = Average % Mark	
3. DRAW AN ORGANOGRAM AND DISCUSS WORKFLOW IN THE LABORATORY	**% Mark**
ASSESSMENT CRITERIA	
3.1 A diagram indicating organisation and hierarchy in the laboratory is drawn and responsibilities are discussed in writing	
3.2 A flow diagram showing routes followed by Clinical Chemistry specimens in the laboratory is sketched from specimen collection to reporting of results.	
Total % Mark	
÷ 2 = Average % Mark	

4. PREPARE SOLUTIONS (USING RELEVANT CALCULATIONS) FOR USE IN THE LABORATORY	**% Mark**
ASSESSMENT CRITERIA	
4.1 Isotonic saline solution is prepared and checked for accuracy using analytical methods ($< 2\%$ error).	
4.2 A standard solution is prepared and checked for accuracy using available analytical methods ($\leq 2\%$	

	% Mark
error).	
4.3 Correct care and use of laboratory glassware and pipettes are demonstrated and discussed.	
4.4 Dilutions are made and checked for accuracy using analytical methods (< 5% error)	
Total % Mark	
÷ 4 = Average % Mark	

	OPERATE AND USE AN AUTOMATED	**% Mark**					
ENT FOR	**ROUTINE ANALYSES**						
	ASSESSMENT CRITERIA						
	The general operation of the instrument used is described.						
the	COMPULSORY: Analyse urea, electrolytes, creatinine and glucose						
	laboratory S.O.P.'s.						
		Electrolytes	Urea	Creat.	Glucose	Tot	÷ 4
5.2.1 Criteria for correct collection and suitability of specimen are explained.							
5.2.2 Principles of each method of analysis are correctly stated.							
5.2.3 Appropriate control/s are validated by obtaining values within ± 2 SD, reported and interpreted correctly.							
5.2.4 Test results are correctly reported and interpreted.							
5.2.5 Work is planned and organised effectively							
TOTAL MARKS							
AVERAGE MARKS							

5.3 PERFORM TESTS FOR 7 OTHER ANALYTES ACCORDING TO LABORATORY S.O.P.'s (State chosen group A, B or C)					
GROUP			**% Mark**		
ASSESSMENT CRITERIA					
	Enzymes	Bilirubins	Proteins	Total	÷

(Insert analytes tested).					
5.3.1 Criteria for correct collection and suitability of specimen are explained					
5.3.2 Principles of each method of analysis are correctly stated.					
5.3.3. Appropriate control/s are validated by obtaining values within ± SD, reported and interpreted correctly					
5.3.4 Test results are correctly reported and interpreted.					
5.3.5 Work is planned and organised effectively					
Total % Mark					
÷ 5 = Average % Mark					

PERFORM ANALYSES IN THREE OTHER AREAS OF THE TESTS DONE IN THE CLINICAL CHEMISTRY LABORATORY	**% Mark**				
COMPULSORY: ANALYSE CSF ACCORDING TO S.O.P.'s.					
ASSESSMENT CRITERIA					
	T.P./ M-T.P /Globulin	Chlorine	Glucose	Total	÷
1.1 Criteria for correct collection and suitability of specimen are explained					
1.2 Principles of each method of analysis are correctly stated.					
1.3 Appropriate control/s are validated by obtaining values within ± 2 SD, reported and interpreted correctly.					
1.4 Test results are correctly reported and interpreted.					
1.5 Work is planned and organised effectively					
Total % Mark					
÷ 5 = Average % Mark					

6.2 PERFORM ANALYSES IN TWO OTHER AREAS OF STUDY ACCORDING TO S.O.P.'s			**% Mark**	
ASSESSMENT CRITERIA (State selected topics)			Total	÷ 2
6.2.1 Criteria for correct collection and suitability of specimen are explained				
6.2.2 Principles of each method of analysis are correctly stated.				
6.2.3 Appropriate control/s are validated by obtaining values within ± 2 SD, reported and interpreted correctly.				
6.2.4 Test results are correctly reported and interpreted.				

100

6.2.5 Work is planned and organised effectively				
Total % Mark				
÷ 5 = Average % Mark				

7. DISPLAY COMPLIANCE WITH RULES/REGULATIONS OF THE LABORATORY.	% Mark
7.1 An appropriate time schedule is adhered to in accordance with laboratory policy	
7.1.1 Arrive and leave work place at proper time.	
7.1.2 Supervisor is notified timeously when late or absent.	
7.1.3 Protocol laid down regarding attendance during training period is followed.	
7.1.4 Supervisor is informed of whereabouts during the day.	
7.1.5 Lunch and tea breaks are taken within time limits.	
7.1.6 Acceptable attendance record is maintained.	
Total % Mark	
÷ 6 = Average % Mark	
7.2 Acceptable conduct and observance of other laboratory rules and protocol is demonstrated.	**% Mark**

8. MAINTAIN PROFESSIONAL INTEGRITY AND DISPLAY DEPENDABILITY	% Mark
ASSESSMENT CRITERIA	
8.1 Correct professional relations and co-operation with laboratory personnel and other health care professionals is demonstrated.	
8.2 Ability to work independently is demonstrated.	
8.3 Time allocated for integrated learning project is used responsibly. Project is planned and organised effectively and systematically.	
8.4 Assigned tasks are completed timeously.	
8.5 Interest is demonstrated by exhibiting initiative.	
Total % Mark	
÷ 5 = Average % Mark	

9. DISPLAY CO-OPERATION AND EFFECTIVE COMMUNICATION	% Mark
ASSESSMENT CRITERIA	
9.1 Criticism is accepted and effort is made to improve.	
9.2 Ideas and concepts are expressed clearly.	
9.3 Appropriate questions are asked.	
9.4 Oral and written directions /instructions are followed willingly and correctly.	
9.5 Response to questions is appropriate.	
Total % Mark	
÷ 5 = Average % Mark	

CALCULATIONS

The following format must be used for calculations:

	Outcome	% Weighting	Average % Mark	Weighting calculation	Final Mark
1.	Safety	5		x 0.05	
2.	Quality control	10		x 0.10	
3.	Workflow	5		x 0.05	
4.	Solution preparation	12		x 0.12	
5.	Automated instrument				
	Operation	3		x 0.03	
	Electrolytes etc.	11		x 0.11	
	7 other analytes	11		x 0.11	
6.	Analyses in 3 other areas				
	CSF	7		x 0.07	
	2 other topics	18		x 0.18	
7.	Laboratory rules and regulations				
	Time schedules	3		x 0.03	
	Other rules & conduct	2		x 0.02	
8.	Professional integrity & dependability	8		x 0.08	
9.	Co-operation & communication	5		x 0.05	
				TOTAL	

Performance	Exceptional	Very Good	Above Average	Average	Below Average	Poor
Range %	80 - 100	70 - 79	60 - 69	50 - 59	40 - 49	< 40
Nominal	85	75	65	55	45	35

Appendix 4: Students' questionnaire

Dear student

Mrs T.A. Ndimande, a Masters student at the University of KwaZulu/Natal under the supervision of Prof C. Mbali in the Centre for Higher Education Studies, is doing a research study. The purpose of the study is to investigate the perceptions of staff and students in introducing portfolio assessment in Biomedical Technology at Mangosuthu Technikon.

It would be greatly appreciated if you would spend some few seconds to answer the following questions. This is anticipated at giving you an opportunity of explaining how teaching and assessment influence your understanding when learning in Biomedical Technology. Your honest response would be greatly appreciated. Please remember that your response will be strictly confidential and answers will be anonymous.

Thanking you in advance.

Mrs T.A. Ndimande
031 – 907 7516
082 – 802 1730

_____

Student's signature: DATE:

SECTION A

This section is about yourself and how you learn

1) Which is the most often spoken language at your home?

	English	Zulu	Other (specify)
	☐	☐	☐

2) Language proficiency:

		Speak	Write	Read
a)	English	☐	☐	☐
b)	Zulu	☐	☐	☐
c)	Other (specify)	☐	☐	☐

3) Age range?

	16 – 18	19 – 21	22 and above
	☐	☐	☐

4) Sex

	Male	Female
	☐	☐

5) Matriculation results (Grade & symbol)

	Grade	Symbol
Mathematics		
Physical Science		
Biology		
English		

6) When admitted at Mangosuthu, did you write a psychometric test?

       Yes   No

       ☐   ☐

7) Have you ever been exposed to the Science laboratory before Mangosuthu Technikon?

       Yes   No

       ☐   ☐

8) If you have repeated any of the subject/s in Biomedical Technology, List them below.
…………………………………………………………………………………………
…
…………………………………………………………………………………………
…
…………………………………………………………………………………………
…
…………………………………………………………………………………………
…
…………………………………………………………………………………………
…

9) Write a paragraph explaining the activities that motivate you in the classroom to understand more what you learn.
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
………………

10) Write a paragraph on what makes you increase your performance in class.
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
…………………………………………………………………………………………
………………

SECTION B

In your point of view, select **ONLY THREE** most important statements and answer for only those three, stating whether they are true (**T**) or false (**F**) indicating by either T or F in the relevant box.

	T	F
I learn to pass a test or examination		
I learn to understand the content of what has been taught		
I learn to get employment at the end of my academic life.		
If I have an assessment due, it limits my concentration of understanding other content in class.		
When learning I focus on understanding the subject matter.		
I compete with my peers in the classroom.		
When learning I concentrate on what I think will come out of the test or examination.		

4. Please indicate the degree to which you agree or disagree with the following sentences

	Strongly Agree	Agree	Agree nor Disagree	Disagree	Strongly disagree
I try to learn facts to understand what they mean					
I try to learn facts to understand how they are related					
I learn by memorizing the facts even if they do not fit into a coherent body of knowledge					
I do find out what the lecturer wants and deliver it					
Tests help me find out how well I have learnt					
The mark that I obtain on the test always reflect what I understood on the sections					
Using a variety of assessment methods may help me to learn more.					
Assessment allows me to understand practicals better					

5. Please indicate to what extent do you believe teaching in your programme may have helped you to:

a. Communicate scientific concepts accurately

Great deal	Fair amount	Little	None at all	No opinion

b. Write effectively

Great deal	Fair amount	Little	None at all	No opinion

c. Relate principle concepts to real-world applications

Great deal	Fair amount	Little	None at all	No opinion

d. Think creatively and critically

Great deal	Fair amount	Little	None at all	No opinion

6. Given a chance what would you like to change in the assessment methods that are used in Biomedical Technology.

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
………………

SECTION C

**COMPARISON BETWEEN TRADITIONAL ASSESSMENT AND PORTFOLIO
ASSESSMENT (indicate with a cross- X)**
Traditional assessment = Tests / Examination

	TRADITIONAL ASSESSMENT	**PORTFOLIO ASSESSMENT**
a. Gives students equal opportunities to succeed		
b. No individual is disadvantaged		
c. Provide adequate feedback to allow me to work on my weaknesses		
d. Feedback is continuous thus help me learn.		
e. It gives me an opportunity to re-do if something goes wrong.		

SECTION D

Write a paragraph to indicate your opinion on the portfolio assessment done in your last
level of Chemical Pathology and the one that you did in industry.

……………………………………………………………………………………………

……………………………………………………………………………………………

……………………………………………………………………………………………

……………………………………………………………………………………………

Appendix 5: Laboratory supervisors' questionnaire

Researcher: Mrs T.A. Ndimande
                              Mangosuthu Technikon

Student No: 202525851
                              University of KwaZulu Natal

Supervisor: Prof C. Mbali
                              Centre for Higher Education Studies
                              University of KwaZulu Natal

Contact details: 031 907 7516(w)
                              082 802 1730©

Thank you for agreeing to participate in this study. This form outlines the purpose of the study and provides a description of your involvement and rights as a participant.

The purpose of this study is:

➢ To gain insight on the employers' perceptions on Mangosuthu students in Medical Technology on introducing portfolio assessment as a means of identifying students' competencies on what they have gained at the Technikon.

This has been done due to the industry's concerns on the standard of the majority students who come out of the institution for experiential training with less than expected knowledge of operations in the workplace.

The methods used to collect information for this study are explained below. From this information I will compile a general report that might assist lecturers in the department to improve the way they deliver their lectures and assess students. This is hoped to improve the standard of students' abilities to perform in the workplace.

You are also encouraged to ask any questions at any time about the nature of the study and the methods used. Your suggestions and concerns are important to me; please contact me at any time at the phone numbers listed above.

_____
Laboratory supervisor

QUESTIONNAIRE

As the student supervisor of students from the department of Biomedical Science at Mangosuthu Technikon, we would be most grateful if you would take a few moments of your time to complete the following evaluation questionnaire and return it to Ms T.A. Ndimande. The questionnaire aims at determining your perceptions on the use of portfolio assessment to allow students to improve their performances in the workplace starting with the experiential training.

1. Rank the following skills and abilities the way you think students from Mangosuthu Technikon respond.

    These should be ranked according to the rating scale submitted below.

0 = POOR   1 = UNSATISFACTORY 2 = SATISFACTORY 3 = GOOD 4 = EXCELLENT

Skill/ Ability	Rating scale
1. Adherence to safety procedures	
2. Thorough check on specimens suitability before analysis	
3. Knowledge of handling different types of chemicals	
4. Store chemicals according to the laboratory rules	
5. Criteria for specimen rejection	
6. Quality control concepts	
7. Knowledge of quality control procedures	
8. Solution preparation	
9. Appropriate sample dilution when needed	
10. Action to be taken into account when receiving an urgent specimens	
11. Action to be taken on feedback	
12. Willingness to take on extra tasks assigned to them	

13. Communicate effectively	
14. Compile a required portfolio of evidence	
15. Write effectively	
16. Identify and solve problems independently	
17.Organise and manage themselves appropriately	
18. Work with others as a team	
19. Relate theory done at the Technikon with practice	
20. Their work performance relate well with their performance at Mangosuthu	
21.Any other skills/abilities you would like to include	

2. Are there any suggestions that you would recommend to improve the use of portfolio in industry?

_____
_____
_____
_____
_____

3. Explain if you have noticed any differences in the way the 2005 and 2006 students from Mangosuthu Technikon handle their portfolio work as compared to the previous years?

_____
_____
_____
_____
_____

4. Do you believe portfolios can be used as the means of determining the students' competencies?

Yes   No

☐   ☐

Appendix 6: Staff members' Consent Form: Biomedical Technology Lecturers

Researcher: Mrs T.A. Ndimande
                     Mangosuthu Technikon

Student No: 202525851
                     University of KwaZulu Natal

Supervisor: Prof C. Mbali
                     Centre for Higher Education Studies
                     University of KwaZulu Natal

Contact details: 031 907 7516(w)
                     082 802 1730©

Thank you for agreeing to participate in this study. This form outlines the purpose of the study and provides a description of your involvement and rights as a participant.

The purpose of this study is:

➢ To gain insight on the lecturers' perceptions on Mangosuthu students in Medical Technology on introducing portfolio assessment as a means of identifying students' competencies on what they have gained at the Technikon.

This has been done due to the industry's concerns on the standard of the majority students who come out of the institution for experiential training with less than expected knowledge of operations in the workplace.

The methods used to collect information for this study are explained below. From this information I will compile a general report that might assist lecturers in the department to improve the way they deliver their lectures and assess students. This is hoped to improve the standard of students' abilities to perform in the workplace.

You are also encouraged to ask any questions at any time about the nature of the study and the methods used. Your suggestions and concerns are important to me; please contact me at any time at the phone numbers listed above.

_____
Biomed Tech: Lecturer

Appendix 7: Semi-Structured Interview Questions

    1.   What is your opinion about the existing assessment methods?

_____

_____

_____

_____

_____

_____

_____

_____

    2.   How would you explain the role played by assessment in your teaching?

_____

_____

_____

_____

_____

_____

_____

_____

    3.   Do you think the assessment has an effect on how the students learn?

_____

_____

_____

_____

_____

_____

_____

_____

4.   Do you think you offer enough feedback to help students understand the subject matter?

_____

_____

_____

_____

_____

_____

_____

5.   Given a chance, would you introduce portfolio compilation as another form of assessment in your subject? Why?

_____

_____

_____

_____

_____

_____

_____

6.   What would affect you and /or your teaching when using portfolio assessment?

_____

_____

_____

_____

_____

_____

_____

Appendix 8: Minutes of the Joint Advisory Board meeting: 21 May 2004

DURBAN INSTITUTE OF TECHNOLOGY

FACULTY OF HEALTH SCIENCES
DEPARTMENT OF BIOMEDICAL TECHNOLOGY

JOINT ADVISORY BOARD: BIOMEDICAL TECHNOLOGY – DIT AND MANGOSUTHU TECHNIKON
Minutes of Meeting of the Joint Advisory Board
held on Friday , 21 May 2004 at 13:00
In the Council Chamber, 8ᵗʰ Floor, D Block, M L Sultan Campus

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PRESENT

J M P FRASER	:	CHAIRPERSON
P PILLAY:		DIT
B T MKHIZE:		DIT
D GOVENDER:		DIT
S PRITHEPAUL:		DIT
L SHRIVES:		
N MTSHALI:		DIT
T NDIMANDE:		MANTEC
N MBALO:		MANTEC
K HUNT:		MANTEC
P NAIDOO		
L PILLAY		

R Bridgemohan

T Ndlovu

y Karim

V Rambiritch

C Mc Intosh

Z Siyaca: STUDENT

1. **<u>WELCOME</u>**

The Chairperson welcomed all present. .

2. **<u>APOLOGIES</u>**

R Smith

V Muthusamy

L Govender

F Magagane

S Mashego

3. **ADDITIONS TO AGENDA**

Molecular Biology B Tech and employer

4. **MINUTES OF PREVIOUS MEETING**

The minutes of the previous meeting were read, amended and adopted.

5. **MATTERS ARISING**

5.1 **Moderation of Laboratory Practice 3 - Experiential Training**

Mrs B T Mkhize reported that the moderation of Laboratory Practice that was tabled at the Laboratory Practice 3 Review Workshop and at previous Advisory Board meetings is to be implemented for 2005.

Question 1 and 2 on the moderation form are to be completed by the laboratory moderators. Question 3 will be addressed by the technikon moderators. She also indicated that is was necessary for laboratory supervisors to keep evidence to validate the responses to Question 1 and 2 and that this would help to ensure that training

was being done in a manner that ensures fairness. She also added that this was not meant to be a time consuming process. She indicated that the moderation covers the training period/training session for a particular period and is meant to assess training as a whole and not each student.

5.2 **Experiential Learning Fee – Experiential Training**

Ms L Pillay indicated that she had conducted an investigation on the fee that should be instituted for Laboratory Practice and had arrived at an approximate figure of R5 000 per student. Ms P Naidoo indicated that Ampath Laboratories had conducted a similar exercise and had arrived at R650 /student for Chemistry.

Ms Rambiritch indicated that Blood Transfusion did not cost much in terms of training students and that this did not justify placing a fee for Laboratory Practice in Blood Transfusion.

Concerns were raised that the fee of R5000 per student was too high. Mr Fraser agreed with this and added that we need to consider a token amount for the training of students. It was indicated that a reasonable amount of about R1000 could be considered.

Mr Hunt commented that Laboratory Practice should be considered as partnership between the Technikons and the employers and was concerned about who would be liable to pay for this since the Technikons did not specifically get money for students. Mr Hunt also enquired whether the state laboratories did not consider getting funding from Government. It was indicated that the students might have to pay this fee. Ms Mkhize

indicated that on behalf of DIT it is acknowledged that a token fee needs to be paid. We need determine how it will be split in terms of disciplines.

The student representative Ms Siyaca expressed concerns regarding this matter on behalf of the students. It was suggested that Ms P Naidoo conduct a costing exercise for the other subjects.

Another concern was raised about the laboratory practice 3 is the current students who come from the Technikons have high aggregate marks which do not correlate with the performance that they are displaying in industry. Students are unable to perform basic procedures that they would be expected to perform at their level. Both DIT and Mangosuthu Technikon were requested to look into this issue and present a solution in the next Advisory Board meeting.

5.3   Needle Stick Injury

Mr Fraser indicated that the DOH needs a written agreement regarding Needle Stick Injuries to Technikon students during Laboratory Practice 3. Mr Hunt indicated that there was a personal accident insurance portfolio to the value of R22800 covering medical expenses for Mangosuthu Technikon students.

Ms Mkhize indicated that DIT currently does not have an HIV policy. In any event of a needle stick injury the laboratory concerned must administer AZT to the affected student and thereafter invoice DIT. Mr Fraser requested that a written declaration to this effect be submitted to the Laboratories.

6.   New Matters

6.1   Curriculum Development