CONSTRAINTS AFFECTING THE QUALITY OF TEACHING AND LEARNING AT TECHNICAL COLLEGES IN KWAZULU NATAL

BY

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PROMOTER: PROF. MONICA JACOBS

DATE: JANUARY 2000

DEDICATION

This work is dedicated to the principals of all technical colleges in KwaZulu Natal

DECLARATION

Constraints Affecting the Quality of Teaching and Learning at Technical College in KwaZulu Natal

D.Ed 2000

I, **ENOCK VUSUMUZI NZAMA**, do hereby declare that this thesis, which is submitted to the University of Zululand for the degree of Doctor of Education, has not previously been submitted by me for a degree at any other university. This thesis represents my own work in conception and execution and that all sources which I have quoted have been acknowledged by means of a complete reference.

Signed by me on the 20 th day of January 2000

SIGNATURE: E.V. Nzama....

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7 Finally, I thank God, the Almighty, for giving me the strength and means to accomplish this great work.

E V NZAMA

JANUARY 2000

SUMMARY

The main aim of this research was to identify constraints affecting the quality of teaching, learning and practical training of students at technical colleges in KwaZulu Natal. Questionnaire surveys as well as informal interviews were used. A mixture of quantitative and qualitative methods has enabled the researcher to gain a deeper understanding and a more penetrating insight regarding the problem under investigation.

The five criteria for effective technical college-based training are identified and discussed in detail with the aim of using them as a yardstick for the analysis of the results of this study. The criteria are: effective partnership, adequately equipped workshops, effective education, practical application of knowledge and adequately qualified lecturing staff.

In Chapter 3 recent examination results are analysed in order to inpoint those colleges in KwaZulu Natal where teaching and learning appear to be ineffective; identify constraints affecting the quality of training since colleges with excellent results may very well have fewer constraints then colleges with poor results; and identify those colleges which are most affected by constraints.

In Chapter 4 the data collected from nineteen principals who completed questionnaires regarding staffing at technical colleges is outlined. The focus is on staff provisioning [including qualifications and recruitment] as well as staff development and in-service training at colleges.

Chapter 5 consists of a discussion of the data collected from nineteen principals who completed a questionnaire regarding training equipment at technical colleges. The focus was on:

- relatedness of equipment and accreditation;
- exemplification of equipment needed;
- didactic rationale for the need of equipment; and
- perceptions of principals regarding equipment
- an inventory of equipment at selected colleges.

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In Chapter 6 there is a particularisation of the constraints that affect the quality of teaching, learning and practical training of students at technical colleges. Ten serious constraints were identified, divided into four categories, namely:

- *Constraints related to students*: lack of a Science and Mathematics background, as well as student support systems.
- *Constraints related to lecturers:* inadequately qualified lecturers, frequent resignations and the lack of staff development programmes.
- *Constraints related to equipment:* a lack of up-to-date tools, equipment, heavy machinery and consumables.
- *Constraints related to the department:* partnership between colleges and industry is non-existant, most of the training is not in line with commerce and industry, merketing of technical colleges is ineffective and there is a lack of coherent and consistent funding policy for technical colleges.

In Chapter 7 the empiriacl results are analysed, using the five criteria formulated in Chapter 2. It is shown that no technical college training can be effective unless these five criteria are met. Shortcomings in technical training in KwaZulu Natal are highlighted and the practical problems experienced in technical education are shown to be caused by a neglect or disregard of the theoretical underpinnings on which technical training should rest.

Chapter 8 outlines the recommendations which emanated from the findings of this study. The following are some of the most significant recommendations:

- bridging courses in Science and Mathematics for students;
- certain non-technical skills should be taught, such as problem-solving and English reading skills;
- induction and staff development programmes should be offered to lecturers;
- short-term staff exchanges should occur regularly between colleges and industry;
- facilities and equipment should be drastically updated;
- the department should introduce a new funding policy;

- training offered by technical colleges must be in line with the needs of business and industry.

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IQOQO LOKUBALULEKILE

Inhloso enkulu yalolucwaningo ukukhomba izingqinamba eziphazamisa isimo sokufundisa, sokufunda kanye nesokuqeqeshwa kwabafundi ezikoleni zobuchwepheshe esifundeni saKwaZulu Natal.

ISAHLUKO SESIBILI: saloluncwaningo sikhuluma ngezindlela zokuhlunga eziyisihlanu okubonwa ngazo izimo zokunquma ukuphumelela kwemfundo yobuchwepheshe ngenhloso yokusebenzisa zona lezizici njengesilinganiso sokuhlaziya imiphumela yalolucwaningo.

ISAHLUKO SESITHATHU: sibheka imiphumela yokuhlolwa ukuze:

- Sikhombe lawo makolishi esifundeni saKwaZulu Natal ukufundisa nokufunda kubonakala kungekho ezingeni eliphezulu.
- Kukhonjwe izingqinamba kumbe izinkinga eziphazamisa isimo esihle sokuqeqesha njengoba kwazeka ukuthi amakolishi enemiphumela emihle kakhulu ayebe nezinkinga ezincane besekuthi lawo anemiphumela emibi kuba yiwona ahlaselwa izinkinga.
- ukukhomba lawo makolishi ahlaselwa kakhulu izinkinga.

ISAHLUKO SESINE: siklama imininingwane noma izisusa ezivunyiweyo, zendaba eziqoqwe kothishanhloko abayishumi nesishiyagalolunye abagcwalisa iphepha elinamahlelo emibuzo mayelana nokuqashwa kwabafundisi ezikoleni zobuchwepheshe.

ISAHLUKO SESIHLANU: sikhuluma ngemininingwana noma izisusa ezivunyiweyo zendaba eziqoqwe kothishanhloko abayishumi nesishiyagalolunye abagcwalisa iphepha elinamahlelo emibuzo mayelana nemishini, namathuluzi nezinye izinto zokuqeqesha abafundi emakolishi. Indawo okuqondwe kuyo du lapho izinto ziqhamise khona yilokhu:

- ukuhambelana noma ukuhlobana kwezinto zokuqeqesha nemigomo noma imithetho ebekwe amabhodi okuqeqehsa.

- ukufanisa imishini yokuqeqesha edingekayo, kanye
- nemibono yothishanhloko mayelana nemishini nezinto zokuqeqesha.

ISAHLUKO SESITHUPHA: sesibheka ngqo izingqinamba eziphazamisa izimo ukufundisa nokufunda kanye nokuqeqeshwa kwabafundi ezikoleni zobuchwephesha.

ISAHLUKO SESIKHOMBISA: sihlaziya imiphumela yocwaningo sisebenzisa izindlela zokuhlunga eziyisihlanu ezibekwe esahlukweni sesibili. Lesisahluko sihlukene izigaba eziyisihlanu njengoba kubekwe esahlukweni sesibili, lezizigaba zimi kanje:

- ukubambisana okubonakalayo
- ukuhlomisa izindlu zokuqeqesha ngamathuluzi nemishini eyanele
- ukuhluza noma ukuhlaziya ngokubonakalayo
- ukudlulisela ulwazi, kanye
- nokuqeqesheka kwabafundisi

ISAHLUKO SESISHIYAGALOMBILI: sibeka izincomo eziqhamuke kulolucwaningo. Lesisahluko sibuye futhi sikhulume ngezinto ezintsha nemiphumela yazo mayelana nohlaka kanye necebo likazwelonke kumfundo eqhubekisela phambili ezifundweni zobuchwepheshe [National Strategy for FET on Technical and Vocational Education].

Imibuzo yocwaningo eyayibhalwe phansi kanye naleyo eyayimibuzo ebuzwa ngomlomo yasetshenziswa kulolucwaningo. Ukuxubana kwemibuzo eyayibhalwe phansi neyayibuzwa ngomlomo kusize umcwaningi ukuthi athole ulwazi olunjulu ngezinkinga ezihlasela izikole zobuchwephesha. Lezizingqinamba eziyishumi ezilandelayo yizona ezitholwe yilolucwaningo:

1. Lolucwaningo luveze ukuthi abafundi abaningi abafunda u NTC 1-3 ezifundeni zobunjiniyela kakhulukazi labo abaqhamuka kulawomakolishi ayephethwe kumbe akhelwe abamnyama ngaphansi kukahumeni omdala, abanazo izifundo ze Mathematics ne Sayensi ezifundweni zabo. Lesisimo senza ukuthi kubenzima kulababafundi ukuthi baphase izifundo ezinje ngo Motor

Mechanics [izifundo zokukhanda imoto] Electrical [zikagesi] kanye nezokudweba, Mathematics no Sayensi.

2. Azikho izinto zokusiza abafundi nokukhansela emakolishi, ukubatshela ngezifundo abangazithatha nama thuba abanawo uma sebephumela ngaphandle emva koqeqesho.

3. Ucwaningo lubuye lwathola ukuthi abafundisi abaningi kulamakolishi abaqeqeshiwe ngokwanele okungangokuthi amakolishi ayesemnyangweni wemfundo omdala wakwaZulu ne DET ayaqhubeka nokuba nezinkinga ukuthola othisha abaqeqesheke ngendlela.

4. Ucwaningo luveza ukuthi abafundisi emakolishi kakhulukazi ayephethwe umnyango omdala wemfundo waKwaZulu bayawushiya umsebenzi baqashwe izinkaphani ezizimele la bafike bathole khona amaholo namanye amathuba angcono kunase mnyangweni wemfundo.

5. Awekho amathuba nezifundo zokuthuthukisa othisha.

6. Ukuxhumana nokusebenzelana phakathi kwamakolishi nezinkampani ezizimele akukho.

7 Awekho amathuluzi esimanje, izinto zokuqeqesha kanye nemishini esindayo nokokuqeqesha abafundi okusetshenziswa kuphele (consummables) ezindlini zokuqeqesha [workshops], lesisimo sidala ukuthi kungaqeqesheki kahle abafundi kulamakolishi.

8. Ucwaningo luveza ukuthi azikho izindlela zokudayisa kahle amakolishi emphakathini.

9. Ucwaningo kuveza ukuthi ayikho inqumo mgomo yokunikeza imali kulamakolishi ezobheka isinwe noma ukulingana, ukuthuthuka kanye noku qeqesheka.

10. Uqeqesho olusezikoleni zobuchwebepha aluhambisani nezidingo zosomabhizinisi nezinkampani ezizimele.

Uqeqesho olwenziwa izikole zobuchepheshe alukho esimeni sokuthi lukwazi ukubhekana nezidingo zezinkampani ezizimele. Loluqeqesho olusezingeni eliphansi lugcine lwakhe isimo la abafundi abaqeqeshwe yilawamakolishi bengawutholi umsebenzi.

OKULANDELAYO LA IZINCOMO EZIBALULEKILE EZIKHISHWA YILOLUCWANINGO:

IZINCOMO EZIMAQONDANA NABAFUNDI

1. Ucwaningo luthole ukuthi abafundi bahlulwa kakhulu izifundo ze Mathematics ne Sayensi; ngakhoke kuyanconywa ukuthi amakolishi awabe nezifundo zokuwelisela abafundi [bridging courses] kulezifundo ezibahlulayo.

2. Izifundo zesilungu [English] kanye namakhono ahambisana nokucabanga, ukuxazulula izinkinga ukuphathwa kolwazi, ukulalela, ukuxoxisana kanye nokufunda kufanele kufakwe kuhlanganiswe nezifundo zobunjiniyela.

3. Amakolishi kufanele abenazo izinto zokulekelela nokusiza abafundi.

IZINCOMO EZIMAQONDANA NABAFUNDISI

1. Amakolishi awakhe izinhlelo zawo zokuqeqesha othisha abasanda kuqashwa.

2. Amakolishi awabe nezinhlelo zokuthuthukisa othisha ukuze kukhuphuke izinga lokufundisa nokuqeqesha abafundi.

3. Kunesidingo sokuthi kubekhona ukubolekiswa nokushitshanisa kothisha nabasenzi bezinkampani ezizimele.

IZINCOMO EZIMAQONDANA NEZINTO ZOKUQEQESHA

1. Umnyango wemfundo mawu wathengele amakolishi amathuluzi, izinto zokuqeqesha kanye nemishini.

2. Ukuhlanganiswa kwamakolishi akwenziwe ngokushesha; lokhu kuzokwazi ukuthi kuvimbele ukuphinda phindeka kwezinto zokuqeqesha.

IZINCOMO EZIMAQONDANA NOMNYANGO WEMFUNDO

1. Umnyango wemfundo uhlangane nowabasebenzi kumele uvumelane kokufakwa kwengxenye yezifundo zokufundela ukuqala noma ukuphathwa kwamabhizinisi.

2. Umnyango wemfundo kufanele ube nemigomo emisha yokunikezela ngezimali ezizobheka nokulungiselwa, [redress] ukulingana [equity] kanye nokushintsha kwezihlelo [transformation].

3. Uqeqesho olwenziwa amakolishi ezobuchwephesha kufanele luhambisane nezidingo zamabhisinisi kanye nezinkampani ezizimele.

Lolucwaningo lukwazile ukuveza ezinye zezingqinamba eziphazamisa uhlelo lokuqeqeshwa kwabafundi ezikoleni zobuchwepheshe esifundeni sakwaZulu Natal; lwaphinda futhi lwakwazi ukuveza nezincomo ukuthi kungabhekwana kanjani nalezizinkinga.

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CHAPTER I

STATEMENT OF THE PROBLEM AND METHODOLOGY

1.1 ORIENTATION

It is generally accepted that technical and vocational education is a key factor in socio-economic development. Human resource development in a country depends to a large extent on the quality of technical and vocational education offered within that country. The labour market requires individuals to be efficiently trained in order to obtain employment, but in South Africa, there appears to be an imbalance between the technical education system and demands for technical skills. To meet the demand for skilled manpower, technical and vocational education needs to raise the standards of both teaching and learning in order to enhance the status of graduates as well as to improve the development of the human and economic resources of society as a whole.

In order for technical and vocational education to be able to meet the needs for skilled technical manpower, it requires superior infrastructure, facilities and a large number of specialized teachers than found in general education. UNESCO [1990:22] stresses that the role and training of teachers in technical and vocational education is a crucial issue, particularly in view of the rapid technological advancements and changes.

UNESCO [1990:55] further focuses upon the essentiality of ensuring that technical and vocational education teachers possess appropriate, up-to-date knowledge and skills if they are to meet the training needs of all students. This shows the concern attached to the technical vocational teacher and her/his role in the training needs of students.

The task of providing high quality training to students in KwaZulu Natal technical colleges depends largely upon an adequate number of suitably qualified teachers and upon the availability of resources. The brief discussion which follows covers the ex-Departments of Education in KwaZulu Natal, staffing at technical colleges, and staff qualifications which provide a background to the study.

1.2 HISTORICAL OVERVIEW

The rationale underlying the existence of technical colleges of education and their natural place within the broader framework of education and training can possibly best be understood through an overview of their history, highlighting some of the changes that have evolved due to changes in the economy and in the wider education system.

The establishment and development of technical colleges has been related to the growth and needs of industry in particular; as well as to commerce. The discovery of diamonds at Kimberley in 1867 and the consequential development of diamond mining, followed by gold mining at the Witwatersrand in 1886, led to the establishment of railways in South Africa. As the railway system developed, a demand for technical education for railways apprentices was created and so technical education and training was begun at Railways Institutes in Durban in 1884, Salt River in 1890, Uitenhague in 1895 and in East London and Pretoria in 1902. These places of training were made technical colleges during the 1920s [Malherbe 1977: 167].

The school of mines was established in Kimberly in 1896 and was later to become the University of the Witwatersrand as the first institution which can be described as a technical college. As the needs for technical education and training expanded in a wide variety of occupational fields, the demand for more institutions of this nature increased. This demand called for a wider set of vocational courses as well as for the standardisation of syllabuses and examinations on a national level. Given the impetus of World War 1, by the mid - 1920s the colleges had expanded their curricula beyond apprentice training to tertiary level courses in a variety of fields in order to meet the requirements of the country's growing industrialisation.

The Pretoria polytechnic and the Durban Technical Institution opened in 1906 and 1907 respectively, whilst the South African college in Cape Town started with part-time technical classes. By 1910 there were day-time technical schools in Pretoria, Durban and Pietermaritzburg and one under construction in Johannesburg [Malherbe 1977: 167].

The Pretoria Trade School which opened in 1909 prepared pupils for the trades of mechanics, woodwork, wagon building, printing, blacksmithing, plumbing and electrical engineering. A minimum age of 13 and a standard four pass was required to enrol and classes consisted of 50 % workshop and 50 % classroom tuition [Pittendrigh 1988: 6].

The Durban Technical Institute included a technical high school for boys over 13 years who had passed standard six, yet it appears that they made no attempt to prepare these pupils for a trade. The purpose of accepting them was to provide vocational training to enable them to enter technical, commercial or teaching occupations.

The Minister of Education convened a conference on technical, industrial and commercial education in Pretoria in 1911. The conference passed a total of 67 resolutions, the most significant of which were the need for the following:

- Central control of vocational education.
- A National Advisory Board on Vocational Education and
- Central Syllabi, examinations and certification in Technical education [Pittendrigh 1988: 6].

Although provincial administrations were not keen on implementing these proposal as they were guarding the rights granted to the provinces by the South African Act of 1909, a National Advisory Board for Technical Education without executive functions was established in September 1912. National technical syllabi and National technical examinations were established only in 1916 [Pittendrigh 1988: 9-10]. Despite this, technical and vocational educational remained largely in the hands of the provinces.

The provisions of Section 85 of the South African Act, 1909 placed a limitation on the transfer of any form of education not being clearly defined as "higher education" from the provinces to the Central government, and this limitation was jealously guarded by the provinces. Unfortunately the founders of the Union had not yet clearly defined "higher education" and there was no agreement as to the meaning of the term .

This haziness created many problems - financing of education, responsibility to parliament, etc. - and it became clear from several annual reports by the Secretary for Education that change would be called for.

This change was initiated by the Financial Relations Fourth Extension Act, 1922 [No. 5 of 1922] which defined "higher education" as:

- education provided by University and University Colleges incorporated by law
- education provided by the South African Native College
- education provided by such technical institutes as the minister may declare to be places of higher education and
- such part of education provided by other technical institutes [including schools of art, music, commerce technology, agriculture, mining and domestic science] as the Minister of Education may, after consultation with the provincial administration concerned, declare to be higher education [Pittendrigh, 1988 10].

This new definition of higher education enabled the Minister to alleviate the major financial difficulties which had developed at the Durban Technical Colleges by declaring the college work, other than technical high school work, to be higher education and therefore paid the college a grant with effect from 1 April 1922. With the change of this college from a provincial to a state subsidised institution also came a change of name to Natal Technical College as well as recognition of college work in engineering and commerce as being of University standard. This work was conducted in conjunction with the Natal University College in Pietermaritzburg [Pittendrigh, 1988: 12-13].

In October 1922 the Cape Province Technical Institute became the Cape Technical College and was declared by the Minister to be an institution for higher education. Ultimately the following factors gave rise to the passing of the Higher Education Act [No. 30 of 1923] in 1923:

- Cutting back on finances from the Union Government to Provincial Administration
- Provinces being unable to finance expanding vocational education
- Defining "higher education" in the South African Act of 1909 so as to include vocational education
- Funding vocational education by the Union Government under the Financial Relations Fourth Extension Act, 1922 [Pittendrigh, 1988:13].

Initially the Higher Education Act, 1923 [No. 30 of 1923] was only applied to the Natal Technical College, the Cape Town Technical College and the South African Native College [which later became the University of Fort Hare]. However, the financing of education still remained a critical issue. An Education Administration Commission was appointed in 1923 to, inter alia, define the limits of compulsory education and assign the burden of costs for such education, to examine and to report on existing provisions for industrial or technical education or training and to what extent the existing provision should be altered [Pittendrigh, 1988: 21].

This Commission recommended:

I] that Provincial Administration should assume immediate control of all education in state-provided or state-aided institutions within their respective areas, with the exceptions of agricultural colleges and institutions of University rank, and

ii] that a Union Board of Education should be constituted with authority to co-ordinate the educational activities of the four Provincial Administrations, both with one another and with those of the Universities and agricultural colleges [Pittendrigh, 1988: 24].

Armed with the Commissions report, the Minister convened a conference in Durban in October 1924. At this conference the Minister proposed as part of the scheme for adjusting the financial relations between the central government and the Provincial Administrations, that the Department should assume responsibility for all vocational education under provincial control. This was accepted after protracted negotiations so that "higher education" was extended to include any other education which, with the consent of the Provincial Administration concerned, the Minister of Education may declare to be higher education [Pittendrigh, 1988: 26].

This led to the establishment of technical colleges under the Higher Education Act at East London, Pietermaritzburg, Port Elizabeth, Pretoria and Johannesburg and the establishment of technical institutes at Bloemfontein and Utenhage. A period of vigorous development then took place with various colleges being established and large numbers of buildings being erected.

The Witwatersrand Technical Institute became the Witwatersrand Technical College in 1930 and by the end of 1933 it had branches at Benoni, Brakpan, Germiston, Springs, Boksburg, Krugersdorp, Witbank and Vereeniging. In 1982 it took over correspondence courses for the post office and public service messengers which were previously conducted by the General Post Office and from 1929 extended these courses so as to include technical and general courses. In the same year the Cape Technical College became responsible for commercial correspondence courses [Pittendrigh, 1988: 29-30].

In 1927 an Indian Technical Institute was established in Durban, but it was not until in 1946, with the establishment of the M L Sultan Technical College, that technical education for Indians was grounded. Its creation was as a result of the recommendation of the Hugo Committee of 1942 [27/1992] Behr [1978: 140].

By this time technical colleges were involved in a range of work from continuation classes to day schools, covering classes from standard six level up to post matriculation work. The Natal Technical College offered degree courses in engineering, fine arts and commerce in conjunction with the Natal University College with a view to prevent the duplication of work. The Minister decided to appoint a special commission to report on the delineation of duties between technical colleges and institutions of University status. This Commission [the Van Der Horst Commission] recommended the following:

- a closer linking of colleges with other secondary work and a limitation on their functions to provide a more specialised type of secondary work;
- the stopping of examinations for outside bodies such as the institute for bankers, etc.
- the placing of technical colleges under the direct control of the Union Government and
- the stopping of University work done by technical colleges.

Resulting from these recommendations the university courses of the Natal Technical College were transferred to the Natal University, but because of vigorous reaction to this report by the technical colleges no further actions were taken [Department of Education b], 1997: 10].

THE DE VILLIERS COMMISSION ON TECHNICAL AND VOCATIONAL EDUCATION [1948] AND SUBSEQUENT DEVELOPMENT

The De Villiers Commission [1948] on Technical and Vocational Education [UG 65/1948], defined vocational education as education which is designed to meet the specific demands of a particular occupation or group of occupations. It visualised the objective of vocational education as providing occupational efficiency [Behr 1978: 140].

The Commission deplored the lack of facilities for technical education for the coloured population which, if provided, would produce skilled craftsmen, foremen and building contractors [UG 65/1948]. In 1946, a mere 2000 Black pupils were receiving some form of vocational training. The De Villiers Commission attributed the lack of progress in the industrial training of Blacks to a "limited sphere in which the trained native worker can find an outlet for the practical application of his skills" [Behr 1978: 141].

The Vocational Education Act of 1955 [Act 70 of 1955] provided for the complete take- over of the technical colleges by the Central Government Department of Education and Science. The central Government wanted to increase control because most technical colleges had not taken the Afrikaner's national character and philosophy of life into due account.

Act 70 of 1955 proved detrimental to technical colleges since they were expected fulfill the dual role of providing both secondary and post-secondary education. The technical colleges were dependent on student fees, and the post-secondary training was hampered by a lack of funds and foresight on the part of the Government [Behr 1978: 141].

Having decided to transfer the control of technical colleges to the state and having passed Act 70 of 1955, the Department commenced developing courses for the training of technicians in 1950. After careful consideration and planning, courses and syllabi were compiled in consultation with industry and other interested parties in three major branches of engineering, namely for Chemical, Electrical and Mechanical Engineering. The first technical courses were started at the Witwatersrand Technical College in 1958 and were four-year sandwich courses mainly sponsored by the Chamber of Mines [Pittendrigh 1988: 12].

This was followed by a period of healthy expansion of advanced technical courses with new courses being introduced each successive year. This included advanced courses in Art and Design as well as in Secretarial and Commercial Studies.

During the 1960's, as greater emphasis on tertiary technical education and training became apparent, many of these original technical colleges became Colleges for Advanced Technical Education [CATE] which later developed into technikons in terms of Act 43 of 1979. This Act defined the functions of a CATE as the provision of such advanced technical education and such secondary and other education on a part-time basis as the Minister may require. This resulted in FOUR Colleges for Advanced Technical Education [Behr 1978].

Shortly hereafter the Technical Colleges Act, 1981 [No. 104 of 1981] was promulgated. This act was based on the original form of Act 40 of 1967 and under this Act the 42 existing technical institutes became technical colleges and together with the 29 existing technical colleges, were declared State-Aided institutions. It must be stressed that this Act only applied to technical colleges that fell under the House of Assembly.

The development of technical colleges and vocational education have therefore been hampered by the problems of the apartheid era. After 1948 the Nationalist Government brought technical colleges under central state control for different racial groupings. A consequence of the policy of separate development was the creation of separate systems of administration, governance and financing of the colleges under different legislation and different departments. All the colleges under the House of Assembly, mainly White Colleges, became state-aided while colleges in the following areas were state colleges:

- Ex-Department of Education [Ex-DET] mainly Black Colleges
- Ex-Department of Education and Culture [House of Delegates [HOD] - mainly Indian Colleges]
- Ex-Department of Education and Culture - [Ex-House of Representative [HOR] - mainly Coloured Colleges]
- Ex-KwaZulu Department of Education and Culture [Ex-KZDEC] - mainly Black Colleges - in the Homeland of KwaZulu and the former self governing territories and TBVC states.

However, despite these differences in administration and governance, the mission and goals of all technical colleges are remain the and the students of these institutions are studying towards common national examinations and certificates.

INSTITUTIONAL INFRASTRUCTURE

Institutions providing technical and vocational education in KwaZulu-Natal

Vocational education is provided by technical colleges of different former education departments operating on a basis of either state-aided or state colleges.

There are 23 technical colleges under the jurisdiction of the KwaZulu-Natal province which originated from former education departments. They are as follows.

TABLE 1: FORMER EDUCATION DEPARTMENTS OF EDUCATION

EX-DEPARTMENTS	NO. OF COLLEGES	ADMINISTRATION
Ex-House of Assembly [previously for Whites Only]	9	State-Aided Colleges
Ex-Department of Education [Ex-DET]	3	State Colleges
Ex-House of Delegates [Ex-HOD]	3	State Colleges
EX-House of Representative	1	State Colleges
Ex-KwaZulu Department of Education & Culture [Ex-KZDEC]	7	State Colleges
TOTAL	23	

STAFFING AT TECHNICAL COLLEGES

Staff Provision

The global provision of posts for technical colleges is determined according to the personnel provision scale in accordance with general policy which is related to the total full-time equivalents [FTES] or total teaching hours of the preceding year. The total number of establishment posts at all of the KwaZulu-Natal Colleges in 1995 amounted to 770. These were distributed per post level as follows:

TABLE 2: TOTAL NUMBER OF ESTABLISHMENT POSTS AT KWAZULU-NATAL COLLEGES

	EX-NATAL [9 COLL.]	EX-KZDEC [7 COLL.]	EX-DET [3 COLL.]	EX-HOD [3 COLL.]	EX-HOR [1 COLL.]	TOTAL
Post Level 6	1	0	1	1	1	4
Post Level 5	5	1	3	2	1	12
Post Level 4	7	6	2	4	3	22
Post Level 3	15	10	5	6	5	41
Post Level 2	41	10	21	19	11	102
Post Level 1	145	181	92	123	48	589
TOTAL	214	208	124	155	69	770

Source: Discussion document for policy and implementation for Technical Colleges in KwaZulu-Natal drafted by project Task Team chairman Marais J J p.8, 1995.

1.3 BACKGROUND TO THE STUDY

1.3.1 PROVISION OF TECHNICAL AND VOCATIONAL EDUCATION IN KWAZULU-NATAL

The term "KwaZulu" is used to describe those parts of Natal in South Africa which were set aside by the former South African Government [1948-1994] for occupation exclusively by the Zulu people. When the Government of National Unity was set up on 27 April 1994, South Africa was divided into nine provinces and the province of KwaZulu-Natal was one of these. This province was a combination of the former KwaZulu region and the former province of Natal. KwaZulu-Natal has its own Department of Education which is responsible for the control of all five ex-Departments of Education which were created according to race classification by the previous government system.

As stated in the previous section, vocational and technical education in KwaZulu-Natal had previously been provided by technical colleges falling under the different education departments and these colleges operated on the basis of being classified as either state-aided or state colleges. As a result there was a multiplicity of control of education according to racial divisions. The ex-KwaZulu Department of Education and Culture was responsible for the education of blacks in ex-KwaZulu and this department provided seven technical colleges.

The formation of the tricameral parliament by the South African Government in 1983, led to the development of these five ex-Departments of Education, which were also founded in KwaZulu-Natal and each department was responsible for the control of education for a certain racial group. These departments were:

i] The Department of Education and Culture [House of Assembly] which controlled nine state-aided technical colleges in Natal, providing technical education for Whites.

ii] The Department of Education and Training catered for blacks who lived in Natal but outside of the region of KwaZulu. This department had three state technical colleges.

iii] The Department of Education and Culture [House of Delegates] provided education for the Indian people and controlled three state technical colleges.

iv] The Department of Education and Culture [House of Representative] was responsible for the education of the coloured population and provided one state technical college.

v] The KwaZulu Department of Education and Culture had responsibility for the education of black people residing within the KwaZulu region. This department controlled seven state technical colleges.

These five departments no longer exist as separate departments but now fall under one control, namely, the KwaZulu-Natal Provincial Education Department with one Ministry of Education in the region. There are at present twenty-three technical colleges in KwaZulu Natal.

1.3.2 TEACHING STAFF IN KWAZULU-NATAL TECHNICAL COLLEGES

Technical colleges from the five ex-Departments of Education draw most of their lecturers from industries. The appointment of lecturers into technical colleges is based on technical qualifications as well as on experience gained in either the industry or commercial institutions.

In order for a lecturer to qualify for a lectureship post at a college, she/he must be in possession of a National Technical Certificate [NTC] 3 obtained from a technical college. After obtaining a NTC 3 certificate, she/he has to serve an apprenticeship for three years in industry and thereafter pass a trade test with the Department of Manpower in order to qualify for a trade diploma.

The trade diploma is an entry or minimum qualification for a lectureship post at technical colleges and is classified as category C or Matric + 3 years [M+3] which is equivalent to a Secondary or Primary Teacher Diploma [STD or PTD] from a college of education.

Table 3 presents a profile of the current [1996] qualifications of lecturing staff in KwaZulu-Natal technical colleges.

TABLE 3: QUALIFICATIONS OF LECTURING STAFF

CATEGORY	A	B	C	D	E	F	G
POST LEVEL							
1	14	7	272	147	51	8	
2	-	-	2	42	21	8	
3	-	-	-	15	10	3	3
4	-	-	-	9	5	2	2
5	-	-	-	1	4	4	1
6	-	-	-	1		2	
TOTAL	**14**	**7**	**274**	**215**	**91**	**27**	**6**

SOURCE: Adapted from the Discussion Document for the Provincialisation and Unification of Technical Colleges in KwaZulu-Natal, under the Chairmanship of Mr J J Marais - Department of Education, Ulundi, 1993.

Category "A" lecturers are those who do not have matric or standard ten certificates but possess standard eight and National Technical Certificates [NTC 3]. They do not have trade diplomas qualifications obtained after serving apprenticeship programmes from either industry or firms.

Category "B" lecturers possess Matric or standard ten certificates, plus the NTC 3 qualification obtained from technical colleges. These lecturers have neither a trade diploma nor apprenticeship experience.

Category "C" lecturers possess Matric or standard ten certificates, NTC 3 to NTC 6 certificates/diplomas plus trade diplomas obtained after serving as an apprentice in the industry.

Category "D" lecturers usually have Matric or standard ten certificates, trade diplomas plus a teaching qualification. They may be without teaching certificates but they do have a standard 10 or Matric certificate plus a National N Diploma from a technical college or Technikon. In addition they have six NTC courses or a second National N Diploma obtained from a technical college.

Category "E" lecturers have a Matric or standard ten certificate, a National N Diploma, a teaching certificate plus a second National N Diploma or Bachelor's degree either from a Technikon or University.

Category "F" lecturers have a Matric or standard ten certificate, a National N Diploma, a teaching certificate, a second National N Diploma or Bachelors degree plus a Master's degree certificate from a University or a Masters Diploma from a Technikon.

Category "G" lecturers have a Matric or standard ten certificate, a National N Diploma, a Second National N Diploma, a teaching certificate, a Bachelor of Education Degree, a Masters Degree/Diploma, as well as a Doctoral degree or equivalent.

Table 3 shows that lecturers at technical colleges are classified according to six post levels. Post level one lecturers do not hold any senior position at the college. Post level two lecturers are senior lecturers responsible for the control of certain sections of the college programme, e.g. as a senior lecturer for the Motor Mechanic Trade Theory Section. Post level 3 is a Head of Division or a principal lecturer. Post level 5 is a Principal or Senior Deputy Principal of a college and this position depends largely upon the size of the college. Post level 6 is held by a principal or a rector of a college.

A combination of categories A, B and C in Table I shows that 295 of 634 [the toal of 770 in Table 2 includes temporary and substitute lecturers, whereas 634 are those iiin permanent posts] lecturers do not have professional or teaching certificates. The minimum school qualification for a technical college lecturer is standard seven. Table 3 further reveals that 21 lecturers do not have standard ten or matric certificates although a number of them hold standard 7 as well as NTC 3 certificates without trade diplomas.

From the figures in the above table it is obvious that most technical college students are taught by lecturers whose qualifications are based mainly on technical education background rather than on teaching experience and who have been recruited directly from industry. This suggests that these lecturers are specialists in their subjects in terms of their experience and technical standing but inexperienced with regards to subject presentation in a classroom situation. Although this table indicates that most lecturers are adequately qualified in terms of NATED prescriptions [Category C]; it is a matter of concern that a large number of lecturers do not have a teaching qualification or teaching experience.

1.4 STATEMENT OF THE PROBLEM

1.4.1 LACK OF DIDACTIC SKILLS

One of the most problematic areas in Black technical colleges in KwaZulu-Natal seems to be a shortage of teaching staff who are technically as well as didactically qualified. The difficultty in recruiting didactically qualified teaching personnel who also have industry experience stems from the fact that the salaries offered to lecturers at technical colleges are too low to act as an incentive for technically qualified people to obtain a teaching diploma as industry offers them greater financial rewards based upon their technical qualification alone.

The failure of the education system to pay satisfactory salaries to adequately qualified lecturers from industries, forces the lecturers to return to industries and business for re-employment. This situation lowers the standard of training at technical colleges and naturally affects the quality of students produced by these institutions.

1.4.2 LACK OF TECHNICAL SKILLS

On the other hand, when lecturers are recruited from training colleges or universities they usually have no work experience and thus tend to emphasize theory to the detriment of practice. UNESCO [1990: 72] explains how industrialized countries deal with this problem:

"In industrialized countries the recruitment of qualified technical and vocational teachers with experience in industry is followed by special in-service programmes oriented towards subjects updating and didactic training. Many countries indicate general concern to improve the qualifications of teaching staff at all levels by means of in-service training, study grants, or other incentives to promote training. In many countries the retraining of teachers is supported by the state".

This shows that even in industrialized countries authorities find the training of technical teachers problematic. It is therefore not surprising that a semi-industrialized country such as South Africa finds itself in a far worse situation than industrial countries.

1.4.3 LACK OF STRATEGIC PLANNING IN KWAZULU-NATAL

In KwaZulu-Natal there is not, at present, a well defined programme of recruitment and in-service training programmes. It also appears that there is little general concern to improve and up-date qualifications and knowledge of college teaching staff as many of the teachers at technical colleges still do not have standard 10 certificates. Some possess a standard seven or eight qualification, a National Technical Certificate [NTC 2 or 3] plus a Trade Diploma obtained after passing a trade test set by the Department of Manpower. A lecturer with standard 7, NTC 2 and Trade Diploma is classified as M+3 [Matric plus three years training] and is then regarded as academically and professionally qualified. These lecturers have industry and business experience but usually lack didactic and academic training or background and the situation becomes problematic when they are placed in the practical teaching situation in which they are required to impart knowledge.

This predicament places the KwaZulu-Natal Department of Education under pressure to introduce an initial special, teacher-training programme with the aim being to provide adequately trained technical and vocational teaching personnel and also to update and constantly upgrade their knowledge and skills.

1.4.4 NEEDS IDENTIFIED IN PREVIOUS STUDIES

a] Hartshorne

Hartshorne [1973:9] underlines the importance of a well qualified teacher when he asserts that in the development of any educational programme, whether in a developed or developing country, the first priority, even before building, is the teacher supply. He emphasizes that this supply must be "of a quality and with an education and training appropriate to the purpose".

b] Kotasek

Kotasek [1970:93] confirms that teaching involves a certain degree of teaching skills without which it would be impossible for even an experienced teacher to get along. The skill must, according to Kotasek, be deliberately formed in the course of the teacher's preparation. What has reference here are the teacher's conduct, organization of her/his teaching activities, her/his ability to hold attention, maintain discipline and the ability to assess her/his pupils.

Furthermore the teacher must be able to make good use of modern teaching aids as well as carry out certain administrative tasks. He maintains that the proper preparation of teachers contributes to more purposeful and better planned education since the practical and theoretical problems of all fields of education are centred in the teacher. Kotasek's views assert that teaching is the transmission of knowledge and that it has certain pedagogical tenets with which the teacher should familiarize her/himself.

c] Mende

Mende [1971:77] identifies four main groups of didactic studies that the teacher needs to undergo before she/he qualifies as a teacher:

i] Pedagogical studies:

Curriculum theory, general didactics according to the stages of education, strategy and technology of education and teaching, theory of education and educational systems, philosophical, ethical and religious problems of education, comparative education.

ii] Psychological studies:

Psychology of development, psychology of teaching and learning, psychometry and social psychology.

iii] Sociological studies:

Sociology of education, methods of empirical research, political and juridical aspects of the school and educational system, economic aspects of education.

iv] Practical and clinical courses:

Methods of observation and analysis of situations in teaching and education, case studies, successful planning, implementation and control of education and curricula, aims of teaching curricula methodology, school and school organisation as a system and as an object of research and development.

d] Louw

According to Louw [1984:94] functions which define the teacher as an expert in the transmission of knowledge can best be realised by involving the teacher in pedagogical studies. This means that the teacher must understand the structure of pedagogy as well as the various perspectives of the pedagogical reality. She/he must study:

i] didactical pedagogy to understand the didactic relationship between teacher and child as being a pedagogical relationship;

ii] psychological pedagogy to evaluate and assess the psychological aspects of the child;

iii] historical and comparative pedagogy to understand how pedagogy as a science has developed;

iv] socio-pedagogy to facilitate insight into the social implications of the child's becoming by and through her/his associates;

v] vocational pedagogy to understand the child's orientation to reality as a vocational reality;

vi] fundamental pedagogy to gain insight into the grounding of pedagogy as a science which will include a description of the fundamental pedagogical structure.

vii] ortho-pedagogy to understand the reasons for stagnation or derailment in the becoming of the child.

e] Smith

Smith [1966:45] states that the ultimate success of all education and of all educational systems rests with the character of the teacher. He stresses that if a society is still uncertain about its aims and cannot formulate them concretely and clearly there can be no sound educational objectives. "It would seem that the various elements in our population do not have that sense of common destiny that would enable them to accept certain cardinal educational objectives". He holds that the regeneration in education must begin with the training of teachers since, without this, no breakthrough can be made in schools.

f] Rautenbach

Technical colleges require specialised workshops, buildings and equipment, considerable material inputs and specialist lecturers with marketable skills. In this regard Rautenbach [1993:33] states that educationists in technical education need to recognise that training in the use of tools and processes of modern industry enable young people to gain a concrete understanding of the processes and working methods used in an industrial culture. Provided this insight is consciously linked to the teaching of technology, mathematics, science and strong and weak points of the industrial culture, it can become a very powerful vehicle for modernisation and human development.

It is essential to realise that the objective of technical education is not merely to award a certificate but to prepare a person for a productive and satisfying career. Technical education is therefore a joint effort between professionals in education and technology and people who have insight into the current and future requirements and who are actively involved in the industrial sector. Methods of instruction and output in technical education should therefore be under continuous review.

g] Bot

Bot [1991: 17] argues that in KwaZulu- Natal it has been found that school leavers who received post-school technical or vocational training often remain unemployed, with only 30 percent of technical college trainees managing to secure full-time employment. One explanation for this is that technical training in colleges concentrates largely upon theory, whilst neglecting to provide adequate practical experience.

She elaborates with the explanation that segregation restricted the development of technical education because facilities for White students were available all over the country, whereas those for other race groups were both fewer in number and concentrated in particular regions [Bot, 1991: 25].

h] The National Manpower Commission

This Commission [Human Sciences Research Council, 1981: 9] confirmed that the oversupply of training material to White technical colleges created a serious problem. Other related problems identified by the National Manpower Commission include:

i] the disparity in standards and quality between institutions,

ii] that where there are no facilities for certain race groups, employers either do not employ those groups or are forced to send trainees further away, thereby increasing travel and accommodation expenses,

iii] the expense involved in providing separate facilities and

iv] the inconsistency of segregation within an integrated labour market.

I] Newman and Ziderman

These researchers [1989:58] confirm that school-based vocational/technical education is extremely costly and it tends to narrow options for advancement because it fails to prepare students for the demand of the labour market. Exacerbating factors in this regard are:

i] Predicting demands for specific skills years ahead of job entry becomes increasing doubtful in view of rapidly changing technologies and recurring economic recessions.

ii] School-based vocational education is highly detached from labour market conditions and practices.

iii] The high cost of school-based vocational education often leads to situations where workshop equipment is outdated and instructors lack up-to-date knowledge.

1.4.5 CURRENT NEEDS

This study was initiated due to two obstacles which appear to hamper the attainment of a high quality technical education in KwaZulu-Natal:

- a shortage of adequately qualified lecturers
- a shortage of appropriate equipment for teaching technical skills.

The evidence on which conclusions are based, however, remains vague and speculative since empirical research evidence of current problems is limited. For this reason, this study is a systematic, scientific investigation to establish whether these obstacles are a reality and, if so, to what extent they prevent effective training. Only once the true situation is known, based on actual research evidence, can solutions be sought and methods devised to raise the quality of education in this field.

a] The problem of the shortage of well-qualified lecturers

In order for a teacher to be able to be effective in both the classroom and the workshop, it is imperative that she/he possess the appropriate academic, technical and pedagogical qualifications as well as having experience in industry.

Smith [1966: 63] suggested that a lecturer's professional education should consist of pedagogics which would include philosophy of education, general didactics, school organisation and administration and general psychology. Smith's suggestion in this regard cuncurs with Louw's concept of the teacher's pedagogical form [as discussed in Section 1.4.4 e].

The above views seem to suggest that no teacher should be considered as adequately trained or qualified unless she/he has followed a course which includes professional and cultural studies , culminating with teaching practice in a school. This further emphasizes the fact that competent and adequately qualified lecturers should have a sound pedagogics knowledge. Yet in KwaZulu-Natal a total of 295 lecturers [Table 3 : Categories A to C] lack professional and teaching qualifications.

The lecturers who are appointed to teach theoretical and practical skills-based subjects are employed by colleges on the strength of their [presumably] proven skills. The majority of college lecturers are recruited from industry or commerce and largely have technical qualifications, trade diplomas as well as industry experience. This suggests that the majority of lecturers recruited from the private sector into KwaZulu -Natal technical colleges lack the teaching skills which are gained in the course of teachers' preparation. This situation also implies that many lecturers at colleges have not yet been exposed to teaching aids, the manner in which knowledge is imparted, organisation of teaching activities or proper training appropriate to the purpose of teaching [see Table 3: Categories A to C].

An urgent need exists for research aimed at identifying those constraints affecting the quality of teaching at ex-KwaZulu technical colleges. An investigation is also necessary to examine the methods used by technical colleges to recruit staff.

b] **Problem of shortage of equipment**

A further problem which needs to be addressed regarding technical colleges in KwaZulu-Natal is that of inadequate teaching material and equipment for the practical training of students as the workshops apparently do not have sufficient training equipment and tools. The equipment which does exist appears to be outdated and colleges are unable to replace equipment which is obsolete in the context of rapid technological advances, with the result that technical teachers are ill-prepared to meet the needs of their students and the requirements of industrial and commercial enterprises. Inadequate resources have particular adverse effects on vocational or technical education which, by its very nature, is expensive. These adverse effects are compounded in the present time of a rapidly changing technology in which it is imperative to be up to date.

As Bot [1988:71] demonstrates, the lack of provision of facilities for Blacks relative to an over-provision for whites is not only inequitable but also inefficient. In KwaZulu-Natal there are a number of technical colleges, particularly those from the ex-KwaZulu Department of Education and Culture, which do not seem to have demonstration models, e.g. they lack running engines, gear-boxes, brake systems in the case of motor mechanics workshops, engineering drawing models for teaching a class of Engineering Drawing, electronics or electrical equipment for training students in trades, etc.

If one compares this situation with historically White, Indian and coloured colleges it is noticable that the latter workshops are better supplied with up-to-date and modern equipment. This results in a situation where certain technical colleges are in a better position to produce students who have sufficient practical skills than others.

As a result of these circumstances ex-KwaZulu technical colleges have tended to provide an inadequate and inappropriate preparation of students for entry into the work arena. The lack of facilities in technical colleges has meant that many college leavers have been unable to cope with the required standards from commerce and industry.

Consequently, KwaZulu-Natal has generated a multitude of students who are unemployed and also unemployable due to their inadequate training and urgent research and information is required for this situation to be rectified.

1.5 RESEARCH PROBLEMS

This investigation focuses on the following problems:

- *Which constraints affect the quality of teaching at technical colleges in KwaZulu-Natal?*
- [illegible] KwaZulu-Natal?

1.6. HYPOTHESIS

This is essentially a qualitative-exploratory study which breaks away from a strict positivistic approach. It was therefore, not imperative to underpin it with a hypothesis. Nevertheless, to make the search for a solution to the first problem above more disciplined and goal-oriented, the following hypothesis guided this part of the research:

"Two major constraints at ex-KwaZulu technical colleges which cause a low quality of teaching and high failure rates among students are, firstly, a shortage of properly qualified lecturers and, secondly, a lack of suitable facilities, equipment and material for the teaching of technical courses."

No hypothesis were stated for the second problem due to its open-ended nature and its interconnectedness with the first problem.

1.7 DEMARCATION OF STUDY FIELD

In this study the primary focus is on the identification of constraints affecting the quality of teaching at technical colleges in KwaZulu-Natal. As is evident from the above hypothesis, the study concentrates mainly on two major issues related to the provision of technical education in KwaZulu-Natal:

- the scarcity of teaching staff who are technically as well as didactically qualified,
- the inadequate provision of teaching material, equipment and facilities for the practical training of students.

1.7.1 KWAZULU NATAL TECHNICAL COLLEGES

The investigation concentrates on 23 KwaZulu-Natal technical colleges. These colleges were selected according to their historical affiliations and geographic location. The colleges are under the jurisdiction of the KwaZulu-Natal province which originated from the former education departments and are:

- Ex-Department of Education and Culture [House of Assembly] which controlled nine state- aided technical colleges. These colleges are all situated in the urban areas within KwaZulu- Natal and catered for the white population.

- The Department of Education and Training [DET] provided for blacks and had three colleges, all situated in the urban areas.

- The Department of Education and Culture [House of Delegates] was responsible for the Indian population. This department controlled three state colleges which are situated in urban areas.

- The Department of Education and Culture [House of Representatives] which controlled education for the coloured population for whom there was one technical college situated in an urban area.

- The KwaZulu Department of Education and Culture catered for black people within KwaZulu. This department controlled seven state technical colleges, two of which are situated in rural areas and five in urban areas.

Much doubt has been expressed regarding technical college-based training and the manner in which students are prepared for future employment. The criticism has been that students are not receiving quality training from technical colleges as number of these institutions do not have adequately equipped workshops or properly qualified lecturers. For this reason this study deas chiefly with technical colleges.

1.7.2 ENGINEERING STUDIES

Engineering studies have been selected because most of the technical colleges in KwaZulu-Natal offer these courses from NTC I to NTC 6. Engineering courses are both practical and theoretical and depend mainly on the availability of modern workshop equipment and adequately qualified lecturing staff.

Hesitation has been evident regarding the ability of technical colleges to produce good results in NTC I Engineering Studies, particularly in Engineering Science Drawing, Mathematics as well as in Motor and Electrical Trade Theories. This criticism has been constant with reference to technical colleges which train NTC I Engineering Studies students with specific reference to colleges in ex-KwaZulu. For this reason this study will also look into the examination results of Engineering Studies, specifically the following courses:

Engineering Mathematics	NTC I
Engineering Science	NTC I
Engineering Drawing	NTC I
Motor Trade Theory	NTC I
Electrical Trade Theory	NTC I

1.8 RESEARCH METHODOLOGY

The researcher used three research methods for gathering data::

a] a literature study,

b] questionnaires, and

c] interviews

The discussion of the methodology below consists of two parts, namely:

a] justification of methods used

b] description of methods used.

1.8.1 JUSTIFICATION OF METHODS USED

The substantiation of methods used is outlined in six parts:

- sample as a basis for research
- triangulation
- literature study
- questionnaires
- interviews
- observation

1.8.1.1 SAMPLE AS A BASIS FOR RESEARCH

It is well known that research is often conducted on the basis of a sample from which the research worker derives certain generalizations applicable to the population from which the sample is taken [Mouly, 1970:173].

Ideally, the sample is representative of the group or population accessible to the researcher. In turn this accessible population should be representative of an even larger group which the researchers want to understand better or to which they mean to apply their conclusions, known as the target population [Dyer, 1979:90].

Mouly [1970:175] holds that sampling is both necessary and advantageous. Taking a total census is costly and often difficult, so the main reason for sampling is to reduce expense in time, effort and money and the factor of cost must be balanced against the adequacy of the data that are obtained. He explains that the size of the sample is determined by the nature of the survey, the instrument to be used, and the means of access to the population. The size of the sample should be in line with the degree of precision required. In this study sampling was used during both interviews and observation.

1.8.1.2 TRIANGULATION

Triangulation may be defined as the use of two or more methods of data collection in the study of some aspects of human behaviour. The use of multiple methods, or the multi-method approach as it is sometimes called, contrasts with the ubiquitous, but generally more vulnerable, single-method approach that characterizes so much research in the social sciences. In its original and literal sense, triangulation is a technique of physical measurement. Maritime navigators, military strategists and surveyors, for example, use several location markers in their endeavours to pinpoint a single spot or objective [Cohen and Manion, 1994:233].

By analogy, triangular techniques in the social sciences attempt to map out, or explain more fully, the richness and complexity of human behaviour by studying it from more than one standpoint and, in so doing, by making use of both quantitative and qualitative data [Cohen and Manion, 1994: 233].

The advantages of the mulit- method approach in social research are manifold. Firstly, whereas the single observation in fields such as chemistry and physics normally yields sufficient and unambiguous information on selected phenomena, it provides only a limited view of the complexity of human behaviour and situations in which human beings interact. Exclusive reliance on one method, therefore, may bias or distort the researcher's picture of the particular slice of reality she/he is investigating. The researcher needs to be confident that the data generated are not artefacts of simply one specific method of collection [Lin, 1976:97]. This confidence can only be achieved, as far as normative research is concerned, when different methods of data collection yield the same results. The more the methods contrast with each other, the greater the researcher's confidence. If, for example, the outcomes of a questionnaire survey correspond with those of an observational study of the same phenomena, the more confident the researcher can be about the findings [Lin, 1976: 97-98].

Secondly, the use of triangular techniques will help to overcome the problem of method-boundness.

Boring [1953:169-84] states that:

> "as long as a new construct has only the single operational definition that it received at birth, it is just a construct. When it gets two alternative operational definitions, it is beginning to be validated. When the defining operations, because of proven correlations, are many, then it becomes rectified".

In this study triangulation occurred in the use of different techniques, namely:

a] questionnaire

b] focused interviewing

c] the study of documents

d] examination of records: specifically NTC 1 results in Engineering, Science, Drawing, Mathematics as well as Electrical and Motor Trade Theories.

e] visits to engineering workshop were undertaken with the aim being to observe the manner the in which workshops were equipped.

f] inventories of equipment.

1.8.1.3 LITERATURE STUDY AS A RESEARCH METHOD

Cohen and Manion [1994:51] confirm that "the review of the literature in other forms of educational research is regarded as a preparatory stage to gathering data and serves to acquaint researchers with previous research on topics they are studying. It thus enables them to continue in a tradition, to place their work in context, and to learn from earlier endeavours."

During this investigation the researcher consulted literature covering technical vocational education in South Africa. The emphasis in the review of literature was on the recruitment of teachers into technical education, their qualifications, their performance as well as the practical training of students. This provided a conceptual framework around which the problem will be analysed.

1.8.1.4 QUESTIONNAIRES AS A RESEARCH METHOD

A section of the empirical data was collected by means of questionnaires. Behr [1983:149-50] defines a questionnaire as:

> "....... a document normally distributed through the post to be filled out by the respondent himself in his own time. On occasion questionnaires are completed by the respondents under the supervision of the researcher".

Dyer [1979:157] offers a number of suggestions and advantages for using questionnaires. These include:

- questionnaires administered through the mail are usually less costly to the researcher;
- they are easy to administer;
- they may create more trust in the anonymity of the respondent's answers to personal or embarrassing topics

Questionnaires are used to measure what a person knows [knowledge and information], what a person likes and dislikes [values and preferences] and what a person thinks [attitudes and beliefs].

Tuckman [1972:197] explains that:

> "Questionnaires and interviews can be used to discover what experiences have taken place [biography] and what is occurring at present. This information can be transformed into numbers or quantitative data by using attitude scaling or by counting the number of respondents who give a particular response thus generating frequency data".

The questionnaire technique as a research instrument was used to collect information from all twenty - three KwaZulu-Natal technical colleges. The sample was therefore representative of KwaZulu Natal technical colleges and the results obtained from questionnaires are generalisable.

Weakness of the questionnaire

Clarke and Clarke [1970:102-113] stress the value of the questionnaire in reaching a wide audience, but feel that the instrument should be used with great integrity. They warn against poor and distorted questions, improper procedure and a sample that is either too large or small and recommend that questions be arranged in a logical order, be clear and concise and should allow for answers that can be clearly quantified or understood.

Strengths of the questionnaire

The questionnaire was employed in this study because of its advantages of being easily standardised, cheap and efficient in the saving of time. Its use was found to be supported by Borg [1967:204], who considers it to be a very valuable technique in understanding current situations. It is also advocated by Fox [1969:525-529], who advises the use of clear languages with single-purpose questions and absolute clarity of intent. He points out that the variety of possible responses include those that are totally free, those that are limited to some extent and those that are partly or wholly structured.

1.8.1.5 INTERVIEWS AS A RESEARCH METHOD

Central to this research were focused interviews. The greater the degree of standardisation of an interview, the greater the measure of reliability, but when reliability is achieved by a closer control of the element, validity is reduced. Kitwood writes:

"....in an interpersonal encounter people are more likely to disclose aspects of themselves, their thoughts, their feelings and values, than they would in a less human situation. At least for some purposes it is necessary to generate a kind of conversation in which the respondent feels at ease. In other words, the distinctively human element in the interview is necessary for its validity" [Kitwood, 1977:252-3].

The focused interview does not have typicality but is able to probe. Merton and Kendall [1946:541-57] confirm that the focused interview differs from other types of research interviews and identify the differences as:

a] The persons interviewed are known to have been involved in a particular situation. They may, for example, have watched a T.V. programme, or seen a film or have been a participant in a social situation.

b] By means of the techniques of content analysis, elements in the situation which the researcher deems significant have previously been analysed by her. She has thus arrived at a set of hypotheses relating to the meaning and effects of the specified elements.

c] Using her analysis as a basis, the investigator constructs an interview guide. This identifies the major areas of enquiry and the hypotheses which determine the relevant data to be obtained in the interview.

d] The actual interview is focused on the subjective experiences of the people who have been exposed to the situation. Their responses enable the researcher both to test the validity of her hypotheses and to ascertain unanticipated responses to the situation thus giving rise to further hypotheses.

The interview technique as a research method in this study was used to collect information from ten technical colleges in KwaZulu-Natal.

1.8.1.6 OBSERVATION AS A RESEARCH METHOD

There are two principal types of observation - participant observation and non-participant observation. In the former the researcher or observer engages in the very activities she/he sets out to observe.

Non-participant observers on the other hand, stand aloof from the group activities they are investigating. The author was a non-participant observer at the time of observation at technical colleges in KwaZulu-Natal. The best illustration of the non-participant observer role is perhaps the case of the researcher sitting at the back of classroom coding up every three minutes the verbal exchanges between teacher and students by means of a structured set of observational categories. [King, 1979:109].

It is important and relevant to mention that the writer and researcher in this study was in an informal way, a participant observer since he was a principal of a technical college in KwaZulu-Natal.

The purpose of observation is to probe deeply and to analyse intensively the multifarious phenomena that constitute the life cycle of the unit with a view to establishing generalizations about the wider population to which that unit belong [Cohen and Manion, 1994:107]. They identify the following inherent advantages in the observation approach:

a] Observation studies are superior to experiments and surveys when data are being collected on non-verbal behaviour.

b] In observation studies, investigators are able to discern ongoing behaviour as it occurs and are able to make appropriate notes about its salient features.

c] Because observations take place over an extended period of time, researchers can develop more intimate and informal relationships with those they are observing - generally in more natural environments than those in which experiments and surveys are conducted.

d] Case study observations are less reactive than other types of data gathering methods. For example, in laboratory-based experiments and in surveys that depend upon verbal responses to structured questions, bias can be introduced in the very data that researchers are attempting to study.

1.8.2 METHODS USED IN THIS INVESTIGATION

The investigation employs four main methods of research -

- the literature study
- the questionnaire survey
- interviews
- observation.

1.8.2.1 THE LITERATURE STUDY

A review of literature has formed an important aspect of this study and the researcher consulted three types of literature:

a] Books on research methodology

b] Sources dealing with the history of technical education on a national as well as on an international scale.

c] Books and research articles regarding the didactic principles on which high quality technical education is based.

1.8.2.2 THE QUESTIONNAIRE SURVEY

A copy of the questionnaire which was used for this study appears in Appendix A.

a] Format of the questionnaire

The questionnaire was divided into four parts, each one directed at achieving a certain purpose. The questionnaire consisted of fifteen questions focussing on the staffing and equipping of colleges as well as on general technical college-based training programme in KwaZulu-Natal.

Of the 15 items in the questionnaire, one was of an open-ended response type [Question 15]. It was accepted that an open-ended question was necessary since it would allow respondents to answer within their own frame of reference. However, the actual number of open-ended questions had to be limited to one since it was also accepted that such questions invariably elicit a great deal of repetition and irrelevant material which takes considerable time to analyse and classify. The use of mostly closed questions, including those with specified 5 point scales, was preferred. This facilitated the coding of respondents in terms of response categories.

The sequence of items in the questionnaire was such that one question led logically and naturally to another. To prevent respondents from becoming disconcerted by shifting from one aspect of education to the next and back, questions on various areas of the topic were grouped together as follows:

i] **PART ONE:** Examinations Results

Question 1

ii] **PART TWO:** Recruitment, Staffing and Upgrading of teachers

Questions 2 to 7

iii] **PART THREE:** Provision and utilization of teaching equipment at technical colleges.

Questions 8 to 13

iv] **PART FOUR**: Improving the training offered at technical colleges.

Questions 14 to 15

b] Discussion of the questions and their purposes from the questionnaire

PART ONE: EXAMINATION RESULTS

Question 1:

Examination Results [1996 Trimester 1] for students who studied NTC 1 in Engineering, Science, Mathematics, Drawing as well as Motor and Electrical Trade Theories.

Purpose:

This question aimed at obtaining NTC 1 Engineering Science, Mathematics, Drawing as well as Electrical and Motor Trade Theories examination results for Trimester 1, 1996.

PART TWO:RECRUITMENT, STAFFING AND UPGRADING OF TEACHERS/LECTURERS

Question 2:

The principal's general feeling about the qualifications and experience of the teaching staff in relation to course objectives.

Purpose:

To establish whether the qualifications and experience were requirements for appointment in lecturing post at technical colleges. It was also to establish whether those lecturers who happened to be appointed as lecturers at technical colleges had relevant and suitable qualifications for the job offered to them.

Question 3:

Technical and professional qualification of college lecturers.

Purpose:

To establish the total number of lecturers with technical qualifications only, professional qualifications only as well as lecturers with both technical and professional qualifications.

Question 4:

Staff members who were moving to industry or other positions because of better pay or good benefits.

Purpose:

To find out if there were any lecturing staff members leaving teaching to take new jobs in industry because of better salaries.

Question 5:

Staff development plan.

Purpose:

To establish the effectiveness of the staff development programme for lecturing staff.

Question 6:

Recruitment of adequate number of professionally qualified staff with industry experience.

Purpose:

To establish the extent to which the college was able to recruit adequately qualified lecturing staff with both technical and professional qualifications.

Question 7:

Arrangements for in-service teacher training at technical colleges

Purpose:

To establish whether colleges were capable of organising in-service training programmes for lecturers.

PART THREE: PROVISION AND UTILIZATION OF TEACHING EQUIPMENT AT TECHNICAL COLLEGES

Question 8:

Range of workshop equipment.

Purpose:

To establish the extent to which the workshops were equipped.

Question 9:

Relevancy of equipment to course needs.

Purpose:

To find out if equipment in the workshops were relevant to course needs or courses offered at the college.

Question 10:

Condition of equipment in terms of being up-to- date.

Puprose:

To establish whether the colleges were capable of updating equipment for the effective practical training of students.

Question 11:

Provisions in annual budgets for replacing tools and equipment at technical colleges.

Purpose

To establish the extent to which the budget provided for the replacing and updating of tools and equipment in the workshops.

Question 12:

Availability of materials as well as consumables and their use in the workshop.

Purpose:

To establish whether colleges had adequate training materials or consumables in their workshops.

Question 13:

Maintenance of equipment at the college

Purpose:

To establish the extent to which equipment was maintained at technical colleges.

PART FOUR

Question 14:

Measures that would improve the training offered at the college.

Purpose:

This question requested that the college principal identify some measures she/he thought would (if attended to) improve quality of training in her/his institution. The principal was asked to write number 1 next to the most important measure, number 2 next to the second most important measure etc. according to the rank of order of importance.

Question 15:

Major problems experienced by principals at technical colleges.

Purpose:

To determine the major problems experienced by principals at technical colleges. This is an open-ended question aimed at obtaining qualitative data and the responses here would be presented under qualitative results.

c] Administration Procedure

The questionnaire was to be completed by 23 principals of KwaZulu-Natal technical colleges. The researcher was a technical college principal and also a member of the principals committee, known as the Committee of Technical College Principals [CTCP]. This committee met three times a year to discuss issues affecting their institutions and it was at these meetings that the questionnaires were distributed to all 23 principals. After the questionnaires had been completed, all respondents posted them back to the researcher.

Once the completed questionnaires were received, they were processed and analysed.

d] Respondents

The 23 Principals of technical colleges in KwaZulu Natal were the respondents. Tables 3 and 4 show the names, historical affiliations and geographic areas of the colleges used in the survey.

TABLE 4: <u>TECHNICAL COLLEGES SITUATED IN URBAN AREAS</u>

		N = 21				
		HISTORICAL AFFILIATION				
NO.	NAME OF COLLEGE	EX-WHITE	EX-INDIAN	EX-COLOURED	EX-DET	EX-KWAZULU
1.	Durban Central	✓				
2.	Durban Tech *	✓				
3.	Cator Manor *		✓			
4.	Edendale				✓	
5.	Ezakheni					✓
6.	Ladysmith	✓				
7.	L C Jonhson *			✓		
8.	Madadeni					✓
9.	Newcastle	✓				
10.	Northdale		✓			
11.	Ntuzuma *					✓
12.	Pinetown	✓				
13.	Plessislaer *				✓	
14.	Portshepstone	✓				
15.	Richarsbay	✓				
16.	Sivananda *					✓
17.	St Oswald *		✓			
18.	Swinton *				✓	
19.	Vryheid	✓				
20.	Umlazi *					✓
21.	Umsunduze *	✓				
TOTAL		9	3	1	3	5

* The asterisk after the names of 10 colleges in Table 4 indicates those colleges that were selected and used for interviews.

TABLE 5 TECHNICAL COLLEGES SITUATED IN RURAL AREAS

		N = 2				
		HISTORICAL AFFILIATION				
NO.	NAME OF COLLEGE	EX-WHITE	EX-INDIAN	EX-COLOURED	EX-DET	EX-KWAZULU
.	Enyenyezi					✓
2.	Nongoma					✓
TOTAL		-	-	-	-	2

e] THE LIKERT SCALE

For Parts 2 - 4 in the questionnaire the Likert Scale formula [Likert 1932] was used. Respondents were presented with a five point scale and requested to indicate which category reflected their opinion regarding the problem under investigation.

i] Advantages of Likert Scale

The Likert Scale formula was used mainly because it is regarded as the most suitable when compared with other types of attitude scales [Borg and Gall, 1989:312]. Quantification and analysis of results can be done effectively because the data yielded are more complex than data collected using summated rating [Bailey, 1987:346].

ii] Disadvantage of Likert Scale

The main disadvantage of the Likert Scale is that one can never be sure of the degree to which the responses of the participants reflect their true attitudes [Borg and Gall, 1989:312].

1.8.2.3 INTERVIEWS

The researcher used interviews to identify a number of key issues. These issues were dealt with in the conversational style suggested by Cohen and Manion [1989: 241]. This research method enabled the interviewer to procure first-hand information from the interviewees themselves. It also made the probing of more deep-seated issues possible rather than religiously accepting initial and sometimes unreflective responses. Interviews, compared with other techniques, are popular because they allow researchers opportunities for closer and more detailed questioning than is possible with other methods [Borg and Gall, 1989: 401], such as surveys or statistical analysis.

Interview format and rationale:

The researcher in this study used both informal and semi-structured interviews for the purpose of collecting data. The researcher (Interviewer) asked a series of structured questions and probed more deeply, using open-ended questions in order to obtain more complete data. The following questions were used as a guide during the interviews.

QUESTION 1

Explain how the college orientates newly appointed lecturers, without teaching qualifications, who are recruited directly from industry.

The purpose of this question was to find out how the lecturers were orientated by the college before they were engaged in teaching activities. The idea behind this was to establish whether there was any induction or orientation course specifically for lecturers who were moving directly from industry to the college or lecturers employed directly form technical colleges of education or universities [who are without industry or work experience] into colleges.

QUESTION 2

Explain how the college admits NTC 1 students in Engineering studies departments.

The purpose of this question was to find out the criteria the college used when admitting NTC 1 students to Engineering Studies. The aim was to establish whether the college conducted selection tests or had any bridging courses preceding the NTC 1 programme. It was taken into account that Question 1 of the Principal Questionnaire regarding NTC 1 results may have elicited similar responses. However, *realising the limitations of the questionnaire it was felt that the interview situation* would provide deep-seated insights regarding the problem of high failure rate.

QUESTION 3

What do you dislike most about teaching and training that takes place at your college and in your lecturers?

This question was directed at finding out what the respondents regard as unpleasant tasks concerning their supervisory work at the college. The assumption here was that some of the ideas arising from this question would be incorporated in the recommendations resulting from this study. This would be possible because the nature of this question was such that it could highlight some deficiencies of teaching and training in the technical colleges.

QUESTION 4

Suggest how training offered at your technical college can be improved.

The purpose of this question was to establish from the college Heads of Departments as well as Deputy Principals how they consider teaching and training could be improved. This is an open-ended question which required that the senior officials of the college mention some measures they thought would improve quality of training in their institution.

Size of sample

Ten colleges were chosen from ex-Departments for the interviews. Two people at each of these colleges, namely the Deputy Principal and one Head of Department, were interviewed. A total of 20 interviewees participated in the research project. The ten colleges were chosen according to the rank order of quality of their results and stand as follows:

- The first two colleges were the highest quality white colleges situated in urban areas.
- The third college was the high quality coloured college [the only college for the coloured population in KwaZulu Natal] situated in an urban area.
- the fourth and fifth colleges were high quality Indian colleges, both situated in urban areas.
- The sixth and seventh colleges were high quality ex-DET colleges, also situated in urban areas.
- The eighth college was the highest quality ex-KwaZulu college situated in an urban area.
- The ninth college was a medium quality college from Ex-KwaZulu, situated in the urban area.
- The tenth college was the lowest quality college from ex-KwaZulu, also situated in an urban area.

Modus Operandi

The interviews were personally conducted by the researcher. Note - taking was done by the researcher as the interview was in progress. The researcher further used a tape recorder for recording interviews. Tape-recording was found to be more convenient during the interview period because lecturers tended to speak rather quickly and did not repeat themselves. Both note-taking and tape recording appear to have yielded reliable information.

1.8.2.4 OBSERVATION

The researcher conducted one type of observation, namely, inspection of premises, laboratories or workshops for practical work.

Inspection of premises

The researcher inspected the premises of the ten colleges which were studied in depth [see 1.7.2.3 d]].

The researcher asked permission to visit college premises for the sake of inspecting and observing workshop practice. The permission was granted and the researcher had an opportunity to visit two workshops, namely, the Motor Mechanics and Electrical Trades Workshops in each college.

The researcher inspected these two different workshops thoroughly and many notes were made. The lecturers accompanied the researcher into the workshop and they were able to explain a number of things to the researcher. Each workshop had a store-room, strongroom and lecture room.

1.9 DEFINITION OF TERMS

1.9.1 CONSTRAINTS

The word "constraints" refers to something that serves to restrict conditions. Constraints are limitations, restrictions or prohibiting factors which appear to affect the smooth running or functioning of a system. In this study the word "constraints" usually refers to restrictive elements which negatively affect the quality of teaching in technical colleges.

1.9.2 DIDACTICS

This thesis is based on two compatible definitions of General Didactics, namely those of Van der stoep and Van der Stoep and Duminy and Sohnge.

a] Didactics may be described as a theory of what teaching entails, which conditions are valid for the progress of teaching events, the general principles to be considered in teaching all the different forms which teaching may assume, the methods which may be relevant in the practice of teaching, what is understood by learning, learning activities and learning intention, what the subject matter of tuition is, in which way the subject matter may be arranged, which aids are necessary to a teacher and how they can and should be used and in cases where the teaching activities do not succeed, which aspects may be considered by the teacher to enable him to work orthodidactically, i.e. remedially, correctively, in his classroom [Van der Stoep & Van der Stoep 1973:1].

b] "As a part-discipline of pedagogics, didactics is a scientific reflection centering on educative teaching learning acts ..... and related aspects such as didactic principles [teaching principles], teaching and method .... Didactics, briefly, embraces the entire activity of teaching and of being taught. This includes words like "didaskolos" [teacher], "didaskolia" [vocation of teaching], "didache" [a person who is in one way or another engaged in teaching] [Duminy and Sohnge, 1986:1].

1.9.3 FORMAL EDUCATION

The type of education that takes place in a planned way at recognised institutions such as schools, colleges, technikons and universities.

1.9.4 INFORMAL EDUCATION

The type of education that takes place in informal situations and spontaneously, for example, within the family or the neighbourhood [Le Roux, 1985 :7].

1.9.5 LEARNING

This involves the acquisition of insight or knowledge through contact with external events, accompanied by changes in thought, attitude and behaviour [Hoyle, 1980].

1.9.6 LECTURING STAFF

The lecturing staff of a technical college means the principal, the senior deputy principal, the heads of divisions, senior lecturers, lecturers or any other person performing didactic duties in the technical college.

1.9.7 NON-FORMAL EDUCATION

Education which proceeds in a planned but highly adaptable way in institutions, organisations and situations outside the spheres of formal and informal education, for example, in-service training in a work situation [Le Roux, 1985:7].

1.9.8 SKILLS

Skills refer to mechanical skills [e.g. grasping an object, practising a sleight of hand], intellectual skills [e.g. reasoning, analysing and differentiating between feelings] and creative skills [e.g. writing poetry]. Skills also include those abilities that appear to be, while not natural in the sense of automatic, nonetheless, acquired through the environment [e.g. talking] and those that in most cases need to be learned with the aid of teachers [e.g. writing essays]. Skills are systematic and co-ordinated patterns of mental and/or physical activities usually involving both receptor processes [sense which receive stimuli] and reflector processes [muscles or glands which provide responses] Page and Thomas [1977:312] state that "Skills may be perceptual, motor, manual, intellectual, social, etc. Finally, skills are sometimes physical or mental abilities acquired through knowledge and practice which can be exercised with relative ease and accuracy".

1.9.9 TEACHING

In this thesis the definition of teaching suggested by Hyman [1974:1] is accepted. He defines teaching as a deliberate series of actions aimed at inducing learning. Central to the concept of teaching is a manner on the teacher's part which implies respect for the student, reason-giving and truth.

1.9.10 TECHNICAL COLLEGE

In the South African context a technical college can be described as an educational institution in which students are prepared for technical careers either on a part-time or full-time basis through the use of a trimester system. One of the most important functions of technical colleges is to provide tuition which will enable people who serve an apprenticeship in one of the trades [e.g. mechanics, plumbers, electricians, hairdressers, etc.] to obtain formal qualifications recognised by commerce and industries. The qualifications which can be obtained form a hierarchical structure reflecting the degree of difficulty related to various certificates, namely N1, N2, N3, N4, N5 and N6. Each certificate requires a minimum of one trimester to complete and consists of four subjects. The entrance requirement for N1 is Grade 10, which means that most students enrolling for this course for the first time are approximately sixteen years of age. Other important courses offered at most technical colleges are bridging courses leading to N1 [mostly for students who passed Grade 9], courses to obtain national diplomas in vocational fields and courses preparing advanced students for a Certificate of Competence for Engineers.

1.9.11 TECHNICON

Although technikons fall outside the scope of this study, it is useful to distinguish between technikons and technical colleges by bearing in mind the following definition of technikon: a technikon is an educational institution in which post-matric students are prepared for technical careers through the use of a semester system. The main impetus at technikons is to train technologists [as opposed to artisans] and the hierarchical structure of certificates which can be obtained is T1, T2, T3, T4 and T5. Technikons often work in close liaison with universities, although technikon courses usually have stronger practical components than university courses.

1.9.12 THEORY

According to the Collins Concise Dictionary [1989:1352] the word "theory" is a system of rules, procedures and assumptions used to produce a result. It is abstract knowledge and reasoning. In technical education people frequently distinguish between theoretical and practical subjects.

The theoretical section of a subject [e.g. Electrical Trade Theory] is the theoretical knowledge offered to students in a lecturing or discussion situation which culminates in written examinations. This is normally accompanied by a practical component of the course in which students learn practical knowledge and skills in a workshop or laboratory situation and which culminates in performance tests. In scientific research theory is seen as a set of hypotheses related by logical arguments to explain a wide variety of connected phenomena in general terms, e.g. the theory of relativity.

1.9.13 TRAINING

To train people is to provide them with "know-how" or the ability to perform certain actions. Training may take place in respect of intellectual matters [e.g. one may train a person to conduct research in a particular way] as well as physical matters, but it is probably more common to talk of it in the latter context, e.g. trained mechanic, trained chef, trained clerk, etc. We may distinguish between training a person to do something specific, training them in a skill [e.g. training them to strip car engines] and training them for an occupation e.g. as clerk, mechanic or researcher. In every case the key characteristic of trained individuals is that they have the ability to carry out some operation but they lack the theoretical understanding that lies behind it. Once such understanding is added we move from the merely trained state towards that of being educated. In practice, we distinguish between the automatic performance of operations [the mark of the trained person] and the understanding of operations with or without skill in performance [a sign of an educated person]. The distinction should not be taken to imply either lack of connection between the two or to lessen the value of training. Training may be of great value in its own right in some contexts and preliminary to education in others.

1.9.14 UNIVERSITY

This is an institution of higher education usually with a reputation in teaching and research. It is a corporate body empowered to award its own degrees. It usually has faculties, subdivided into departments in which lecturers prepare students to obtain degrees in advanced fields of study on four levels: Bachelor, Honours, Masters and Doctor's degrees. Universities usually serve as a base for research, teaching and community services.

1.10 CONCLUSION

In this chapter three structural features of the research were outlined, viz. the problem, the methodology and the terminology. With regards to the problem it was established that the central concern in this study is to identify some of the most significant constraints which affect the quality of teaching at technical colleges in KwaZulu-Natal. In order to gain circumspection and depth of vision it was felt that criteria for effective thehnical education, as revealed in the literature, needed to be outlined. The next chapter, therefore, consists of a discussion of criteria for technical education.

CHAPTER 2

CRITERIA FOR EFFECTIVE TECHNICAL COLLEGE BASED TRAINING

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CHAPTER 2

CRITERIA FOR EFFECTIVE TECHNICAL COLLEGE BASED TRAINING

2.1 INTRODUCTION

Technical education is composed of programmes designed to prepare individuals for gainful employment as semi-skilled or skilled workers, technicians or sub-professionals in recognised occupations and in new emerging occupations. According to Nkungula [1980: 14] the main aim of technical education is to develop skills, abilities, work habits and appreciation encompassing knowledge and information needed by workers to progress in employment. Ngubentombi [1989: 60] explains that technical education:

- provides courses of study that will enable the student on completion to enter employment with a level of skills acceptable for continued apprentice training,

- provides a clear understanding of the structure and roles of occupation for which she/he is being trained so as to enable the student to comprehend her/his specialist contribution to, and responsibilities in the community, and

- ensures a level of language competence that will not only enable the student to communicate fluently within her/his own environment through the spoken and written word, enhance the ability to read with insight , follow instructions, give directions and write with precision, but will further provide these skills in relation to an occupation and a sufficient grasp of technical language.

The Kwa-Zulu Training Trust [KwaZulu Department of Education, 1986: 28] states that the aim of technical education is to give people the marketable skills required in the formal and informal sectors. Willis [1963: 4] advances a similar argument in his claim that "technical education refers to that part of student's intuition intended specifically to fit the student for work". The view of Silver and Brenman [1988: 34] is that "technical education implies deliberate preparation of students for employment".

Some educators, such as Roberts [1971: 9] and Leslie [1972: 3], make no distinction between technical education and academic education. They are of opinion that all education is vocational. Others, such as UNESCO [1973: 11] and Smith [1956: 5], go to the other extreme by limiting the term technical [vocational] education to the learning of specialised manual skills. But, in a broad sense, all education contributes to vocational competency.

Brookover [1962: 16-17] elucidates:
"Skills in reading, mathematics, and other general studies are essential for acquiring specific vocational competence and the higher levels of education needed for many occupations. It is therefore essential for the schools to increase their efficiency in teaching the fundamental school subjects to all students. The early school leaver, who has not acquired the basic skills, is not only unable to find satisfactory permanent employment, but is also greatly handicapped in acquiring specific vocational training as an adult."

Basic general education is therefore the best foundation for entering upon a vocational [technical] education programme. Technical [vocational] education is then an integral part of the total educational system, sharing many of the system's basic goals and principles. As indicated above, the central purpose of education is to prepare people to function within and improve society by facilitating smooth entry of the individual into the world of work and technical education helps to achieve this.

Nkungula [1980: 14] claims that technical education aims at assisting high school pupils in acquiring job skills that will enable them to earn a livelihood and also aid in the development of the country. Technical education is therefore directly responsible for supplying trained manpower into an economy, as well as being responsible for the upgrading of manpower for those already following a career. The American Vocational Association [1975: 27] states that technical education is:

> "education designed to develop skills, abilities, understanding, attitudes, work habits and appreciation encompassing knowledge and information needed by workers to enter and make progress in employment on useful and productive basis. It is an integral part of the total educational programme and contributes towards the development of good citizens by developing their physical, social, cultural and economic competencies".

The criteria discussed in this chapter are regarded as extremely important for effective technical college - based training and, without the application of these criteria, the colleges may easily become ineffective. The criteria which are discussed here are:

1] Effective partnership between technical colleges and private sector.
2] Adequately equipped workshops for engineering practical skills training.

3] Effective evaluation of student's tasks/projects, theoretical work and examinations by college lecturers and other department officials

4] Theoretical training of students should lead to practical application of knowledge by the students.

5] Adequately qualified lecturing staff.

2.2 CRITERION ONE: EFFECTIVE PARTNERSHIP BETWEEN TECHNICAL COLLEGES AND THE PRIVATE SECTOR

The general view adopted in this section of the study is that no technical college-based training can be effective unless there is an equally effective partnership between technical colleges and the private sector.

Partnerships here imply a very broad sense of stake holder participation. It involves partnerships between the institution and the community, the institution and its learner population, the institution and labour and business and partnerships between the institution and institutions in other sectors. Strengthening of the ties could offer opportunities to attract resources and assistance to the technical education sector. To rationalise resources [human, buildings, machinery, etc.] and ensure effective and efficient delivery of education and training, partnerships between the private sector and colleges is of vital importance. Langlow and Lillis [1988: 51] argue that "there is widespread agreement that partnership between enterprises and colleges should be formed, and where they exist, they should be strengthened, so that the abyss separating the world of the colleges from the world of work is closed".

Partnerships imply mutual benefit. Through co-operation, colleges and the private sector are each able to enhance the quality of their own services as well as contribute to greater economic growth and employment creation within their communities. Partnerships imply a very broad sense of stakeholder participation and they therefore involve partnerships between the institutions, labour and business.

The Institute for Partnership between Education and Business [IPEB] in South Africa [1996: 1] argues that partnerships between colleges and the private sector involve developing innovate means of encouraging colleges and business to take co-responsibility for introducing students to various work opportunities. This has the added benefit of providing business with new recruitment opportunities [IPEB] [1996: 1].

IPEB [1996: 1] elaborates that these partnerships should focus on areas of specific concern and development, for example, science education, technology and technical education, social reconstruction, enterprise education and environmental education. Furthermore, partnerships which focus upon technological and technical innovation in technical colleges are vital. IPEB [1996: 1] states that such partnerships work on the assumption that advanced technology is crucial for today's workforce, however, many technical colleges still do not have state of the art resources. An obvious benefit of the suggested partnerships would mean that business and industry facilities would be made available for students to work on site and experience a modern technological environment IPEB [1961: 1].

A partnership between the private sector and technical colleges has multiple benefits including:

- it improves practical training of the students and affords them an opportunity to *gain insight from the private sector regarding the latest trends and innovation*
- lecturing staff learn from employers who are already in possession of up-to-date knowledge [Ross and Smith, 1988: 5-13].

Banham suggests that a partnership between technical colleges and the private sector can be developed through various methods:

- site visits or work observation
- courses and seminars
- work simulation
- teacher placements
- problem solving projects
- teacher secondment
- curriculum development
- supplying finance and equipment to colleges
- *career guidance or presentations* [Banham, 1989: 14].

The purpose of involving industry in technical/vocational education

Jamieson and Lightfoot [1982: 13] argue that industrialists and trade unionists provide students and teachers with insight into alternative forms of work, different structures and hierarchies as well as different values and attitudes towards work.

However, working in partnership with members of industry is not beneficial merely because it contributes to students' knowledge of the working world. It provides them with another context within which they can develop interpersonal skills [Smith, 1988: 57]. This author elaborates by saying that, the opportunities which such contacts create for students to develop an empathy with people who work in different settings and who may have values and opinions about work which are different from those presented by teachers or lecturers, are significant.

Smith [1988: 76] lists three roles which the private sector assumes whilst working in partnership with technical colleges. They act:

- as planners and designers of curricular experience in collaboration with teachers/lecturers
- as providers of experience and expertise
- as assessors and evaluators of experience.

Esland [1991: 67] believes that partnerships between private sector and technical colleges:

- provide teachers and students with opportunities to observe life in the work-place and gain practical experience with more up-to-date equipment which may be available at the training site,
- provide partnership arrangements to improve communications and co-operative work ties between the world of learning and the world of work,
- provide technical colleges with material and human resources and opportunities to collaborate directly with business and industry,
- sponsor many kinds of activities designed to encourage the development of work- related skills,
- provide an opportunity to learn about employer standards of punctuality and work site behaviour.

UNESCO [1978: 28] argues that:
"Co-operation between education and industrial enterprises increases the relevance of technical and vocational education to industry and provides a good opportunity to meet required industrial standards even at training stage. This co-operation gives technical and vocational education teachers the opportunity to update their knowledge or skills to meet current practice, often linked with access to new technology."

UNESCO [1978: 29-30] further holds that the industrial enterprises also benefit from such co-operation which:

- offers them a chance to make a preliminary selection of future employees from among the students on work placements; and
- gives trainees the opportunity to obtain and improve their scientific and technical knowledge and skills during their training, thereby producing a better quality

workforce for the future.

UNESCO [1978: 29-30] indicates that technical and vocational teachers in the educational institutions attached to industrial enterprises benefit from this partnership through familiarizing themselves with:

- changes and innovations occurring within local industries;
- the extent to which the industrial enterprises require traditional skills and what new skills are required;
- the nature and extent of usability of special training facilities within the industries;
- the actual training and retraining requirements of current and future employees. This gives them an opportunity to update the curriculum so that it is relevant to actual needs.

In Britain, business organisations, taking a relatively new stand, assert the necessity for business to become involved in setting policies for education and even business/industry's positive right to do so. They point out that, not only does the world of work have a special claim to be heard, education and business are mutually dependent, have common interests and many common purposes and must therefore co-operate as partners [Association of British Chambers of Commerce, 1984 as quoted by Jon and Kevin, 1988: 52].

Economic development, alleges Norton [1995: 52], takes place most successfully when communities organise for their own economic future. Speaking from the Canadian experience, he further argues that people who live and share in that community are the only people who are willing to put in volunteer time and the extra energy to help that community move ahead. Partnerships of institutions, business, industries and labour and the community agencies in that community are essential to that community's future.

The community college's model of the United States of America is internationally renowned and a growing number of further education colleges in the United Kingdom are moving towards the USA model for open access education and training [Wymer, 1995: 91]. Various community colleges in the United States have links with other colleges and the private sector. An example forwarded by Wymer is a formal agreement that was signed by Poilston Community College and Bunker Hill College. One outcome of this agreement was the June 1995 International Conference on Education and Training. This partnership has created new projects, such as the creation of small enterprises, the establishment of a consortium with The British College of Banking and Finance in Moscow, Moscow College in Vyasma and the South African Community College Movement [Wymer, 1995: 91].

The idea has developed in South Africa where the Attridgeville College for Vocational Education has established a consortium with East Devon, Arnold and Carlton and Preston Colleges of Further Education in the United Kingdom [Marcus, 1997: 56]. It has become increasingly evident that educators need to be better informed regarding the requirements of employers, that, as technical education becomes more costly, it can profit from the material and political support which the business sector is able to provide, and that colleges need access to the work place in order to bring a greater degree of realism and sense of immediacy to their curricula.

Jon and Kevin [1998: 67] comment on the business/industry involvement in education and eloquently summaries the issue:

> "If business/industry involvement in education is to be successful, and even expand, careful attention has to be given to establishing the conditions and appropriate Institutional arrangements for collaboration between business/industry and the colleges. Some progress towards this in France and Britain is noted: in Germany the dual system has for long proved these conditions for vocational and technical training, though relatively little has been done to expand collaboration with respect to general education".

UNESCO [1990: 26] states that "the close linkage of technical education with industrial, commercial, and agricultural enterprises also contributes to the improvement of the organisation and development of technical and vocational education". This body also indicates that "technical and vocational education systems throughout the world are quite similar in curricula and content, sharing similar approaches".

Partnerships between institutions and labour and business are vital and essential to the future of colleges. Such partnerships contribute to educators' development and empowerment as they need to be kept abreast of development in their fields of expertise. There is a dire need for colleges to work closely with business and industry in order to empower college trainees with up to date knowledge and skills. Thus, a significant component of their task is that of public relations; relating effectively with industry, employer unions, professional associations and government bodies. These skills are not only required with respect to the effectiveness of programmes of co-operative education, but also with respect to counselling and advising students in matters relating to their careers. The development of these skills must be provided for in the preparation of lecturers.

2.3 CRITERION TWO: ADEQUATELY EQUIPPED WORKSHOPS FOR ENGINEERING PRACTICAL SKILLS TRAINING

Adequately equipped workshops are a vital prerequisite if technical college-based training is to be effective as workshop practice and related activities are taught by college lecturers. For workshop practice, each learner should have an individual workplace, and group training given on a rotating principle.

The National Education Department in South Africa is mostly responsible for the standardization of education equipment from National Technical Certificates one to six levels [NTC 1-6] . The procedure adopted for the standardization of workshop equipment is as follows:
The curriculum experts prepare lists of equipment on the basis of the curriculum. The course experts lay down specifications for various items. The Department of Education is responsible for providing technical and vocational institutions with adequate and up-to-date equipment for practical training. UNESCO [1979: 130] argues that:

"Machines and equipment used in workshops in educational institutions should be geared to the level and training of the users. This equipment should be simple and designed especially for pedagogical purposes without being obsolete". Technical and vocational education require a more adequate infrastructure, facilities, equipment and specialised teaching staff to meet the needs of students and industry. The lack of learning materials and training equipment in the workshops affects the quality of the teaching and learning process [UNESCO 1990: 23].

UNESCO [1978: 106] explains that the problem in implementing adequate and effective technical and vocational education programmes in technical colleges is that of providing the proper facilities or equipment for practical training. Due to this, UNESCO [1878: 106] reveal that the problem is dual, viz:

- technical and vocational institutions are ill-equipped and, provision for actual work experience in enterprises is lacking.
- equipment for industrial or practical fields of technical and vocational education is very expensive, both in terms of initial investment and in terms of maintenance.

The technical and vocational institutions are faced with a challenge to meet the training needs of industrial and business enterprises by providing trainees with solid theoretical knowledge and quality practical training. Nzama [1991: 45] reveals that the challenges on technical training are characterized by demands for changes in attitude and values and also for the adoption of high quality technological equipment and modernization of production process in all technical colleges. Inadequate teaching materials and equipment as well as lack of facilities to provide relevant and up-to-date practical training to students, especially in Black colleges in South Africa, constitute a major problem.

Bot [1988: 17] is of the opinion that very few students are able to secure employment after training because of lack of practical training and that, in KwaZulu Natal, it was found that school-leavers who received post-school technical or vocational training often remain unemployed. Only 30 % of technical college trainees manage to secure full-time employment. Part of the reason is that technical training in colleges concentrates on theory and does not provide adequate practical experience. It was found by Bot [1988: 17] that there is no training equipment for certain race group, particularly Blacks, and that, as a result, employers either do not employ those groups or are forced to send trainees away for further training.

UNESCO [1979: 119] argues that "in order to ensure quality in technical and vocational education, responsible national authorities should establish criteria and standards, subject to periodic review and evaluation, applying to all aspects of technical and vocational training including:

- staff qualifications
- ratios of teaching and training staff to learners
- the quality of curricula and teaching materials
- physical facilities, workshop layout, quality and type of equipment."

A further contention of UNESCO [1979: 119] is that "adequate funds need to be allocated for recurrent expenditure for supplies, maintenance and repair of training of equipment".

Adequately equipped workshops play a crucial role in successful technical college-based training, because, through them, all students can be exposed to practical experience. Students can learn exactly what certain equipment looks like; how it is used and what function it serves. When this happens, effective training can take place and this is likely to lead to a sense of systematisation and order in the minds of the trainees.

2.3.1 FOR THE USE OF EQUIPMENT TO BE DIDACTICALLY JUSTIFIABLE, IT MUST PROMOTE THE PROBLEM-SOLVING ABILITY OF THE STUDENT

According to Gates et.al. [1963: 449] problem-solving occurs when there is some obstacle to the attainment of an objective. If the path to the goal is straight and open, little difficulty is experienced in reaching a goal, but when one has to discover a means of circumventing an obstacle the stage is set for reasoning to be applied. Behr [1988: 51] goes so far as to assert that "problem-solving can be regarded as the chaining of a series of principles". To solve a problem the learner must have an understanding of the nature of the solution.

Gagne [1985: 178] in his discussion of problem solving techniques views this as: "a process by which the learner discovers a combination of previously learnt rules, and plans their application so as to achieve a solution for a novel problem situation". He explains that, for the process to occur efficiently, students will need to master two general kinds of capabilities, viz. intellectual skills and cognitive strategies. To complete the process, Gagne recommends a learning hierarchy in which a skill learnt in one situation can be used to master a similar task in another situation. This concept is known as transfer of learning.

Technical students need to develop an ability to solve problems and the specifics of creativity and resourcefulness and that requires equipment, tools and heavy machinery. Problem-solving skills are necessary when students are expected to diagnose faults in cars and to be creative in considering alternative solutions.

2.3.2 ACTIVE LEARNER PARTICIPATION AND DISCOVERY LEARNING

The principle of active participation, as used in this study, means learner participation, engagement or involvement of engineering students in a didactic situation. This principle implies that students should be mentally and physically active during teaching. Students tend not to remember material covered only theoretically, instead they need to practice with equipment. Skills can only be learnt through active participation or involvement, especially in Motor and Electrical trade subjects.

The principle of active participation in a didactic situation is encapsulated by Jones and Jones [1981: 42] who argue that "Regardless of whether one views learning as based upon the reinforcement of appropriate responses, modelling or reconstruction of cognitive concepts, learning will take place only when a learner is actively in attempting new skills".

Van der Stoep and Louw [1990: 61] present the notion that "pupil involvement" in their clarification of the dynamic didactic situation as "pre-eminently a situation of movement". They explain dynamism in didactic terms as "more concerned with the quality of the attitude, the enthusiasm and the zeal of the participants". Therefore, both teachers and students in a didactic situation are seen as imbued with dynamism - a sense of active participation.

Without active student involvement in a didactic situation, no effective learning and practical training can successfully take place. There can be no doubt that adequately equipped workshops are essential for students to be actively involved in learning.

Kruger and Muller [1988: 4] opine that teaching is highly effective if the learner can increasingly give meaning, or appropriate meaning to what she/he is learning. In this sense learner participation is demonstrated by her/his ability to interact with the subject matter and assign or attribute personal meaning. Learner participation is crucial to the point that no meaningful learning can take place without learner participation and active involvement [Vrey, 1979; Cawood and Gibbon, 1981; Avenant, 1988; Bourd, 1988].

Vrey [1979: 209-210] is of the opinion that "only by personal involvement can the learner understand or discover meanings, because these have to be correlated with relevant anchoring ideas in the existing cognitive structure which forms the learners' unique, functional knowledge". Vrey's argument extols what Jerome Bruner calls "discovery learning" [Bruner, 1966: 83] - learning which belongs to a "tradition that views learning as a problem solving creative, discovery activity in which the learner is a principal actor rather than a bench - bound listener" [Richards and Rogers, 1986: 100]. In this regard van der Stoep and Louw [1990: 56] posit that: "The didactic situation is aimed at helping the child towards self discovery in reality so that he can establish his *own position regarding reality*".

The task of the teacher is "eminently to aid, support and help the child in his self discovery to enable him to reach what he can and to become what he ought to be" [van der Stoep and Louw, 1990: 57]. Bruner [1966: 83] was a proponent of the discovery method of learning and his work was influenced by Piaget's theory of developing [Curzon, 1985: 17].

Bruner suggests that teaching will be most productive when subject matter is reduced to the structural elements, to provide a foundation for the acquisition of principles [Bruner as quoted by Curzon, 1985: 60]. Through the discovery methods pupils may learn concepts and relationships. Bruner hypothesises that a student who knows the principles of a discipline has the power to *investigate and solve problems within its parameter.* Avenant [1988: 117] corroborates this idea that learning is facilitated when learners become principal actors in the learning experience. Naturally this implies learner self exertion and effort as Avenant argues:

"None can actually teach someone else something. One can supply the educational material, make the learning circumstances as ideal as possible and provide the necessary verbal, visual or auditory stimuli, but it remains the learner's responsibility to form his own concepts. Furthermore, none can remember that which has been taught for him. He must succeed in *remembering the subject matter by self exertion exercises and repetitions*".

Gunter [1982: 41] echoes Avenant with his point that the learner "himself has to assimilate, interpret, reconstruct, appropriate and apply" what the educator presents and transmits to her/him. For Gunter, "pupil participation through self activity" is an important pedagogical didactic criterion. Curzon [1985: 60] states that discovery learning:

- promotes the ability to develop strategies by approaching and analysing patterns in her/his environment, in an organised manner
- *may be applied to real problems outside the classrooms.*

The purpose of presenting the above arguments is to emphasise that the use of learner participation and discovery as methods of presentation of Motor and Electrical trade courses is likely to be didactically most effective. This situation demands that workshops for practical training of students be adequately equipped so that students will be able to participate actively in the learning and training process.

2.3.3 CONTINUOUS UPDATING AND MAINTENANCE OF WORKSHOPS

The equipment for practical training of students at colleges within the province of Kwa-Zulu Natal tends to be below the expectations of business and industry and the maintenance of this equipment appears to be an ongoing problem.

UNESCO [1990: 17] states that "scientific and technological progress makes training equipment in technical colleges obsolete at an ever increasing pace. To overcome this problem a well-defined maintenance programme needs to be designed". This programme will assist in ensuring *that each tool, piece of equipment and heavy machinery in the workshop is updated, maintained* and well looked after by the college and Department of Education.

Esland [1991: 243] indicates that "a high degree of employer co-ordination and involvement is needed to make this system work".

According to UNESCO [1990: 42], "most of the countries are unable to maintain, replace, upgrade, update and look after their equipment which has become obsolete in the context of rapid technological changes". This information suggests that many technical institutions are ill-prepared to meet the requirements of their students and industries. UNESCO indicates that "some countries end up donating specific equipment to the training institutions and also form joint programmes of maintenance, research and development within local companies" [Ibid, 1990: 43].

UNESCO [1990: 14] maintains that "automation and increased adoption of new technologies will in turn promote an increased demand for a qualified labour system of updating and maintenance of existing equipment".

2.3.4 ADEQUATE FUNDING FOR PURCHASING OF TOOLS, EQUIPMENT AND HEAVY MACHINERY

Efficient funding of technical colleges is an important prerequisite for technical college- based training to be meaningful. State funding seems to be the most problematic area in any institution. The disparity in the provision of funding during the apartheid area is still largely prevalent. The difference in financing and financial management between state-aided [largely previous White colleges] and state colleges [mostly Black, Indian, ex-DET and Coloured colleges] is vast. The funding of state-aided colleges is based on the full-time equivalent [FTE] formula. This is worked out on the basis of the number of successful learners and the number of subjects taken over a period of time. The State pays operating costs for formal programmes to state colleges and their funding does not take the FTEs into consideration. The amount is dictated by the state.

Bartel [1976: 30] asserts that "equipment should change as the technology itself changes and also as the individuals' needs change, to help provide an appropriate course of study relevant to the needs of society. This creates a need for continual revision and updating of content and equipment and thus vocational/technical education tends to be costly".

2.4 CRITERION THREE: EFFECTIVE EVALUATION OF STUDENTS' PROJECTS, TASKS, THEORETICAL WORK AND EXAMINATIONS BY COLLEGE LECTURERS AND OTHER DEPARTMENTAL OFFICIALS

The supervision of practical training in the workshop is an important element in the process of technical and vocational training as the workshop teacher is at the very foundation of any form of education. It is through a workshop teacher that the students will have their first real contact with the working world. This idea is backed up by Nel [1991: 123] who believes that "the lecturers *should occupy a visible role in the supervision of practical work*". The workshops for the state-colleges are situated on the college premises and workshop practice or projects given to students are classified as practical subjects and are taught or offered by trained lecturers. For basic workshop courses, each learner has an individual workplace, whereas for advanced courses, group training is given on a rotating principle. This system allows for maximum utilization of expensive workshop equipment, since it ensures that uninterrupted use is made of the available facilities. In all technical colleges in South Africa, the practical training of students is supervised and assessed by lecturers from within the institutions or colleges. To ensure the effective supervision of students' tasks in the workshops, the student-lecturer ratio should be limited to 1:18 or even less, depending on the nature of the course.

The workshop lecturer in his supervisory capacity is expected to comply with the following:

- to familiarise the student with expectations
- to orientate the student with the workshop
- to plan a programme for the students
- to structure student programmes to enable them to progress from the simple to the more complex activities
- to demonstrate certain techniques to students
- to provide resource material
- to observe and analyse students' progress
- to complete an evaluation profile [Govender 1988: 28].

Technical college students have to be assessed to fulfil the practical training requirements. The supervisory lecturers are assigned a responsibility of supervising, assessing and evaluating *practical work or projects of students*. UNESCO [1973: 130] suggest that "*evaluation should be* an integral part of the teaching and learning process in technical and vocational education and its major function should be the development of the particular individual in accordance with his interests and capabilities."

Although standards of performance should be upheld, evaluation of the student's work should be made on an overall basis considering, amongst others, her/his interest and attitude, class participation, progress, time spent on project/task and examinations and aptitude. It is believed by UNESCO [1973: 130] that "students should participate in the evaluation of their progress and the evaluation of student work should have a system of feedback built into it so that learning problems and their causes may be identified and steps taken to correct them." Continuous evaluation of students' projects or tasks should be undertaken by both lecturers and representatives from the private sector, along with the participation of students; in order to determine the effectiveness of the methods and material used and to devise alternatives should the need arise.

2.4.1 DIDACTIC PERSPECTIVE OF EVALUATION

Cronbach [1963, as quoted by Stenhouse, 1975: 98] defined evaluation as "decisions about others: identifying the needs of the pupils for the sake of planning his instruction, judging pupil merit for the purpose of selection and grouping, acquainting the pupil with his own progress and deficiencies". To evaluate any task at school involves ascertaining and attributing its value or worth. In the education situation, through the process of evaluation, the teacher affords worth to or makes judgements on her/his teaching and this includes the judgement of the pupils.

2.4.2 THEORIES ON EVALUATION

According to Bossert [1980: 195], evaluation is a more complex concept than examining, testing and measurement. In the measurement procedure quantity is emphasised, while in evaluation quality as well as quantity are the focus.

Evaluation is seen by Kruger and Muller [1988: 155] as a concept which comprises an assessment of the effect of teaching. It includes techniques such as measuring, testing and examining which can be applied in order to obtain a reliable picture of pupils' results.

Welton and Mallan [1988: 496] believe that the purpose of educational evaluation is to provide data which enables one to make qualitative judgements about pupils, teachers and school performance.

2.4.3 THE ROLE OF EVALUATION IN DIDACTICS

Apart from measuring results, value is also attached to subjective assessment of human characteristics. Nyikana [1990: 43] asserts that evaluation is a more subjective, qualitative as well as quantitative assessment of pupil progress and that evaluation includes appreciation. She believes that, in every moment of a lesson, the teacher is busy evaluating, appreciating and judging.

2.4.4 EVALUATION AS A PROCESS

The distinction between measurement and evaluation is clearly outlined by Kruger and Muller [1988: 156]. In measuring, the only consideration is the mark obtained and no other influencing factors are considered. In testing and examining, achievement is often expressed in marks which reflect both quantitative and qualitative considerations. This also encompasses that evaluation is influenced by expected future achievement. For example, if a pupil underachieves according to her/his usual level then previous test and examination results could indicate whether she/he has sufficient understanding of the work to recover or even to achieve more highly at a later stage.

2.4.5 EVALUATION IN A COLLEGE CONTEXT

Brennan [1985: 110] states that evaluation is a complex process which is concerned with the appropriateness and suitability of curriculum objectives and the sequence in which they are presented. It also deals with the delivery of the curriculum in the classroom in terms of content and learning established by the student. He considers that evaluation is a "formative" process which shapes every aspect of the curriculum, from the formulation of objectives and their intermediate sequencing, to classroom organisation and presentations in a continuous search for improvement and refinement.

The argument from Welton and Mallan [1988: 495] is that evaluation has always been an essential component of instruction and student performance has been the traditional focus. They consider this to be a three-part process that consists of:

- identifying criteria or standards
- gathering data on student performance
- making judgement about an individual's performance.

2.4.6 PERFORMANCE ASSESSMENT

Performance assessment is a direct and systematic observation of a learner's performance or an examination of products created. During performance assessment, learners are engaged in activities which require the demonstration of specific skills or the development of specified products. The demonstration can take place in a controlled environment such as Electrical or Mechanical workshops, laboratories or classrooms, or in a real life environment where the complexities faced by the learners are of a higher level. In the latter case, the performance assessment is also called "authentic assessment". In both cases the learner can demonstrate complex learning that integrates knowledge, skills and deposition/attitude in a single performance [Janine Hout, as quoted by Department of Education a], 1997: 31].

Performance assessments have the following characteristics. They:

- require from learners to perform, produce, create or do something
- are representative of performances displayed by individuals in society or in the work place
- are scored by people with the use of assessment criteria as the basis or human judgement
- provide opportunities for learners to present and explain their work
- involve learners in their own assessment [Ibid. 1997: 32].

2.4.7 THE DEVELOPMENT OF PERFORMANCE ASSESSMENT

Richard Stiggins, as quoted by the Department of Education [a], 1997: 32], suggests five steps to developing performance assessment:

① Clearly identify the outcomes to be assessed - create a clear and appropriate target for learners
② determine the purpose of the assessment and how the results will be used
③ design a performance task that will elicit the expected outcomes
④ specify the assessment criteria
⑤ select and construct the scoring and recording instruments.

Performance in this type of assessment includes everyday teaching and learning activities such as projects, debates, assignments, practical work done by the students in the workshops and experiments . When performing, learners are applying their skills in a way integral to the teaching and learning process.

2.4.8 TESTING AND EXAMINATIONS AS ASPECTS OF EVALUATION

Tests assess the overall efficiency of teaching and learning and measure the attainment of objectives. Although there is widespread criticism of tests and examinations as reliable evaluation procedures and standards in education, for now these remain acceptable means of evaluating the learning and teaching situations [Walklin, 1990: 160]. To enhance the reliability and utility of an examination, the teacher must fashion the programme of testing, not so much as to measure how much students have imbibed from lessons, but to ascertain whether the lessons have caused any behavioural changes in the students, as well as the extent to which these changes have taken place.

Reliable and valid examinations can be useful to teachers and other educators by serving as forecasts as they assist in identifying students who would benefit or be suitable for further in-depth work in various subjects in the curriculum [Van der Stoep and Louw, 1990: 159].

2.4.9 THE RELIABILITY OF EXAMINATION RESULTS AS A MEANS OF EVALUATION

To ensure that the reliability of examinations is upheld, teachers should take cognisance of the following:

- the test or examination must focus upon the areas that have been covered during the month, term or year as it is not good practice to spring surprises on pupils
- design question which all pupils have an opportunity of attempting to answer
- give students sufficient advance notice regarding an imminent examination or test and make the time-table available
- if possible, do revision before the examination or test
- avoid ambiguity in questions
- ensure the questions are within the range and ability if the students and that they are answerable and workable
- examinations and tests are not to penalise, but are a means to assess, diagnose

and reinforce [van der Stoep and Louw, 1990: 160].

2.4.10 TECHNICAL COLLEGE EXAMINATIONS

Traditionally, and in terms of the previous South African Constitution, each province was responsible for its own examination system for schools. Nevertheless, owing to the principle of uniformity of standards and qualifications for technical college education, as well as cost-effectiveness achieved by a single examination body, the various education departments entered into agreement that the National Examinations [previously a section of the Department of National Education] to use their examinations. Hence students at all technical colleges write the same external examinations.

For engineering studies:

- Full scale examination sessions for levels N1 to N6 are conducted in April, August and November each year. The pass mark for instructional offerings is 40%, except for multi-disciplinary Drawing Office Practice N4 and N5 and subjects for the certificates of competency for Engineering which require a pass of 50%.

- Holders of an N6 certificate who have 12 instructional offerings in N4, N5 and N6 and who can provide documentary proof of two years appropriate practical instructional experience can also qualify for the issue of a National N Diploma.

In the other six study fields: - Fulll scale examination sessions for levels N1 to N6 are conducted in June and November each year. The pass mark for an instructional offering is 40% [with exception such as Practicals of Hair Care and Cosmetology , which are 60%].

In the fields of Businessss and General Studies, Arts, Social Services, Utility Industries and Agriculture: - Holders of N6 certificates who have passed instructional offerings in N4, N5 and N6 and who can provide documentary proof of 18 months of appropriate practical work experience, can also qualify for the issue of a National N Diploma.

Examinations are used to assess the overall performance of students and institutions and to measure the attainment of objectives. These examinations are reliable evaluation procedures and standards at technical colleges. Chapter 3 in this study will present the examination results of the various technical colleges. An essential reason for including a question regarding examination results in the questionnaire is to identify those technical colleges where teaching appears to be most effective or least effective.

2.5 CRITERION FOUR: THEORETICAL TRAINING OF STUDENTS SHOULD LEAD TO PRACTICAL APPLICATION AND TRANSFER OF KNOWLEDGE BY THE STUDENTS

The relationship between theory and practice in the training of technical college students is a matter which give rise to various problems in the technical education system. Technical college-based training can only be effective if trainees are able to relate theory to practice. The Human Science Research Council [HSRC] [1981: 91] considers that persons who have completed a vocation-oriented training programme should have the ability to perform certain tasks efficiently on the basis expected. These skills should be marketable and related to his expectations, abilities and interest. Technical college lecturers and guidance services have a responsibility to assist college students to practice how to transfer their theoretical knowledge to practice. For this to succeed, there must be a very close working relationship between a lecturer and a student as well as clear understanding of each other's roles.

The link between theory and practice should form an integrated role according to UNESCO [1979: 129]:
"What is learned in the laboratory, workshop or in enterprises should be directly related to the mathematical and scientific foundations of the particular operation or process and, conversely, technical theory as well as the mathematics and science sustaining it, should be illustrated through their practical applications"

The same principle is advocated by Woods [1974: 173] when he declares:
"There is no magic in field experience. It is not meaningful simply because it is "out there". Rather it is meaningful because it is carefully planned, structured, interpreted and linked with theoretical or fundamental studies. Contact with reality without the perspective of theory fosters adjustment to what is, rather than stimulating realization of what could be."

There is no doubt that if college trainees are not properly guided during practical training sessions, their success as real practitioners is jeopardised.

Two methods are found to be particularly effective in accomplishing meaningful transfer from theory to practice. These methods are:

2.5.1 DEMONSTRATION LESSONS

This lesson type includes an oral explanation as well as a practical demonstration of content. The oral explanation makes use of sketches, drawings, photos, models and pictures in which the action is demonstrated. Demonstration lessons must also be supported by a certain amount of information or theory in order that the student understands what is being done and why [Duminy and Songhe, 1983: 30]. Ngcobo [1995: 69] states that, "before a demonstration lesson is conducted, the student should be given enough theory so as to be able to observe the demonstration accurately and to discuss and evaluate it afterwards." Demonstration should be visible to the whole class or the class should be divided into smaller groups for the purposes of the demonstration. Demonstration must be followed by practice by the students through which they begin to imitate the skill that has been demonstrated. The time spent on practice and the duration of the practice session will vary from one technique to another. While practice is in progress, the correction of faults should be attended to.

It needs to be pointed out that there is no perfect lesson and, as such, demonstration lessons should be so organised that there is time for critical evaluation of the lesson.

2.5.2 SELF-ACTIVITY

Self-activity is found in the didactic situation where the learning of the technical college student depends upon his own resources, through which the student himself becomes the seeker, the discover and the creator. Self-activity emanates from the student with the skilful assistance of the teacher, and is based on the learner's own impetus and interests.

Not all activity in the college should be self-activity. A certain aspect of the work will always be routine and fall under the category of what has just been called "activity" in contradistinction to "self-activity" [Duminy and Sohnge, 1983: 84]. Self-activity, as one of the fundamental principles of teaching and learning, must be exercised to the full.

The self-activity method in the field of Motor Mechanics and other related courses can be employed. For example, the following projects follow this method:

- stripping of suspension systems using clamps

- wheel balancing - using wheel balancing machine
- pressure testing of cooling and caps - using radiator pressure testing kit
- bleeding of brakes - using brake bleeder
- checking of wheel alignment - using wheel alignment gauge and turntables
- cylinder leakage testing - using cylinder leakage tester.

One of the most typical characteristics of self-activity is that it always concerns a problem to be solved, a difficulty to be overcome, a confusion to be resolved. Duminy [1983: 86] refers to this methods as the problem solving or heuristic method.

The practice of self-activity should be regarded as preparation for the trainees to improve competence in preparation for employment. Self-activity contributes to the improvement of the student's performance during technical college-based practical training session.

2.5.3 TRANSFER

Transfer is the name given to the phenomenon that occurs when knowledge acquired in one field influences the way in which work is done and the level of achievement in some other field. Usually this influence is positive, but it may also be negative. During the transfer, the results are applied and used in other situations - either modifications of old situations or totally new situations. Vrey [1979: 216] describes transfer as the "influence of knowledge mastered by the learner in one situation on his achievement in another situation". The significance of learning, according to Bruner [Clarizio et. al., 1970: 294], is: "it matters not what we have learnt. What we can do with what we have learnt: this is the issue". Clarizio et. al. [1970: 280] state that: "teaching must be aimed at the transfer of knowledge. If Mathematics is taught to help the pupils to think or to solve Physics problems or whatever, Mathematic principles must be constantly and explicitly applied to this end. The same is true of any other subject".

The possibility of transfer determines the teaching method and also the selection of material with a view to application. Transfer, therefore, does not take place automatically. The teachers have a grave responsibility to teach in such a way that learners' knowledge will be functional in new situations.

a] Didactic perspective of transfer

The teacher's specific task is didactical. Subject matter is explained to the child and she/he is led in order that she/he may assign personal meaning to it. Transfer occurs when learning has been successful, and it must be regarded as both an aim and a result of such learning. In the education situation, through the process of teaching and learning, the teacher assists the child to learn effectively so that the knowledge which the child acquires is used in new situations.

Teachers at technical colleges have to realise their calling to be educators within the ever changing circumstances in which they find themselves. They have responsibilities towards the future development of the country and must therefore ensure that they are prepared to impart knowledge to students in a meaningful manner. Knowledge mastered by the students must then be applied in other problem solving situations.

Ausubel et. al. [1978: 567] indicate that for meaningful transfer of knowledge to take place, essential elements should be present:

a] a meaningful learning set

b] a logical meaningful learning task

c] the availability of relevant ideas in the learner's cognitive structure.

Ausubel et al. further emphasise the importance of appropriate background knowledge of concepts and principles as being essential for meaningful transfer of knowledge.

b] <u>Theories on transfer</u>

Vrey [1979: 305] states that: "Transfer is principally a function of the relevance, meaningfulness, clarity, permanence, integration and exploratory breadth of the ideas that were originally subsumed under more comprehensive ideas. Generalisations may be transferred if they are thoroughly understood and if there has been sufficient over-learning. Ample concrete empirical examples [deductive] will be required". This theory is elaborated upon by Ausubel [1968: 162] when he says that: "transfer can be facilitated by providing opportunity for learning principles in as wide a variety of situations as possible, by explicitly emphasising the similarity between training and the critical tasks and by presenting the latter tasks continuously or in close succession".

According to Ausubel the formulation of a functional cognitive structure by means of receptive learning is more important than specific generalisations. The idea of meaningful variables includes Judd's generalisations, but only as part of a more comprehensive functional unity. Vrey [1979: 307] holds that there is a remarkable similarity between Ausubel's view of cognitive structure and the transposition theory put forward by the Gestaltists and the Field Theorists, to the effect that: "transfer takes place through the person's perception of the relationship between known principles and the particular case presented by the new situation. The cognitive theory emphasises these relationships as well as the process of generalisation".

Vrey [1979: 308], states that "transfer is possible if the new learning task includes elements that are identical with elements contained in the old learning results. The degree of transfer depends upon the quality of the identical elements. This view is based upon the mechanistic principles in terms of which he explains his theory of connectionism".

That there are many other factors that play a significant part in the process of transfer, is also forwarded by Vrey [1979: 308]. These are "principles, generalisations, methods, techniques, the intention to learn, attitudes, self-confidence, self-concept, personal involvement and other personality factors".

According Clarizio et. al. [1970: 282] "the greater the degree of correspondence between tasks, the more effectively transfer is likely to take place". To summarise, according to Vrey [1979: 309], transfer depends upon:

- personal involvement in the act of learning
- reactivation of the relevant concepts , principles or identical elements
- actualisation of learning results. The learning results required for transfer must have been considered in the learner's cognitive system and the consolidation must have been accompanied by a feeling of success.

In conclusion, Vrey [1979: 309] states that "transfer is connected to teaching methods and methods of study". This suggests that the teacher should assist the student to become personally involved in the act of learning and experience her/his relationships with the subject matter meaningfully. The meanings thus assigned and grasped and consolidated. The pupil may then be fully available for transfer in novel situations.

The purpose of presenting these theories and arguments is to prove that the use of the transfer method in teaching and learning, including the practical training of students at technical colleges, is likely to be didactically most effective. This situation demands that the laboratories, workshops for practical training of students, as well as classrooms, must be adequately equipped and that the educators must be adequately qualified in order to assist the students to master knowledge and to be able to transfer or apply this in the world of work.

2.6 CRITERION FIVE: ADEQUATELY QUALIFIED LECTURING STAFF

Teachers in technical and vocational education, including those who teach only practice, should be considered an integral part of the teaching profession and as such should be recognised as having the same status as their colleagues in other fields. Adequately qualified, experienced and skilled lecturing staff are essential for technical college-based training. It is necessary to ensure that technical and vocational education teachers possess appropriate, up-to-date knowledge and skills to meet the training needs of all students.

UNESCO [1986: 350] argues that teachers involved in any aspect of technical and vocational education whether on a full-time or part-time basis, should possess the personal, ethical, professional and teaching qualities essential for the accomplishment of their work. UNESCO [1973: 14] holds that the quality of vocational and technical education depends upon the teachers, teacher-educators and administrators responsible. UNESCO further states that technical the vocational teacher occupies a most important place in modern society:

- he is a link between industrial society - the real world - and the education system;
- he is uniquely placed for contributing to the goals of binding humanism and technology;
- he must then possess a thorough knowledge of his field and have had some experience in the world for which he is preparing his students;
- he must understand his student as individuals, knowing how they learn best and how he may best transmit his own skills and knowledge in order that they be educated and not simply trained;
- he must wish to pursue his studies both technically and pedagogically through his career.

2.6.1 QUALIFICATIONS FOR TEACHERS OF TECHNICAL SUBJECTS

The responsibility of the vocational and technical teachers extends far beyond the mere transmission of specialised knowledge of skills in order to render adolescents employable. If vocational and technical education in the technical colleges is to fulfil these objectives, well-qualified and properly trained teachers in all fields are essential.

Considering technical and vocational education as preparation for an occupational field, teachers in this area should have special qualifications, depending on the occupation for which they are preparing students:

- if the occupational field requires primarily practical skills, the teacher should himself have long employment experience in the exercise of these skills;
- if the students are to be prepared for technician positions, teachers should have

a thorough knowledge, preferably acquired through appropriate practical experience, of the special requirement of this type of position;

- if the occupational field requires theoretical analysis, e.g. an engineering field; the teacher should have both technical and professional qualification [UNESCO 1979: 131].

According to UNESCO [1979: 130], the professional preparation of technical and vocational teachers should include the following:

- educational theory, psychology and sociology as these especially apply to technical and vocational education;
- special teaching methods appropriate to the field of technical and vocational education;
- training in the choice and use of the whole range of modern teaching techniques and aids presupposing the use of up-to-date methods and materials in the programme of professional preparation itself;
- training in how to create and produce appropriate teaching materials of special importance in those cases where technical and vocational materials are in short supply;
- a period of supervised practice teaching experience before appointment to a teaching post;
- an introduction to educational and occupational guidance methods and grounding in safety and emphasis on the ability to teach safe working practice.

2.6.2 SPECIAL ELEMENTS NECESSARY FOR ACHIEVING QUALITY IN VOCATIONAL/TECHNICAL TEACHING

Having an adequately qualified lecturing staff who are technically and professionally qualified, will not alone assure the quality of teaching. This view is supported by UNESCO [1973: 164] who forward that programmes of teacher preparation must not become static and, to this end, they must be reviewed constantly and be adapted to changing conditions. Achieving quality in technical teaching obviously involves any number of very complex problems. UNESCO [1973: 164] identifiers areas which are regarded as important for the quality of technical and vocational training.

2.7.2.1 IN-SERVICE TRAINING

It may justifiably be argued that in-service training is one of the most important means of assuring quality in vocational and technical education [as also in other aspects of education]. UNESCO [1973: 166] states that "the training of teachers in technical and vocational education should be considered as a process continuing throughout their career. If a teacher considers himself once and for all prepared after his initial education, he will be a very poor teacher and example indeed. Certainly, it is even more true for technical areas which are in a state of continual and accelerated change".

The following aspects of in-service training were identified by UNESCO [1973: 166] and other writers:

i] Upgrading and initial teacher qualification

The main purpose of in-service training is to upgrade employed teachers by either enabling then *to obtain an initial teacher qualification or a minimum technical qualification*. A considerable number of teachers are hired without having obtained initial teacher qualifications, and, in some countries, e.g. The Czeck Republic, this is standard policy for certain categories of technical and vocational teachers.

In many countries vocational and workshop teachers are often recruited directly from employment sectors and begin teaching with no teacher training. Recruiting vocational and workshop teachers from industry poses special problems. Although the candidate may know his special field in depth, he will, in all likelihood, not be an effective teacher unless he pursues educational studies and has some knowledge of adolescent psychology. Some form of in-service training would then be the appropriate solution [UNESCO 1973: 170].

When considering meaningful transfer of knowledge, there has to be effective teaching methods through which knowledge can be imparted. An educator who is not professionally qualified is unlikel;y to be knowledgeable about teaching methods and teaching media. Therefore, t he teaching of Engineering Courses [both theory and practice] at technical colleges, necessitates that educators be adequately qualified and trained for the task of teaching.

Teacher training is possibly costly when considering the fact that South Africa has many disadvantaged people who could not afford to pay for their education, but, without it, there can be no effective teaching and learning at all.

Hawes [1982: 9] sums up this situation quite adequately when he states: "much education policy, much curriculum policy has failed because it lacks the appreciation of the humanity of humans".

ii] Updating

Technical updating of teachers is an absolute necessary given the rapid pace of change in all technical areas. It could perhaps be argued that this form of in-service training is even more necessary for the teachers of technicians than for those of skilled workers; for it is in the technician's field that the greatest changes are occurring. In-service courses for vocational teachers are highly desirable. For, though the teacher may be a master of his craft, and able to prepare his students well, with the ever more sophisticated technical processes and equipment being developed, he, too must keep up with the pace of change.

Many programmes of technical updating must be given in close co-operation with industry, commercial institutions, etc. and with the co-operation of the teacher's employing institution. Technical updating courses for both technical and vocational teachers and workshop instructors may be given in technical institutions or in industrial training centres. To cite the experience of Singapore, various updating courses are available to all categories of technical teachers leading to higher technical qualifications [UNESCO 1973: 172]. These courses are given at Teacher Training Colleges, at the vocational institutes, at the Electro-Mechanical Training Centre and at the Engineering Industries Development Agency in collaboration with Singapore Polytechnic. The courses available in Singapore are an example of the flexibility which may be had by utilizing various institutions for in-service training.

It is true that if technical and vocational education at all levels is to function efficiently and if there is to be constant attention given to ensuring the quality of instruction, highly competent teachers who are adequately trained are prerequisties. It is essential to ensure that technical and vocational education teachers possess appropriate, up-to-date knowledge and skills to meet the training methods of all students. The recruitment of adequately qualified teaching staff with experience in industry must be followed by special in-service programmes oriented towards subject updating and curriculum training.

iii] Induction

The initial training of a teacher addresses knowledge of the school and its environs, a profile of the learners and the theory of education. During the training period, teacher trainees are taught the various skills for entry into the profession, such as lesson programming, evaluation of learners and classroom control [Bagwandeen and Louw, 1993: 10].

After the training period has been completed, the teacher's task is to put her/his training into practice. Once the teacher is inducted into the profession, this phase should set directives for the teacher and should orientate the newly appointed teacher to further her/his professional growth. The environment in which the teacher works should stimulate interest and inculcate a spirit of enquiry. The teacher should be encouraged to commit her/himself to the loyalty of the teaching profession [Bagwandeen and Louw, 1993:13].

iv] Guidance and Counselling Support Services

UNESCO [1990: 44] states that in a number of countries "there is a growing trend to provide educational and vocational counselling and guidance aimed at directing students to appropriate learning opportunities within such flexible systems as bridging courses, modularisation and self-study". Students are guided towards their selection of modules and self-study and advice are offered on career opportunities and retraining necessitated by the technological changes within particular firms and career changes related to community or family requirements.

In order to provide adequate guidance and counselling functions, the special vocational guidance centre personnel must be appropriately trained. Furthermore, all technical and vocational teaching staff must be aware of the availability of guidance and counselling in the programme areas which they teach. Vocational counselling must be carried out by qualified teachers, or/and staff who are qualified in Psychology [UNESCO 1990: 45]. The availability of trained personnel is a key element in the provision of adequate vocational and educational guidance and counselling in technical colleges.

v] Recruitment of Qualified Technical and Vocational Teachers

Recruiting and selecting are two steps which employers usually take before employing educators. They first delimit a pool of potential employees within the total labour force and then, from those candidates remaining, they identify those who appear to fall least short in requirements. The preliminary delimitation is recruiting and the second stage is the selection process.

Esland [1991: 292] states that "qualifications are invariably used alongside other criteria and these usually take priority in recruitment". In South African technical colleges, the Department of Education [employer] tends to use a range of recruitment strategies involving a number of devices. The objective here is to attract qualified people into the system. UNESCO [1990:50] indicates that "developing countries which suffer from a chronic shortage of adequately trained manpower fail to attract sufficient numbers of adequately qualified teachers for their educational establishments because of low financial incentives in education compared with those in the manufacturing and service industry". This situation leads to staff discontent and, in some cases, to the loss of academic staff to industry.

In South Africa, the recruitment of adequately qualified lecturers with industry experience is difficult and problematic. The reason for this situation is due to the fact that salaries in education are extremely low when compared with those offered by the private sector [see Table 44].

vi] Science and Mathematics

It is generally agreed that basic vocational and technical education needs to be enriched with the element s previously considered to be part of general education [Mathematics and Science], but which now have a direct and practical significance and belong to the basic skills demanded in almost every occupation. Without doubt, a good knowledge of Science and Mathematics forms a considerable aspect of vocational and technical education. UNESCO [1990: 18] states that "there is an urgent need to improve the background of Science and Mathematics education at all levels".

UNESCO [1990: 19] recommends that "Science and Mathematics and technology background of all students entering technical and vocational education must be improved". The South African black student at technical college still experiences difficulty with these subjects and, for technical college- based training to be effective, a sound knowledge of these is vital.

vii] English Language

When a student encounters a problem, she/he is stimulated to think. The confrontation with reality involves taking certain actions, such as planning, comparing and arranging, all with a view to a possible solution. When a student is stimulated to seek a solution and understanding of certain given problem situations, then the acquisition of knowledge is a possibility [Strauss, 1963: 167]. He stresses that "the act of questioning is the beginning and origin of thought". This implies that the language used by the teacher must be considered, as this is the mechanism which drives the thought process. Without language, there cannot be a didactic situation with meaningful outcomes, as no questions could be asked or answered [Chapman, 1997: 52].

From a South African point of view, English proficiency is extremely important. Since we live in a pluralistic society, it is necessary that one common medium of communication be used, and English has become this medium in all academic and learning situations. Proficiency in English is imperative in order for technical college students to read, understand and communicate what they have learnt.

The black students in South Africa experience English as their second language and research findings [Macdonald, 1990: 41] *have found that they have language learning constraints which* interfere with their learning programmes. Roos [1987: 276] also confirms the issue of language as being problematic as these students are unable to express their needs, difficulties and problems to other members of society. The unexpressed awareness impinges upon the quality of their relationships and upon their ability to grasp learning material.

In South Africa, English is naturally an important element in the didactic situation and problems in this area make it difficult for a learner to associate with others.

viii] Demotivation as the Cause of Failure and Continuous Absence

According to Vrey [1979: 230], repeated and regular failure means that the learner experiences little or no satisfaction. In most cases, the motivation to study the subject concerned will dwindle and disappear, even if it were adequate at the outset. From the student's point of view, the study of the subject is not helping them to elevate themselves. In order to maintain themselves, students choose some other means of self-actualisation. Some such students, not showing interest in their school work, turn to criminal behaviour.

Students who are demotivated, negative or dissatisfied with any aspect of their education often absent themselves from lectures. Absenteeism amongst students at colleges has become very common and is increasing and this, of course, has a negative effect on the teaching and learning process.

2.6.3 FOR TECHNICAL EDUCATION TO BE DIDACTICALLY JUSTIFIABLE, BOTH TEACHERS AND STUDENTS NEED TO BE MOTIVATED

2.6.3.1 DIDACTIC PERSPECTIVES OF MOTIVATION

The word motivation is derived from the Latin verbs *moveo* and *movere*, to move [Griessel, 1989: 28]. Motivation means to put in motion, stir, work upon, excite, inspire, arouse, etc. [Woodbridge and Manamela, 1992: 115]. According to Van Vuuren [1988: 294], motivation embeds the individual's wish to be and to become someone. Fraser et.al. [1990: 55] view motivation as a particular mental or internal condition of man which is "an urge which mobilises and directs the intensity of man's involvement in specific activity".

Entwistle [1987: 72] sees motivation, in the context of school learning, as an indicator of "the strength and direction of the effort being applied to learning activities". Like Entwistle, Hamachek's definition of motivation [as quoted by Cawood and Gibbon, 1981: 181] is within the context of school learning. Hamachek [1968: 3] suggests that motivation is a process that can:

a] lead students into experiences in which learning can occur

b] energise and activate students and keep them reasonably alert

c] keep their attention focused in one direction at a time.

It is well known that there are two types of motivation: extrinsic and intrinsic. Kruger and Muller [1988: 70] explain that motivation can be extrinsic, that is, the pupil can be motivated by extrinsic factors. Extrinsic motivation is, for example, when a child learns because she/he is afraid of punishment or rejection should she/he fail. Fraser et.al [1990: 55] argue that "extrinsic motivation is supplied by stimuli external to the learner" and is sustained by "incentives" such as certificates, medals, commendations, etc. Avenant [1988: 23] is of the opinion that incentives are sometimes used by teachers to motivate pupils towards co-operation and self-exertion. Warrel and Nelson [1974: 3] advance a similar view in their claim that "the periodic use of motivational incentives promotes the learning process".

Alternatively, motivation can be intrinsic or from within - for example, when the pupil learns out of curiosity or inquisitiveness. It is widely accepted that intrinsic motivation is more effective and enduring than extrinsic motivation. In intrinsic motivation the pupil is appealed to directly by the subject matter and everything that belongs to the teaching and learning situation so that she/he shows a spontaneous interest without the need of any outside encouragement [Duminy and Sohnge, 1983: 29]. They argue that a didactic situation which is conducive to learning encourages the inculcation of intrinsic motivation. Indeed, it would be a contradiction to expect learners to acquire a sense of autonomy and responsibility for their own learning at technical colleges if they continually were forced to seek outside approval in the form of incentives. By its very nature, the demand of intrinsic motivation can be seen as its declaration of a vote of confidence in the ability to succeed independently. Intrinsic motivation implies attainment of self-control and self-discipline which are internal dispositions.

Although effective teaching should include both extrinsic and intrinsic motivation, it is imperative that the didactic situation be made conducive to learning so as to impact positively upon intrinsic motivation. Thus, teachers at technical colleges and classroom, workshop and laboratory managers have a responsibility of managing the didactic situation in such a manner that optimal intrinsic motivation should be fostered.

2.6.3.2 TEACHER MOTIVATION

As technical education is by nature demanding and complex , it is obvious that the teachers need to be positively motivated towards teaching and learning which concerns their students. Such motivation would include an attitude which is conducive to accepting new innovations and changes.

It is an unfortunate reality that there are some teachers at colleges who only attend to their lectures in order to collect their salary, but who otherwise show no interest in their teaching material or their students. In some instances, staff members attend to their personal affairs first, and only afterwards do they deem to consider the needs and interests of their students. Ndlela [1993: 105] states that "most of the teachers in the current system seem to be demotivated and demoralised. Some have developed a negative attitude towards inspections". His findings confirm the fact that no effective control measures are enforced to ensure that teachers' work is being done and carried out to the benefit of the students. Some of the teacher organisations are party responsible for this situation [Department of Education and Culture, 1993: 62].

Biehler and Snowman [1990: 536] refer to systems of teacher motivation which can influence the learning outcomes of pupils:

- the ability-evaluative system
- the moral responsibility system
- the task mastery motivational system.

According to these researchers, teachers need to be aware of the behavioural, cognitive and humanistic views of motivation. This could lead to successful didactic encounters within a new and progressive educational system.

2.6.3.3 QUALITIES OF THE TEACHER

Kruger and Muller [1988: 73] recommend that teachers should take note of their own qualities when motivating pupils. They postulate the following principles:

- the teacher should have a thorough knowledge of her/his subject [s]. As pupils become aware that the teacher is knowledgeable, their confidence in her/him and their willingness to work increases. They derive motivation for learning from the teacher's achievement and stature;
- she/he should also have a sound knowledge of the pupils, of their potential, limitations, aspirations and values in order to adapt her/his presentation accordingly. When she/he

knows the pupils authentically and what they want to learn, how they prefer to learn and when they want to learn, she/he will be able to devise a strategy that will increase Their willingness and motivation to learn;

- the teacher who succeeds in motivating pupils also set a good example. Her/his attitude and enthusiasm will inspire the pupils to work and to achieve;
- she/he continually fathoms and arouses their interest. She/he attaches greater value to the interest of the pupils than to excellent test and examination marks;
- the teacher who succeeds in motivating pupils also applies sound educational principles. She/he ensures that the pupils are always actively involved in the teaching and learning situation ;
- she/he empathises with the pupils. She/he seldom has to compel the pupils because her/his stature as a teacher motivates then to do their best.

This theory is then summarised as "everyone who commits himself to a teaching career commits himself to an ideal and should therefore strive to realise these qualities as fully as possible" [Kruger and Muller, 1988: 74].

2.6.3.4 MOTIVATION OF PUPILS IN SCHOOL/COLLEGE CONTEXT

The intensity of motivation amongst students at an institution varies according to the location of the institution, the attitudes of the teachers and management, support services and the prevailing infrastructure. Cohen and Manion [1989: 153] offer that, as far as short-term motivation is concerned, a teacher needs to establish some kind of common purpose at the beginning of the lesson or activity. One way of achieving this is to adopt an approach which induces pupils to attend and learn. They emphasise that, at school, pupils' efforts should be:

a] treated with respect

b] experience that it is human to err.

They should not experience school as a place where meaningless facts have to be memorised in order to please the teacher or to pass an examination. The school should rather be experienced as a place where, under the systematic guidance of the teacher, meaningful answers are sought to meaningful problems.

Duminy and Sohnge [1983: 34] offer that motivation is the teacher's successful teaching. This view is supported by Curzon [1985: 78], who further suggests that: "motivation is what initiates and sustains a pupil's involvement in active learning and, to a large extent, determines the direction and efficiency of the pupil's learning". Shepard [1989: 19] refers to what psychologists call "peak experience", which seems to provide learners with the motivation to generate creative activity. Teachers need to acquire the skills necessary to unlock such potential.

Motivation, in the context of the didactic situation, has to do with arousing and keeping learner interest focussed upon learning. To that end, both the subject matter and teacher components of the didactic situation are important. If the subject matter is perceived as relevant to the needs of he learner, and therefore, appealing, the learner is likely to be motivated to learn. The teacher's role is important in so far as she/he is seen as a classroom manager responsible for all classroom organisation which makes learning possible. The teacher must be aware that her/his role is to prepare pupils in an appropriate way, so that motivation is inculcated and maintained.

2.7 CONCLUSION

A conference that included representatives from 15 major countries recommended the following for the preparation of lecturers for technical and vocational education [National Institute for Educational Research, 1981]:

a] All technical and vocational teachers must be qualified in their subject areas and be trained as teachers.

b] Technical and vocational teachers require a programme of teacher preparation that should include specialization in terms of each subject discipline and teaching methodology.

c] The status and quality of the programmes of teacher preparation for vocational and *technical education must not be inferior to any other forms of teacher preparations.*

d] Authorities responsible for teacher preparation must ensure that teacher trainers should have a sound knowledge of industrial and vocational education, should be knowledgeable in the areas of adult learning, have had practical experience in industry and commerce, and have experience plus the opportunity to improve teaching skills.

e] Curriculum of teacher preparation for technical and vocational teachers should provide for pedagogical studies, vocational and technical subjects, general and liberal studies.

These recommendations correlate well with five criteria for effective technical college-based training discussed in this chapter. These five criteria are especially important in the training of Engineering students and, without their application, the colleges could rapidly become ineffective and useless. For this reason the analysis of results in Chapter 7 will be based upon these five criteria.

CHAPTER 3

PRESENTATION OF EXAMINATION RESULTS

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CHAPTER 3

PRESENTATION OF EXAMINATION RESULTS

3.1 INTRODUCTION

In the light of far-reaching changes currently taking place in technical education in South Africa, it is of paramount importance that the data on which we base our planning should be up to date and it is against this backdrop that the empirical section of this study was undertaken. The success or failure of a technical college is ultimately determined by its ability to counteract structural constraints in such a way that an increasing proportion of its students continue to qualify as highly-skilled artisans and technicians. Thus, to ensure that future changes to technical education are meaningful and relevant, the collection of data in this study centred upon the identification of constraints affecting the quality of teaching in KwaZulu-Natal technical colleges.

The empirical findings will be presented according to quantitative results and qualitative results. The quantitative data were obtained from responses to the principals' questionnaire, while qualitative data were acquired from interviews with senior staff members in selected technical colleges through workshop visits, observations, informal discussions and personal experiences of the researcher in his capacity as principal of a technical college near Durban. Due to the large amount of data obtained from both these categories, each of the two sections will be further divided into subsections.

Before the results are presented, however, a few explanatory notes are necessary regarding the allocation of numbers to the different technical colleges from which data were obtained as great care had to be taken to ensure the anonymity of participating colleges.

3.1.1 CONFIDENTIALITY OF DATA

Considering the nature of bureaucratic systems, principals and other senior administrators of colleges in the sample repeatedly expressed concern regarding the identifiability of particular colleges and possible stigmatization. It was feared that the publication of confidential information about recognizable colleges could have negative consequences in the form of unfair comparisons, labelling and victimization. For this reason the researcher undertook to retain the anonymity of all colleges as far as possible.

This meant that the researcher had to deviate from the normal practice of numbering the colleges chronologically according to an alphabetical arrangement of their names. Instead, numbers were allocated randomly, viz. according to an unpredictable, non-alphabetical list of colleges. Furthermore, colleges from particular ex-departments of education were not grouped together but were split in a random fashion. The net result of this procedure was as follows:-

College 1 : Ex-Department of Education, House of Delegates
College 2 : Ex-KwaZulu Department of Education
College 3 : Ex-KwaZulu Education Department
College 4 : Ex-Department of Education and Training
College 5 : Ex-KwaZulu Department of Education
College 6 : Ex-KwaZulu Department of Education
College 7 : Ex-Department of Education, House of Representatives
College 8 : Ex-Natal Education Department
College 9 : Ex-KwaZulu Department of Education
College 10 : Ex-Natal Education Department
College 11 : Ex-KwaZulu Department of Education
College 12 : Ex-Department of Education, House of Delegates
College 13 : Ex-KwaZulu Department of Education
College 14 : Ex-Natal Education Department
College 15 : Ex-Natal Education Department
College 16 : Ex-Department of Education and Training
College 17 : Ex-Natal Education Department
College 18 : Ex-Natal Education Department
College 19 : Ex-KwaZulu Department of Education
College 20 : Ex-Department of Education, House of Delegates
College 21 : Ex-Department of Education and Training
College 22 : Ex-KwaZulu Department of Education
College 23 : Ex-Natal Education Department.

Throughout the remainder of this thesis the above numbering will be adhered to. The real names of these colleges will be known only by the researcher and by the supervisor of the study so as to ensure confidentiality. However, even though the names of colleges will not be mentioned, references to specific colleges will be consistent and reliable in that College 8, for example, will always refer to one particular college which was previously administered by the Natal Education Department and College 22 will consistently refer to one and the same college which used to be part of the KwaZulu Department of Education. Consistency is also evident in that the number of colleges in each ex-department mentioned here coincides with similar information given in Chapter One: nine from the ex-Natal Education Department, seven from the ex-KwaZulu Department of Education, three from the ex-Department of Education [House of Delegates], three from the ex-Department of Education and Training and one from the ex-Department of Education [House of Representatives].

3.1.2 DATA COLLECTION METHOD

As already mentioned, the quantitative data were obtained from responses to the principals' questionnaires which were distributed to all technical college principals in KwaZulu-Natal [See Appendix A]. Of the 23 principals' questionnaires which were distributed, 20 were completed and returned. The questionnaires which were not returned were from Colleges 4, 14 and 23. Due to organizational and logistical reasons, however, some college principals were unable to respond to certain questions. These occasional non-responses will be clarified in relevant subsections below.

3.1.3 SEQUENCE OF DATA PRESENTATION

Two guidelines are followed with regards to the sequencing of quantitative data presentation. Firstly, the data are presented in the order in which the questions appeared in the principals' questionnaire [See Appendix A]. Since the questionnaire consisted of four parts, the quantitative data are outlined in four subsections, namely examination results, lecturing staff, teaching equipment and improving student achievement. The last question on the questionnaire [Question 15] was open-ended and responses to this will be discussed in the section dealing with qualitative results.

Within this chapter the data are first presented according to the ex-departments of education, followed by one or more comparative tables in which data from the various ex-departments are compared. The order in which information from the five ex-departments is outlined is as follows:-

a] Ex-KwaZulu Department of Education
b] Ex-Natal Education Department
c] Ex-Department of Education and Training
d] Ex-Department of Education, House of Delegates
e] Ex-department of Education, House of Representative

3.1.4 <u>COURSES FOR WHICH EXAMINATION RESULTS WERE OBTAINED</u>

An essential reason for including a question about examination results was to pinpoint those technical colleges in KwaZulu-Natal where the teaching appears to be most effective and least effective. The nature of this information is obviously of special importance in order to identify constraints affecting the quality of teaching, since colleges with good examination results may very well have fewer constraints than colleges with poor examination results.

Bearing in mind this underlying rationale, it was assumed that only a small sample of courses would be sufficient to reveal which colleges seem to be most in need of reform. To obtain a complete record of all the examination results was not warranted - partly because it would have been too time-consuming, and partly because it would have distracted from the main research purpose. Thus, the examination results of only five engineering courses in one particular trimester were requested, namely:

- Motor Mechanics Trade Theory NTC 1
- Electrical Trade Theory NTC 1
- Engineering Science NTC 1
- Engineering Drawing NTC 1
- Engineering Mathematics NTC 1

The information obtained is presented according to ex-department of education as explained above.

3.2 EXAMINATION RESULTS OF EX-KWAZULU TECHNICAL COLLEGES

TABLE 6 MOTOR TRADE THEORY RESULTS OF EX-KWAZULU TECHNICAL COLLEGES, TRIMESTER ONE

N = 74					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
5	10	9	5	4	55,5	44,5	50	40	10
6	17	17	8	9	47,1	52.9	47,1	52,9	0
9	12	12	12	0	100	0	100	0	0
11	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
19	23	20	12	8	60	40	52,2	34,8	13
22	12	12	9	3	75	25	75	25	0
AVERAGE	%				67,5	32,5	64,8	30,5	4,6
TOTAL	74	70	46	24					
					100		100		

3.2.1 Motor Trade Theory Results of Ex-KwaZulu Colleges

The examination results of Motor Trade Theory from these colleges appear in Table 6. To obtain an insight into this table it is worthwhile to note two cardinal points: firstly, the row reflecting AVERAGE reveals that only 67,5% of the students who wrote the examination passed [46 out of 70 students], while 32,5% failed.

Such a high failure rate must certainly have been disappointing from both a teacher's perspective as this is seen as a poor reflection on her/his teaching], as well as from a student's perspective as it can be assumed that, of the 24 students who failed, many may have concluded they had wasted time and money on pointless study and many of them may have dropped out of technical education altogether. Secondly, the pass rate at some colleges was considerably higher than at others: Colleges 9 and 22 had pass rates of 100% and 75% respectively, whilst colleges 5,6 and 19 had pass rates well below the average pass rate of 67,5%. This information suggests that the teaching of Motor Trade Theory at the colleges with below-average pass rates is of a *particularly poor quality and may warrant further investigation. Apart from these two main* conclusions, a few minor observations regarding Table 6 can be made. No data were received from colleges 11 and 13 because the former did not offer Motor Trade Theory during that specific trimester, and the latter failed to complete the questionnaire. It is also noticeable that in colleges 5 and 19 there were some students who enrolled for the course but who did not sit the examination.

The significance of this is discussed later in this chapter when the performances of students from the different ex-departments are compared.

TABLE 7 ELECTRICAL TRADE THEORY RESULTS OF EX-KWAZULU, TECHNICAL COLLEGES, TRIMESTER ONE

N = 91					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
5	10	9	9	0	100	0	90	0	10
6	15	15	15	0	100	0	100	0	0
9	30	30	30	0	100	0	100	0	0
11	-	-	-	-	-	-	-	-	-
13	-	-	-	-	-	-	-	-	-
19	17	16	12	4	75	25	70,6	23,5	5,8
22	19	19	5	14	26,4	73,6	26,4	73,6	0
AVERAGE	%				80,3	19,7	77,4	19,4	3,2
TOTAL	91	89	71	18					
					100		100		

3.2.2 ELECTRICAL TRADE THEORY RESULTS OF EX-KWAZULU TECHNICAL COLLEGE

Table 7 reveals that the average percentage of students who wrote and passed the Electrical Trade Theory examination was 80,3% [71 out of 89 students], while 19,7% failed. The table further reveals that colleges 6 and 9 had a 100% pass rate with their respective total enrolment, whilst college 5 obtained 100% pass rate with those 90% of their enrolment who sat the examination. *Possible reasons for these high pass rates are as follows:*

- students are highly motivated and work co-operatively with the lecturers
- lecturers are highly qualified and competent to teach Electrical Trade Theory and Practice at the colleges
- lecturers in the Electrical Trade Departments work in collaboration with other colleges in the practical and theoretical training of future technicians.

What was perhaps most disturbing was college 22 which had the lowest pass rate of 26,4% [only 5 of 19 students] of those who wrote and enrolled. This means that a large number of students [73,6%] who enrolled and wrote examination failed, suggesting that teaching was least effective in this college.

A further inquiry was made by the principal of college 22 from National Education Department, Pretoria, as to why there was a high failure rate in the Electrical Trade Theory course. The response from the Department was that::

- students were unable to answer questions correctly and to the point;
- a number of students did not answer all the questions as expected, and some students were not sufficiently well-prepared for the examination; and
- lack of understanding of questions by the students because of language problems.

When the Electrical Trade Theory lecturer was questioned regarding this high failure rate in his subject, he explained that he was unaware that the syllabus and textbook for Electrical Trade Theory course had already changed and he had concentrated on the old syllabus. Therefore, students were unable to cope with the Electrical Trade Theory NI paper. This situation reflected poorly on the National Department of Education, especially in view of the Department's failure to update the colleges timeously regarding recent changes in the syllabus work. It is apparent that the lack of effective communication between the Department of Education and colleges had a negative effect on the performance of both students and lecturers. This could be suggestive of the fact that there is a lot of under-utilising of government resources which are wasted through the Department's inability to disseminate information to colleges.

What is conspicuously noticeable in table 7 is the fact that no data were received from colleges 11 and 13 because the former did not offer Electrical Trade Theory during the specific trimester, whilst the latter did not respond at all. Here, again, there was a discrepancy in colleges 5 and 19 between the number of students who enrolled and those who sat for the examination.

TABLE 8 ENGINEERING SCIENCE RESULTS OF EX-KWAZULU. TECHNICAL COLLEGES. TRIMESTER ONE

N = 407					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
5	32	32	16	16	50	50	50	50	0
6	43	43	19	24	44,2	55,8	44,2	55,8	0
9	239	221	198	23	89,6	10,4	82,9	9,6	7,5
11	38	38	26	12	68,4	31,6	68,4	31,6	0
13	-	-	-	-	-	-	-	-	-
19	43	38	18	20	47,4	52,6	41,9	46,5	11,6
22	12	12	5	7	41,7	58,3	41,7	58,3	0
AVERAGE	%				56,9	43,1	54,8	42	3,2
TOTAL	407	384	282	102					
					100		100		

3.2.3 ENGINEERING SCIENCE RESULTS OF EX-KWAZULU TECHNICAL COLLEGES

Table 8 reflects the examination results of Engineering Science from ex-KwaZulu colleges. The evidence in the table above reveals that 56,9% of students who the wrote examination passed [282 out of 384 students], while 43,1% failed. The disturbingly high percentage [43,1%] of failures is a cause for concern. The following are possible explanations for this high failure rate in Science:-

- most of the Black students who are recruited from secondary schools into the colleges for N1 Engineering programmes do not have a Science and Mathematics background. Most students who enter colleges obtained passes in general subjects like History, Biblical Studies, Geography, Biology, Economics, Business Economics, English, Zulu, Afrikaans, Agricultural Science, etc. These subjects do not prepare students well for college courses.
- Unavailability of bridging courses for students who do not have Science and Mathematics backgrounds.
- Language problems, especially with the use of English. Many pupils do not have a good command of English; as a result they are unable to understand

questions in the examination room.

- High rate of absenteeism and late coming in the morning.
- Insufficient time for lecturers to complete their syllabi and students being unable to adjust to trimester (3 months) programmes.
- Lack of in-service training programmes for lecturers to assist them in upgrading their teaching techniques.
- The admission requirement for NI Engineering programmes is a standard seven pass with Science and Mathematics. The students have a tendency to buy school report forms from high school principals or teachers and then apply for admission in colleges using these report forms. This lowers the quality of students entering the college and has an effect on the results, especially because ex-KwaZulu do not conduct selection tests.

As with Tables 6 and 7, this table again reflects that the pass rate at some colleges was considerably higher than at other colleges. Colleges 9 and 11 had a pass rate [of those who wrote] above the average of 56,9%, and colleges 5, 6 19 and 22 had pass rate below the average, suggesting that the quality of the teaching of Engineering Science at these colleges is questionable in that lecturers are not yet adequately qualified to handle the subject, a matter which will be discussed later. Yet, this situation in turn suggests that the problem could also have lain with the students who did not have a Science and Mathematics background.

TABLE 9 **ENGINEERING DRAWING RESULTS OF EX-KWAZULU, TECHNICAL COLLEGES, TRIMESTER ONE**

N = 355					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
5	33	32	20	12	62,5	37,5	60,6	36,4	3
6	31	31	19	12	61,3	38,7	61,3	38,7	0
9	218	212	165	47	77,8	22,2	75,6	21,6	2,8
11	38	38	20	18	52,6	47,4	52,6	47,4	0
13	-	-	-	-	-	-	-	-	-
19	23	20	7	13	35	65	30,4	56,5	13,1
22	12	12	11	1	91,7	8,3	91,7	8,3	0
AVERAGE	%				63,5	36,5	62	34,9	3,1
TOTAL	355	345	242	107					
					100		100		

3.2.4 ENGINEERING DRAWING RESULTS OF EX-KWAZULU TECHNICAL COLLEGES

The general pattern in this table is that 63,5% of students who wrote the Engineering Drawing examination passed [242 out of 345 students], meaning that 36,5% failed.

From the figures in table 9, it appears that certain ex-KwaZulu colleges, especially those situated in the rural areas [colleges 6 - 61,3%, 11- 52,6% and 19 - 35%], did not achieve well in Engineering Drawing. One possible reason for this is that rural colleges are loosing highly qualified lecturers to the private sector for better pay and benefits. It is important and relevant at this stage to mention that Engineering Drawing is a practical subject and requires much practice and application rather than being merely a theoretical subject. The Engineering Drawing syllabus for N courses has been designed for students who are assumed to be apprentices [Block Release Students]. The apprentices are expected to have industrial exposure which makes it easier for them to associate the knowledge gained at college level to that of the industrial situation. Unfortunately, this situation is no longer the reality and, increasingly more college students are unable to apply theoretical knowledge to a practical situation.

Some students experience difficulty in applying their theoretical knowledge to practice because certain colleges do not even have models for demonstration purposes. The students are no longer given an opportunity to look at 2D [Dimensional Drawing - i.e. Drawing with breadth and height] or to build models from these two given views.

This can be done with clay modelling, wax modelling and/or polystyrene models, depending on the material which each college has at its disposal. This practice assists in involving students to reconcile theory and practice, but does not take place in many colleges so students lack understanding of 2 Dimensional and 3 Dimensional interpretations, basic drawing skills and pictorial drawings.

In summary, the average failure rate of 36,5% can be interpreted as being far too low, especially as the Department of Education spends a large amount of money subsidising these colleges which eventually could not produce students with reasonable results. Colleges 9 and 22 had pass rates of those who wrote which were above the average of 63,5% while colleges 5, 6, 11 and 19 had pass rates below the average.

TABLE 10 ENGINEERING MATHEMATICS RESULTS OF EX-KWAZULU, TECHNICAL COLLEGES, TRIMESTER ONE

N = 448					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
5	32	31	14	17	45,1	54,9	43,8	53,1	3,1
6	41	40	18	22	45	55	43,9	53,7	2,4
9	272	247	203	44	82,1	17,9	74,6	16,2	9,2
11	49	47	28	19	59,6	40,4	57,1	38,8	4,1
13	-	-	-	-	-	-	-	-	-
19	42	38	15	23	39,5	60,5	35,7	54,8	9,5
22	12	12	8	4	66,7	33,3	66,7	33,3	0
AVERAGE	%				56,3	43,7	53,6	41,7	4,7
TOTAL	448	415	286	129					
					100		100		

3.2.5 ENGINEERING MATHEMATICS RESULTS OF EX-KWAZULU TECHNICAL COLLEGES

Table 10 above shows that college 9 had the highest pass rate [82,1%] of those who wrote, while college 19 had the lowest [39,5%].

According to the data in table 10, colleges 5, 6 and 19 seem to have experienced severe problems especially in Science and Mathematics. It would appear that only 56,3% [286 out of 415 students] passed, leaving a failure rate of 43,7%. It must be admitted that this high failure rate is probably due to poor teaching coupled with the weak Mathematics background of students.

TABLE 11 COMPARISON OF FAILURE RATES IN FIVE DIFFERENT COURSES FROM EX-KWAZULU TECHNICAL COLLEGES

N = 1375	ENROLMENT	% FAILED
Motor Trade Theory	74	32,5
Electrical Trade Theory	91	19,7
Engineering Science	407	43,1
Engineering Drawing	355	36,5
Engineering Mathematics	448	43,7
TOTAL	1 375	175, 5
AVERAGE %		35,1

3.2.6 COMPARISON OF FAILURE RATES IN FIVE COURSES OF EX-KWAZULU COLLEGES

Table 11 reflects the enrolment and failure rates in five different courses from ex- KwaZulu technical colleges. It is most disturbing from the data in table 11 that Engineering Science [43,1%] and Engineering Mathematics [43,7%] pose severe problems for both lecturers and students. *This table also gives evidence that the teaching of Motor Trade Theory and* Engineering Drawing in ex-KwaZulu colleges remains of poor quality. The average failure rate of 32,5% for Motor Trade Theory and 36,5% in Engineering Drawing is extreme, especially when considering the large subsidies these colleges received.

On the basis of data obtained from interviews and personal observation, the following reasons can be forwarded for the high failure rates in ex-KwaZulu Technical College:

- *Most ex-KwaZulu colleges are situated in the rural areas and are unable to* attract competent and high quality lecturers.
- Most students are not yet thoroughly grounded in Science and Mathematics at the time when they start the course.
- There are no bridging courses for students who enter colleges without Science and Mathematics in their qualifications. This is especially pertinent to students from black or disadvantaged communities who have been deprived of opportunities to adequately study these subjects.
- *Many lecturers offer low quality tuition* [see chapter 4].

- Absenteeism amongst students at technical colleges is high.
- Lack of appropriate facilities for the practical training of students.

3.3 EXAMINATION RESULTS OF EX-NATAL TECHNICAL COLLEGES, TRIMESTER ONE

TABLE 12 MOTOR TRADE THEORY OF EX-NATAL COLLEGES

N = 72					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
2	33	15	15	0	100	0	45,4	0	54,4
3	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-	-	-
18	39	29	27	2	93	7	69,2	5,1	25,7
23	-	-	-	-	-	-	-	-	-
AVERAGE	%				96,5	3,5	57,3	2,6	40,1
TOTAL	72	44	42	2					
					100		100		

3.3.1 MOTOR TRADE THEORY RESULTS OF EX-NATAL COLLEGES

The Average column reveals that 96,5% of students who wrote the examination passed [42 out of 45 students], while 3,5% failed. What is worth noting is that both colleges 2 and 18 performed exceptionally well in this course and such good performance in Motor Trade Theory suggests that teaching in these colleges is very effective.

What is conspicuously noticeable in table 12 is that no data was received from colleges 3-10 as well as colleges 15-17 because these institutions did not offer Motor Trade Theory during the specific trimester. Here again, there was a discrepancy in colleges 2 and 18 between the number of students who enrolled and those who sat the examination. Colleges 14 and 23 did not respond at all and no reason was given for their non-response.

The 100% pass rate in college 2 among students who wrote the examination implies that the teaching of Motor Trade Theory in this college is of an exceptionally high quality. College 18 had a pass rate of 93% suggesting that the college is experiencing little difficulty in this area. A reason for this could be that ex-department colleges are staffed with highly qualified lecturers recruited directly from local business and industry and that 99% of students are white and have a very good command of English. This situation puts ex-Natal colleges in an advantageous position which seems to guarantee good results.

TABLE 13 ELECTRICAL TRADE THEORY RESULTS OF EX-NATAL COLLEGES, TRIMESTER ONE

N = 74					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
2	-	-	-	-	-	-	-	-	-
3	24	23	18	5	78,2	21,7	75,0	20,8	4,2
8	-	-	-	-	-	-	-	-	-
10	106	88	81	7	92,0	8,0	76,4	6,6	17
14	-	-	-	-	-	-	-	-	-
15	21	20	14	6	70,0	30,0	66,7	28,6	4,7
17	-	-	-	-	-	-	-	-	-
18	86	75	71	4	94,7	5,3	82,6	4,6	12,8
23	-	-	-	-	-	-	-	-	-
AVERAGE	%				83,7	16,3	75,1	15,2	9,7
TOTAL	237	206	184	22					
					100		100		

3.3.2 ELECTRICAL TRADE THEORY RESULTS OF EX-NATAL COLLEGES

These figures are influenced by the fact that colleges 14 and 23 did not respond at all and that colleges 8 and 17 are commercial colleges and have never offered Engineering courses. According to the principal of college 2, they did not offer Electrical Trade Theory in trimester one as this alternates with other courses and they offered Electrical Trade Theory only in trimester two.

The picture revealed by table 13 is interesting and the trends which emerge, based on the results, would appear to be extremely positive.

The 92% and 94,7% pass rates in colleges 10 and 18 respectively suggest that the teaching of Electrical Trade Theory in ex-Natal colleges is of a high quality. According to the data of this table, the average pass rate was 83,7% [184 out of 206 candidates], meaning that 16,3% failed. The most important reasons for the high average pass rate are probably that most ex-Natal colleges have adequate resources, highly qualified lecturing staff, well-equipped laboratories and workshops, highly trained laboratory assistants, offer bridging courses to NTC I students, have adequate textbooks and reference books in the libraries, as well as sufficient financial support from the Department of Education and private sector.

All ex-Natal colleges are State-Aided Colleges and receive substantial subsidy directly from the Department of Education. It is important and relevant at this stage to mention the fact that ex-White colleges [ex-Natal] had been receiving preferential treatment from ex-white dominated government . As a result, today, these colleges are adequately resourced and colleges from ex-KwaZulu [Homeland] administration cannot compete with them. Another concern about ex-Natal colleges is that these colleges have well-defined admission policies regarding N1 programmes which include:

- Students, usually with standard 9 and 10 certificates, have to write selection tests. Final acceptance is based upon the results of these tests and on the number permitted in workshops.
- Any student applying for admission in N1 Engineering programmes must have done Science and Mathematics in previous classes.

The above admission conditions guarantee the ex-Natal colleges excellent results. The administration of selection tests in a college situation has a tendency of stopping less gifted students or students from disadvantaged communities from gaining entry into the colleges.

What is very clear from this information is the fact that ex-NED colleges had a tendency of discriminating against less gifted, deprived and disadvantaged communities which enabled these colleges to maintain good standards and escape competition from other racial groups.

TABLE 14 ENGINEERING SCIENCE RESULTS OF EX-NATAL COLLEGES. TRIMESTER ONE

N = 74					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
2	33	29	22	7	75,9	24,1	66,7	21,2	12,1
3	53	52	26	26	50,0	50,0	49,0	49,0	2,0
8	-	-	-	-	-	-	-	-	-
10	81	66	63	3	95,4	4,6	77,8	3,7	18,5
14	-	-	-	-	-	-	-	-	-
15	62	57	40	17	70,1	29,1	64,6	27,4	8,0
17	-	-	-	-	-	-	-	-	-
18	199	171	142	29	82,0	17,0	71,4	14,6	14,0
23	-	-	-	-	-	-	-	-	-
AVERAGE	%				75,0	25,0	65,9	23,2	10,9
TOTAL	428	375	293	65					
					100		100		

3.3.3 ENGINEERING SCIENCE RESULTS OF EX-NATAL COLLEGES

Table 14 contains the examination results of Engineering Science from ex-NED colleges. The row reflecting Average reveals that 75% of the students who wrote the examination passed [293 of 375 students], and that 25% failed. According to data in table 14, colleges 2, 10 and 18 had pass rates of 75,9%, 95,4% and 82% respectively, while colleges 3 and 15 had pass rates below the average pass rate of 75%. The following are possible explanations for this relatively high pass rate in ex-Natal colleges.

All ex-Natal colleges were State-Aided Colleges governed by a council which had decision-making and advisory powers. Ex-Natal colleges had autonomy over their budget, expenditure and investments. The college's council is an employer and appoints staff in the service of the college and also promotes staff subject to ministerial approval. It appoints staff in non-aided posts and determines their salaries and conditions of service. This situation enables ex-Natal colleges to recruit highly qualified lecturers from the private sector, negotiate salaries, purchase training equipment, market the colleges and formulate financial policies. It is against this background that ex-Natal colleges are able to attract adequately qualified lecturers, up-to-date equipment and necessary facilities for the smooth running of the colleges. This situation almost guarantees ex-Natal colleges good results.

Apart from this main conclusion, a few further minor observations can be made. It is *important to note that that pass rate of college 3 dropped from 78,2% in Electrical* Trade Theory down to a 50% pass rate in Engineering Science course. The possible reason for this sudden drop in college 3 is the fact that the college is situated in a rural area. Rural colleges are not always able to attract qualified and experienced lecturers because most prefer to teach in urban areas. It is gratifying to note that college 18 showing a balanced and reasonable performance in almost all courses with the following pass rates: Motor Trade Theory [93% - table 12], Electrical Trade Theory [94,7% - table 14], Engineering Science [83% - table 13], Engineering Drawing [84,3% - table 15] and Engineering Mathematics [84,3% - table 16]. The following are possible reasons for the good performance in college 18:

- the college is situated in an urban area and is capable of attracting competent lecturers with business and industry experience;
- there is an effective partnership between the technical college and the private sector. This situation allows the college to work jointly with industry, especially if they are to conduct workshops or seminars;
- effective supervision of students' tasks/projects by lecturers;
- adequately equipped laboratories and workshops for practical training of students;
- this college has a transfer or placement programme for students who have completed their training. This programme attracts the more capable students to enrol in this college with a view to obtaining employment or placement after completing their studies.

TABLE 15 **ENGINEERING DRAWING RESULTS OF EX-NATAL TECHNICAL COLLEGE. TRIMESTER ONE**

N = 187					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
2	33	29	24	5	82,8	17,2	72,7	15,1	12,2
3	-	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-	-
10	31	25	24	1	96,0	4,0	77,4	3,2	19,4
14	-	-	-	-	-	-	-	-	-
15	43	42	32	10	76,0	24,0	74,4	23,3	2,3
17	-	-	-	-	-	-	-	-	-
18	80	51	43	8	84,3	15,7	53,8	10,0	36,2
23	-	-	-	-	-	-	-	-	-
AVERAGE	%				84,8	15,2	69,6	12,9	17,5
TOTAL	187	147	123	24					
					100		100		

3.3.4 ENGINEERING DRAWING RESULTS OF EX-NATAL TECHNICAL COLLEGES

Evident from table 15 is that 84,8% of students who wrote the Engineering Drawing examination passed [123 out of 147 students], and 15,2% failed. It appears from this information that teaching and learning in ex-Natal colleges is positive and of fairly high quality. A particularly noteworthy aspect of table 15 is that colleges 2 [82,8%], 10 [96%] and 18 [84,5%] had high performance in Drawing, while college 15 [76%] had the lowest pass rate.

Two supporting reasons for this work from ex-Natal colleges are that:

- technical colleges are able to forge links between themselves and industry. The advantage here is that employers can monitor institutional management and training programmes, organize student placement and arrange for industry personnel to be seconded to technical colleges and for academic staff to have industry experience, in order to contribute to aligning education to the country's needs and to the changing structure of the labour market.

- lecturers are provided with adequate training in areas of advanced technology with focus on the learning process and teaching strategies.

TABLE 16 ENGINEERING MATHEMATICS RESULTS OF EX-NATAL TECHNICAL COLLEGES

N = 187					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
2	33	28	20	8	71,4	28,6	60,6	24,2	15,2
3	51	48	25	23	52,0	48,0	49,1	45,0	5,9
8	-	-	-	-	-	-	-	-	-
10	86	83	52	31	62,6	37,4	60,5	36,1	3,4
14	-	-	-	-	-	-	-	-	-
15	65	58	34	24	58,7	41,3	52,3	36,9	10,8
17	-	-	-	-	-	-	-	-	-
18	224	172	145	145	84,3	15,7	64,7	12,1	23,2
23	-	-	-	-	-	-	-	-	-
AVERAGE	%				65,8	34,2	57,5	30,8	11,7
TOTAL	459	389	276	113					
					100		100		

3.3.5 ENGINEERING MATHEMATICS RESULTS OF EX-NATAL TECHNICAL COLLEGES

The data recorded in table 16 suggests that students' performance in Mathematics is low when compared with other courses. Colleges 2, 10 and 15 had low pass rates in Mathematics as compared with Engineering Drawing results [table 15]. For example, college 2 had an 82,8% pass rate in Engineering Drawing [table 15] compared with a 71,4% pass rate in Engineering Mathematics [table 16]. College 10 had a 96% pass rate in Engineering Drawing [table 15] compared with a 62,6% pass rate in Engineering Mathematics [table 17] and college 15 had a 76% pass rate in Engineering Drawing [table 15] compared with a 58,7% pass rate in Engineering Mathematics pass rate [table 16]. This situation suggests that a number of ex-Natal colleges experienced severe problems with Mathematics. The following are possible reasons for this relative poor performance in Mathematics:

- Students, at the time of admission into N1 Engineering programme, did not have a good Mathematics background in their high school qualification;

- Unavailability of bridging courses for students who lack a Mathematics background in their qualifications; and
- Lack of adequately qualified Mathematics lecturers. This study has established that many numbers of competent and highly qualified teachers are leaving the teaching profession and seek employment in the private sector because of better pay and benefits [see chapter 4]. This situation leaves technical colleges with people who are less competent in other areas, e.g. Mathematics.

TABLE 17 COMPARISON OF FAILURE RATES IN FIVE COURSES FROM EX-NATAL COLLEGE

N = 1383	ENROLMENT	% FAILED
Motor Trade Theory	72	3,5
Electrical Trade Theory	237	16,3
Engineering Science	428	25
Engineering Drawing	187	15,2
Engineering Mathematics	459	34,2
TOTAL	1383	94,2
AVERAGE %		18,8

3.3.6 COMPARISON OF FAILURE RATES IN FIVE COURSES OF EX-NATAL COLLEGES

Table 17 presents a picture of how ex-Natal colleges performed in various courses. The failure rate in Motor Trade Theory is fairly low [3,5%] suggesting that the teaching of this subject in ex-Natal colleges is effective. The failure rates in Drawing [15,2%] and Electrical Trade Theory [16,3%] are more disturbing. Again, the reason for this high failure rate may be the fact that rural colleges are unable to attract qualified and competent lecturers from industries because of competition in salary and other benefits. As far as the failure rates in Engineering Science [25%] and Mathematics [34,2%] were concerned, ex-Natal colleges appeared to be experiencing serious problems.

3.4 EXAMINATION RESULTS OF EX-DET TECHNICAL COLLEGES

TABLE 18 MOTOR TRADE THEORY RESULTS OF EX-DET COLLEGES, TRIMESTER ONE

N = 64					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
4	-	-	-	-	-	-	-	-	-
16	29	28	23	5	82,2	17,8	79,3	17,3	3,4
21	35	34	31	3	91,1	8,9	88,6	8,5	2,9
AVERAGE	%				88,6	13,4	83,9	12,9	3,2
TOTAL	64	62	54	8					
					100		100		

3.4.1 MOTOR TRADE THEORY RESULTS OF EX-DET COLLEGES

The data contained in table 18 reveal that 86,6% of students who wrote these examinations passed [54 of 62 students], meaning that 13,4% failed. The table further reveals that college 21 had a 91,1% pass rate and reasons which may be suggested for this:

- that the college is situated in an urban area and is capable of recruiting adequately qualified lecturers from local business and industry

- that ex-DET colleges are predominantly black colleges situated in urban areas with both white lecturers and administration. These colleges have the advantage of obtaining funds directly from the state and are capable of equipping themselves with better teaching facilities compared with those who under homeland administration.

College 16 had the lowest pass rate [82,2%]. Although this pass rate seems to be below average in this college, the students' general performance and the standard of teaching appears to be excellent.

TABLE 19 ELECTRICAL TRADE THEORY RESULTS OF EX-DET TECHNICAL COLLEGE, TRIMESTER ONE

N = 90					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
4	-	-	-	-	-	-	-	-	-
16	60	60	43	17	71,7	28,3	71,6,	28,3	0
21	30	28	25	3	89,2	10,8	83,3	10,1	6,7
AVERAGE	%				80,5	19,5	77,5	19,1	3,4
TOTAL	90	88	68	20					
					100		100		

3.4.2 ELECTRICAL TRADE THEORY RESULTS OF EX-DET COLLEGES

Table 19 reflects the Electrical Trade Theory results which were collected from ex-DET colleges. A closer examination of these results reflects that 80,5% of the students who wrote the examination passed [68 of 88 students], while 19,5% failed. Another interesting feature of table 19 is college 21 with the highest pass rate of 89,2%, suggesting that teaching in this college is highly effective.

TABLE 20 ENGINEERING SCIENCE RESULTS OF EX-DET TECHNICAL COLLEGES, TRIMESTER ONE

N = 356					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
4	-	-	-	-	-	-	-	-	-
16	226	220	188	32	85,4	14,6	83.1	14,2	2,7
21	130	130	130	0	100	0	100	0	0
AVERAGE	%				92,7	7,3	91.5	7,1	1,4
TOTAL	356	350	318	32					
					100		100		

3.4.3 ENGINEERING SCIENCE RESULTS OF EX-DET COLLEGES

The Engineering Science results reflected in table 20 from ex-DET colleges are excellent and encouraging with college 21 having a 100% pass rate. There is also evidence in college 16 [85,4%] that the teaching and learning of this subject is quitesuccessful. One reason for this could be that these colleges administer selection tests and so gain the superior students for N1 - Engineering programmes. Urban colleges are extremely selective when it comes to students' admission. Here, again the high student performances are probably caused by the facts that ex-DET colleges were heavily funded by the state, had white lecturers with better qualifications, well-designed laboratories and workshops with up-to-date teaching facilities.

TABLE 21 ENGINEERING DRAWING RESULTS OF EX-DET TECHNICAL COLLEGES. TRIMESTER ONE

N = 130					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
4	-	-	-	-	-	-	-	-	-
16	65	56	18	38	32,1	67,9	27,7	58,5	13,8
21	65	60	20	40	33,3	66,7	30,8	30,8	7,7
AVERAGE	%				32,7	67,3	29,2	60	10,8
TOTAL	130	116	38	78					
					100		100		

3.4.4 ENGINEERING DRAWING RESULTS OF EX-DET COLLEGES

The evidence in table 21 reveals that only 32,7% of students who wrote the examination passed [38 of 116 students], and that 67,3% failed - a grave cause for concern. A possible cause for this could be that both colleges used a old syllabus. Both colleges [16 and 21] performed extremely well in tables 18, 19 and 20, yet this table reflects a sudden drop in the level of performance in both colleges and this suggests that there was a major problem in the teaching of Engineering Drawing.

TABLE 22 ENGINEERING MATHEMATICS RESULTS OF EX-DET TECHNICAL COLLEGES. TRIMESTER ONE

N = 403					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
4	-	-	-	-	-	-	-	-	-
16	266	260	169	91	65	35	63,5	34,2	2,3
21	137	117	57	60	48,7	51,3	41,6	43,8	14,6
AVERAGE	%				56,9	43,1	52,5	39	8,5
TOTAL	403	377	226	151					
					100		100		

3.4.5 ENGINEERING MATHEMATICS RESULTS OF EX-DET COLLEGES

The data presented in table 22 reflects that 56,9% of students who wrote the examination passed [226 of 377 students], while 43,1% failed. What is most disturbing in this table is the high percent of students who failed the examination and the reasons for this poor performance in Engineering Mathematics may perhaps be similar to those previously mentioned in relation to ex-KwaZulu colleges, viz. the weak Mathematics background of black students, the unavailability of bridging courses, the lack of quality Mathematics lecturers and the absence of in-service training programmes. However, without obtaining further data on the reasons for these disturbingly high failure rates, we cannot provide definite causes for them.

A further interesting fact that emerges from table 22 is in college 16 which had the higher pass rate of 65%, a great improvement when compared with performance in other subjects [see Table 21 [32,1%]. College 21 also made a remarkable improvement [48,7%] when compared with performance as shown in Table 21 [33,3%].

TABLE 23 <u>COMPARISON OF FAILURE RATES IN FIVE COURSES FROM EX-DET TECHNICAL COLLEGES</u>

N = 1043	ENROLMENT	% FAILED
Motor Trade Theory	64	13,4
Electrical Trade Theory	90	19,4
Engineering Science	356	7,3
Engineering Drawing	130	67,3
Engineering Mathematics	403	43,1
TOTAL	1043	150,6
AVERAGE		30,1

3.4.6 COMPARISON OF FAILURE RATES IN FIVE DIFFERENT COURSES FROM EX-DETCOLLEGES

The situation reflected in Table 23 reveals that the failure rates in Motor [13,4%] and Electrical [19,5%] Trade theories are reasonable, although they obviously do require improvement. The 7,3% failure rate in Engineering Science suggests that the teaching of Science in ex-DET *colleges is good. It could be that in this particular subject, lecturers are committed to their* work.

What is most disturbing is the failure rate of 67,3% in Engineering Drawing and it seems to confirm that both students and lecturers experienced serious problems with Drawing. One explanation could be that a substantial number of lecturers lack expertise in Engineering Drawing. Another reason could be that there is lack of communication between students and lecturers and the absence of a working relationship between colleges. As a result, some *lecturers may not even be aware of their problems and have no one with whom to discuss* those problems.

Another concern arising from the results in Table 23 is the high failure rate in Engineering Science [43,1%]. Reasons for this high failure rate in Science may be the same as those previously discussed with respect to the ex-KwaZulu colleges, viz:

- Lack of adequately qualified science lecturers especially in colleges situated in rural areas.
- Most students lack a good Science background in their high school qualification. The negative impact which this lack has on technical education

is blatantly obvious from the results reflected Table 23.

3.5 EXAMINATION RESULTS OF THE EX-HOR TECHNICAL COLLEGE

TABLE 24 MOTOR TRADE THEORY RESULTS OF EX-HOR TECHNICAL COLLEGES, TRIMESTER ONE

N = 10					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
7	10	10	8	2	80	20	80	20	0
AVERAGE	%				80	20	80	20	0
TOTAL	10	10	8	2					
					100		100		

3.5.1 MOTOR TRADE THEORY RESULTS OF EX-HOR TECHNICAL COLLEGE

In Table 24 the examination results of Motor Trade Theory from ex-HOR are shown. The ex-Department of Education, House of Representatives had only one technical college at the time of this research. It is gratifying to note that college 7 had a pass rate of 80% and possible reasons for this high pass rate could include the following:-

i] The college is situated in an urban area which made it much easier for a college to recruit adequately qualified teachers with both technical/industry experience and professional qualifications

ii] The college has an effective staff development programme focusing on:

- teaching methods and techniques [strategies for instruction] and the application of educational technologies
- curriculum development, and

- instructional materials development and usage

iii] The majority of students in college 7 were recruited from the Coloured community with good Science and Mathematics background in their qualifications which enabled students to cope and obtain good results. Education in South Africa has been used to discriminate against people on the grounds of colour alone and has been more concerned with protecting those with power, whether political or economic, than with sharing the benefits of education in an open, democratic society. The Coloured community were treated as second class citizens yet still had better benefits than black students in South Africa. It is against this background that ex-HOR colleges were able to access slightly superior training facilities, qualified teachers and, therefore, achieve better results [see Tables 24 and 25].

iv] College 7 introduced bridging courses in the Engineering and Commercial departments for students who were unable to cope and this assisted in positive results.

v] The college had counselling departments for students with learning problems in various courses. This was a student support programme aimed at meeting students' needs and made their learning at the college easier and supported. This further assisted the college in securing a high pass rate and maintaining a good track record.

TABLE 25 ELECTRICAL TRADE THEORY RESULTS OF EX-HOR TECHNICAL COLLEGE

N = 80					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
7	80	78	74	4	94,9	5,1	92,5	5	2,5
AVERAGE	%				94,9	5,1	92,5	5	2,5
TOTAL	80	78	74	4					
					100		100		

3.5.2 ELECTRICAL TRADE THEORY RESULTS OF EX-HOR COLLEGE

Table 25 reflects the Electrical Trade Theory results from the ex-HOR college and these appear to be satisfactory. 94,9% of the students who wrote the examination passed [74 out 78 students], while only 5,1% failed. This is a standard which all technical colleges in KwaZulu-Natal strive to attain in all their courses.

TABLE 26 ENGINEERING SCIENCE RESULTS OF EX-HOR TECHNICAL COLLEGE. TRIMESTER ONE

N = 189					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
7	189	172	132	40	76,7	23,3	69,8	21,1	9,1
AVERAGE	%				76,7	23,3	69,8	21,1	9,1
TOTAL	189	172	132	40					
					100		100		

3.5.3 ENGINEERING SCIENCE RESULTS OF EX-HOR COLLEGE

The evidence in the table above reveals that 76,7% of students who wrote the Engineering Science examination passed [132 out of 172 students] and that 23,3% [40 students] failed. Generally, students' performance in this subject is lower than their performance in Motor Trade Theory [80%] as well as in Electrical Trade Theory [94,9%]. The impression created here is that the quality of the Engineering Science course at this college is not as good as the quality of the Electrical Trade Theory and that reasons for this discrepancy need to be investigated.

TABLE 27 <u>ENGINEERING DRAWING RESULTS OF EX-HOR TECHNICAL COLLEGE. TRIMESTER ONE</u>

N = 64					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
7	64	62	44	18	71	29	68,8	28,1	3,1
AVERAGE	%				71	29	68,8	28,1	3,1
TOTAL	64	62	44	18					
					100		100		

3.5.4 ENGINEERING DRAWING RESULTS OF EX-HOR COLLEGE

Evident from Table 27 is that 71% of students who wrote the Engineering Drawing examination passed [44 of 62 students], while 29% failed. These figures suggest that there are a fair number of students who experience Engineering Drawing as a difficult and demanding course. Possibly, these students did not have a sufficient understanding of drawing in class as this subject is complicated and for this reason is sometimes not offered in secondary schools. Engineering Drawing teachers are scarce and the course itself is very complicated as it requires patience and detailed attention and involvement from teachers and students.

Although this subject appears to be a general problem in all colleges the data in this chapter suggests that the problem is most serious in ex-DET [67,3% failure rate] and ex-KwaZulu [36,5% failure rate] colleges. According to Table 27, the ex-HOR colleges also experiences problems, although the failure rate of 29 % in this college is not quite as low as that of the traditionally black colleges.

TABLE 28 ENGINEERING MATHEMATICS RESULTS OF EX-HOR TECHNICAL COLLEGE, TRIMESTER ONE

N = 189					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
7	189	174	136	38	78,1	21,9	72	20,1	7,9
AVERAGE	%				78,1	21,9	72	20,1	7,9
TOTAL	189	174	136	38					
					100		100		

3.5.5 ENGINEERING MATHEMATICS RESULTS OF THE EX-HOR COLLEGE

Table 28 shows the results of Engineering Mathematics from the ex-HOR colleges. In terms of Table 28, the data reveals that 78,1% of students who wrote the examination passed [136 of 174 students], while 21,9% failed. Although the failure rate is higher than one would wish, it is not quite as high as the 43.7% in the ex-KwaZulu colleges.

TABLE 29 COMPARISON OF FAILURE RATES IN FIVE DIFFERENT COURSES FROM EX-HOR (HOUSE OF REPRESENTATIVES (EX-HOR) TECHNICAL COLLEGE

N = 532	ENROLMENT	% FAILED
Motor Trade Theory	10	20
Electrical Trade Theory	80	5,1
Engineering Science	189	23,1
Engineering Drawing	64	29
Engineering Mathematics	189	21,9
TOTAL	532	
AVERAGE %		19.8 %

3.5.6 COMPARISON OF FAILURE RATES IN FIVE COURSES OF EX-HOR COLLEGE

Table 29 presents a picture of how ex-HOR colleges performed in various colleges. The failure rate in the Electrical Trade Theory is fairly low [5,1%], suggesting that the teaching of this course in ex-HOR colleges is effective and efficient. The average failure rates for Engineering Drawing [29 %] is disturbingly high.

Other unsettling features of Table 29 are the high failure rates in Engineering Science and Mathematics. These courses seem to present serious problems to both students and lecturers. On the basis of data obtained from interviews and personal observation the following reasons can be forwarded for the fairly high failure rates in the ex-HOR technical college:

- *Lack of students' commitment to thier work.*
- Lack of bridging courses for students who do not have Science and Mathematics qualifications at the time when they enter NTC 1 Engineering programmes.

Comparatively speaking, all five ex-Departments performed badly in Mathematics, Science and Drawing and this situation could suggest that the Department of Education should take steps to reduce these failure rates [see Tables 38, 39 and 40].

3.6 EXAMINATION RESULTS OF THE EX-HOD COLLEGES

TABLE 30 MOTOR TRADE THEORY RESULTS OF EX-HOD (HOUSE OF DELEGATES) TECHNICAL COLLEGES

N = 50					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
1	25	23	21	2	91,3	8,7	84	8	8
12	25	23	20	3	87	13	80	12	8
20	-	-	-	-	-	-	-	-	-
AVERAGE	%				89,1	10,9	82	10	8
TOTAL	50	46	41	5					
					100		100		

3.6.1 MOTOR TRADE THEORY RESULTS OF EX-HOD COLLEGES

No data was received from college 20 as this institution did not offer Motor Trade Theory during the specific semester.

The Motor Trade Theory results from ex-HOD colleges in Table 30 reveal that the average percentage of students who passed Motor Trade Theory examination was 89,1%, while 10,9% failed. College 1 had the highest pass rate of 91,3%, while college 12 had a slightly lower pass rate of 87%. It is clear that both of these colleges offer good courses in Motor Trade Theory. The following are possible reasons for good performance:

- Ex-HOD technical colleges are situated in the urban areas where they are able to recruit lecturers with industry/business experience as well as professional qualifications;

- Another reason could be that of a language advantage for Indian students. The majority of Indian students use English as mother tongue, as well as a medium of instruction. As a result they have an advantage over black students when it comes to understanding questions during examinations;

- Ex-HOD colleges are adequately equipped with up-to-date training material for students to be able to learn effectively;

- Some Indian students' socio-economic backgrounds put them at an advantage to African students whose socio-economic status is usually extremely poor.

TABLE 31 ELECTRICAL TRADE THEORY RESULTS EX-HOD TECHNICAL COLLEGES, TRIMESTER ONE

N = 147					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
1	48	43	30	13	69,8	30,2	62,5	27,0	10,5
12	67	59	45	14	76,2	23,8	67,2	20,9	11,9
20	32	32	17	15	53,1	46,9	53,1	46,9	0
AVERAGE	%				66,4	33,6	60,9	31,6	7,5
TOTAL	147	134	92	5					
					100		100		

3.6.2 ELECTRICAL TRADE THEORY RESULTS OF EX-HOD COLLEGES

Table 31 reveals the following pattern: on average 66,4% of the students who wrote the Electrical Trade Theory examination passed [92 of 134 students], while 33,6% failed. What is remarkable in Table 31 is that the pass rate in Electrical Trade Theory is much lower than that in Motor Trade Theory [89,1%]. Reasons which principals from ex-HOD colleges gave to explain the lower number of passes in Electrical Trade Theory were:

- students' unwillingness to work hard or study.
- absence of teacher initiative and motivation.
- insufficient time to complete the Electrical Trade Theory syllabus.
- a continuing loss of highly qualified engineers/technicians or lecturers to the private sector for better pay or benefits.

Whatever the reasons may be, the finding reveals a weakness which requires closer examination.

As can be see from Table 31, the pass rate in college 12 was considerably higher than that of college 20, which had a dismal pass rate of 53,1%.

TABLE 32 ENGINEERING SCIENCE RESULTS EX-HOD TECHNICAL COLLEGES, TRIMESTER ONE

N = 90					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
1	197	166	114	52	71,4	28,6	57,9	26,3	15,8
12	42	42	30	12	71,4	28,6	71,4	28,6	0
20	34	34	20	14	58,8	41,2	58,8	41,2	0
AVERAGE	%				67,2	32,8	62,8	32,0	5,2
TOTAL	273	242	164	78					
					100		100		

3.6.3 ENGINEERING SCIENCE RESULTS OF EX-HOD COLLEGES

Table 32 shows the results of Engineering Science from ex-HOD colleges. The table shows that 67,2% of the students who wrote the Engineering Science examination passed [164 of 242 students], while 32,8% failed. A possible explanation for this high failure rate in Engineering Science is that Engineering Science lecturers are less exposed to in-service training regarding current teaching methods, especially because some of these lecturers do not hold any professional or teaching qualifications.

What is worth noting is that both colleges 1 and 12 performed fairly well in the Engineering Science course and such a performance in this subject suggests that teaching and learning in these institutions is reasonable. Both colleges 1 and 12 display a 71,4 % pass rate compared with college 20 which had a 58,8 % pass rate. One explanation for this could be that colleges 1 and 12 are staffed with better qualified lecturers, recruited directly from local industry and this places these colleges in a position to produce good results, especially because they are situated in the urban areas.

TABLE 33 ENGINEERING DRAWING RESULTS EX-HOD TECHNICAL COLLEGES, TRIMESTER ONE

N = 114					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
1	37	30	25	5	83,4	16,6	67,6	13,4	19
12	43	37	28	9	75,6	24,4	65,2	20,9	13,9
20	34	34	20	14	58,8	41,2	58,8	41,2	0
AVERAGE	%				72,6	27,4	63,9	25,2	10,9
TOTAL	114	101	73	28					
					100		100		

3.6.4 ENGINEERING DRAWING RESULTS OF EX-HOD COLLEGES

In this table, an average of 72,6% of students who wrote the Engineering Drawing examination managed to pass [73 of 101 students], while 27,4% failed. From Table 33 it appears that the teaching of Drawing in ex-HOD colleges is of a reasonable quality. The college which obtained the highest rate is college 1 [83,4%], while college 20 had the lowest pass rate. There are three likely reasons for this poor performance in college 20:

- the college is situated in a peri-urban area and it is difficult for a college to attract competent teachers because most teachers prefer to teach in urban areas
- lack of exposure to in-service training regarding current teaching techniques
- failure to complete Engineering Drawing syllabus due to limited time.

A trimester consists of 13 weeks and lecturers are expected to complete the syllabus within 11 weeks. The twelfth week is for trial examination and the 13th week is partly spent on revision and partly on the beginning of national examinations. It is therefore necessary that a lecturer completes the syllabus within 11 weeks, failing which, students will not be adequately prepared to face the examination.

TABLE 34 ENGINEERING MATHEMATICS RESULTS FOR EX-HOD TECHNICAL COLLEGES, TRIMESTER ONE

N = 312					WROTE		ENROLLED		
College Code	Enrolment	Wrote	Pass	Fail	% Pass	% Fail	% Pass	% Fail	% Did not write
1	197	151	74	77	49,0	51,0	37,7	39,0	23,3
12	50	39	19	20	48,7	51,3	38,0	40,0	22,0
20	65	62	34	28	54,2	45,2	52,3	43,0	4,7
AVERAGE	%				50,8	49,2	42,7	40,7	16,6
TOTAL	312	252	127	125					
					100		100		

3.6.5 ENGINEERING MATHEMATICS RESULTS FOR EX-HOD COLLEGES

The data provided in Table 34 reveals that, of 312 students who enrolled for the Engineering Mathematics examinations, only 252 students wrote and 127 passed. From the information provided above it would seem that 50,8% of students who wrote the examination passed, while 49,2% failed. Such a high failure rate must be most disturbing from both a teacher's and a student's perspective. Causes for this high failure rate may include:

- Students have a poor Mathematics background and are unable to comprehend simple mathematical terms such as factorise, simplify, manipulate and subtraction of expressions;
- Students' failure to attend classes regularly;
- Lack of a working relationship between colleges. In this case it could be that colleges are working in isolation from each other, and even if one college has a problem, it cannot share it with another college. This is because of the distance between colleges and lack of formal working relationships with each other.
- Certain lecturers do not have teaching qualifications and, as a result, they lack appropriate methods of presenting subject matter. This has an effect on students who are struggling to grasp mathematical concepts.
- Lack of in-service training programmes for college lecturers for the updating of skills, knowledge and teaching techniques.

The information provided in Table 34 suggests that the teaching of Engineering Mathematics in the ex-HOD colleges is of particularly poor quality. The weak performances of students is especially noticeable when one compares the pass rates of Colleges 1 and 12 in this table with those in Tables 30 - 33. In the other subjects the students from these two colleges had very good pass rates but in Mathematics less than 50% of students managed to pass. In College 20 the pass rate was only slightly better than the unsatisfactory achievements of Mathematics candidates in Colleges 1 and 12.

TABLE 35 COMPARISON OF FAILURE RATES IN FIVE COURSES FROM EX-HOD COLLEGES

N = 896	ENROLMENT	% FAILED
Motor Trade Theory	50	10,9
Electrical Trade Theory	147	33,6
Engineering Science	273	32,8
Engineering Drawing	114	27,4
Engineering Mathematics	312	49,2
TOTAL	896	
AVERAGE		

3.6.6 COMPARISON OF FAILURE RATES IN FIVE COURSES OF EX-HOD COLLEGES

Table 35 reveals that the failure rate in Motor Trade Theory was 10,9%, suggesting that the teaching of Motor Trade Theory at ex-HOD colleges is most effective. There is evidence in Table 35 that the teaching of Electrical Trade Theory in these colleges is of much poorer quality and that lecturers in this subject experience serious problems. It is possible that there was little back-up from the Department of Education as well as a lack of in-service training programmes for lecturers.

TABLE 36 <u>COMPARISON OF MOTOR TRADE THEORY RESULTS FROM FIVE EX-DEPARTMENTS OF EDUCATION TECHNICAL COLLEGES. TRIMESTER ONE</u>

N = 270					THOSE WHO WROTE		THOSE WHO ENROLLED		
HISTORICAL AFFILIATION	ENROLMENT	NO. WHICH WROTE	NO. PASS	NO. FAILED	% PASSED	% FAILED	% PASSED	% FAILED	% DID NOT WRITE
EX-NATAL	72	44	42	2	96,5	3,5	57,3	2,6	40,1
EX-KZN	74	70	46	24	67,5	32,5	64,8	30,5	4,6
EX-HOD	50	46	41	5	89,1	10,9	82	10	8
EX-DET	64	62	54	8	86,6	13,4	83,9	12,9	3,2
EX-HOR	10	10	8	2	80	20	80	20	0
AVERAGE					84	16	73,6	15,2	11,2
TOTAL %	270	232	191	141					
					100		100		

3.7 COMPARISON OF EXAMINATION RESULTS OF THE FIVE EX-DEPARTMENTS

3.7.1 MOTOR TRADE THEORY

In Table 36 there is a comparison between Motor Trade Theory results from THE five ex-DepartmentAL technical colleges. The situation reflected in this table reveals that ex-NED colleges have the highest pass rate [96,6% of those who wrote], which is above the average of 84%. The following are possible reasons for this high pass rate:-

- Ex-Natal colleges are historically white institutions, heavily funded by the previous government during the apartheid era and reserved for the white population only.
- Another reason could be that of language advantage. There is little or no problem of communication between lecturers and students in a classroom situation where all are white and use English as medium of instruction. This situation helps the students to learn and understand scientific and

mathematical concepts, as well as examination questions without difficulty.

- Ex-Natal colleges had adequate infrastructure, facilities, equipment and specialised teaching staff to meet the needs of industry.

Apart from ex-Natal results, Table 36 reveals that ex-HOD [89,1%], ex-DET [86,6] and ex-HOR [80%] had pleasing results, suggesting that teaching and learning in these colleges were also of a FAIRLY high quality. A Major reason for these good pass rates is that the colleges of these three ex-Department are situated in urban areas and are better equipped to attract competent and high-quality lecturers in certain subjects. Another reason could be that these colleges have a more stable financial background than those falling under homeland administrations, e.g. ex-KwaZulu Colleges.

The 67,5% pass rate in ex-KwaZulu college is less satisfactory in comparison with the other ex-departments. The following could be the reasons:

- Ex-KwaZulu colleges are mostly situated in rural areas. Because of the apparently lower quality of teachers in rural areas, rural teachers may not be sufficiently competent to prepare students for employment in business or industry.

- Some ex-KwaZulu colleges are situated in Black townships where the crime rate is high. Competent and high quality lecturers, including those from other racial groups, are afraid of going into these areas because of security problems and colleges are forced to employ less qualified and incompetent teachers.

- Lack of support programmes for students who have learning difficulties/problems. These programmes include counselling, induction and study skills programmes. In most of ex-Natal colleges, many students who enrolled for courses did not sit an examination, as is evident from this table where 40% of students who enrolled did not sit for examination, compared with 4,6% [ex-KZN], 8% [ex-HOD] and 3,2% [Ex-DET]. The following could be the reasons:-
    - Ex-Natal colleges insisted that, if a student was unable to obtain a 40% pass in the course during a trial examination, that student could not sit for national examination.
    - Continuous absence from lectureres for 10 days usually leads to disqualification or expulsion.
    - Students with financial problems are excluded from college activities

including examination. Mostly, this affects students from disadvantaged communities, who cannot afford to pay high fees as well as examination fees.

TABLE 37 **COMPARISON OF ELECTRICAL TRADE THEORY RESULTS FROM FIVE EX-DEPARTMENTS OF EDUCATION TECHNICAL COLLEGES. TRIMESTER ONE**

N = 270					THOSE WHO WROTE		THOSE WHO ENROLLED		
ISTORICAL AFFILIATION	ENROLMENT	NO. WHICH WROTE	NO. PASS	NO. FAILED	% PASSED	% FAILED	% PASSED	% FAILED	% DID NOT WRITE
X-NATAL	237	206	184	22	83,7	16,3	75,1	15,2	9,7
X-KZN	91	89	71	18	80,3	19,7	77,4	19,4	3,2
X-HOD	147	134	92	42	66,4	33,6	60,9	31,6	7,5
X-DET	90	88	68	20	80,5	19,5	77,5	19,1	3,4
X-HOR	80	78	74	4	94,9	5,1	92,5	5	2,5
VERAGE					81,2	18,8	76,7	18	5,3
OTAL %	645	595	489	106					
					100		100		

3.7.2 ELECTRICAL TRADE THEORY

The evidence in Table 37 reveals that ex-HOR colleges had THE HIGHEST 94,9% pass rate in Electrical Trade Theory [94,9%], suggesting that teaching and learning in this college is successful. This particular college has never been affected by violence, disruptions, strikes or riots and students therefore spend sufficient time in their lecture rooms and workshops. Ex-Natal colleges had a pass rate of 83,7% of those who wrote, suggesting that ex-Natal colleges are coping fairly well. Possible reasons for the various pass rates have been explained previously.

TABLE 38 COMPARISON OF ENGINEERING SCIENCE RESULTS FROM FIVE EX-DEPARTMENTS OF EDUCATION TECHNICAL COLLEGES. TRIMESTER ONE

N = 1653					THOSE WHO WROTE		THOSE WHO ENROLLED		
HISTORICAL AFFILIATION	ENROLMENT	NO. WHICH WROTE	NO. PASS	NO. FAILED	% PASSED	% FAILED	% PASSED	% FAILED	% DID NOT WRITE
X-NATAL	428	375	293	65	75	25	65,9	23,2	10,9
X-KZN	407	384	282	102	56.9	43,1	54,8	42	3,2
X-HOD	273	242	164	78	67.2	32,8	62,8	32	5,2
X-DET	356	350	318	32	92.7	7,3	91,5	7,1	1,4
X-HOR	189	172	132	40	79.7	23,3	69,8	21,1	9,1
VERAGE					73.7	26,3	69	25	6
OTAL %	1653	1523	1189	317					
					100		100		

3.7.3 ENGINEERING SCIENCE

This table reveals that ex-KwaZulu colleges have the lowest pass rate [56,9%] in Engineering Science compared wish all other ex-Departments. The failure rate in ex-KwaZulu colleges is very high [43,1%], a percentage which warrants concern. Reasons for this low pass rate are the same as those dicussed earlier in this chapter.

TABLE 39 COMPARISON OF ENGINEERING DRAWING RESULTS FROM FIVE EX-DEPARTMENTS OF EDUCATION. TECHNICAL COLLEGES. TRIMESTER ONE

N = 850					THOSE WHO WROTE		THOSE WHO ENROLLED		
STORICAL FILIATION	ENROLMENT	NO. WHICH WROTE	NO. PASS	NO. FAILED	% PASSED	% FAILED	% PASSED	% FAILED	% DID NOT WRITE
-NATAL	187	147	123	24	84,8	15,2	69,6	12,9	17,5
-KZN	355	345	242	107	63,5	36,5	62	34,9	3,1
-HOD	114	101	73	28	72,6	27,4	63,9	25,2	10,9
-DET	130	116	38	78	32,7	67,3	29,2	60	10,8
-HOR	64	62	44	18	71	29	68,8	28,1	3,1
ERAGE					65	35	59	32	9
TAL %	850	771	520	255					
					100		100		

3.7.4 ENGINEERING DRAWING

Table 39 presents a picture of the comparative results for Engineering Drawing. The 84,8% pass rate in ex-Natal suggestS that the teaching of Engineering Drawing course in these colleges is of high quality [see Table 15]. The table above further reveals that ex-KwaZulu colleges had a 63,5% pass rate as compared with ex-Natal [84,8%], ex-HOR [71%] and ex-HOD [72,6%]. It is noticeable that ex-KwaZulu's level of performance is once again the lowest, in line with findings in other courses.

The 32,7% pass rate and 67,3% failure rate in ex-DET colleges is cause for concern and warrants further investigation. It does seem surprising that there could be what appeared to be a sudden drop in the level of performance in the ex-DET colleges. Ex-DET colleges performed extremely well in results contained in Tables 36 [86,6%], 37 [80,5%] and 38 [92,7%], but Table 39 shows a poor performance suggesting that there was a major problem in Drawing. The main reason for this high failure rate in Drawing was the fact that the colleges used old syllabus whereas the papers were set in the new syllabus.

It must be noted, however, that evn the failure rates in the other ex-Departments, ex-HOR [29%], ex-HOD [27,4%], ex-Natal [15,2%] and ex-KwaZulu [36,5%] - are high and obvious;y have a negative impact on the economy of the country, considering the fact that the public and private sectors depend on colleges for employment. Evident in Table 39 is that there is much wastage of government resources as 17,5% of students who enrolled in ex-Natal colleges, 31% in ex-KwaZulu, 10,9% in ex-HOD, 10,8%, ex-DET and 3,1%, ex-HOR did not sit for examination. Therefore, an average of 9% of students who enrolled did not write the examination. This figure is high enough to warrant concern, especially from ex-Natal colleges [17,5%] where quite a large number of students were unable to sit for examination.

TABLE 40 COMPARISON OF ENGINEERING MATHEMATICS RESULTS FROM FIVE EX-DEPARTMENTS OF EDUCATION TECHNICAL COLLEGES. TRIMESTER ONE

N = 1811					THOSE WHO WROTE		THOSE WHO ENROLLED		
STORICAL FFILIATION	ENROLMENT	NO. WHICH WROTE	NO. PASS	NO. FAILED	% PASSED	% FAILED	% PASSED	% FAILED	% DID NOT WRITE
-NATAL	459	389	276	113	65,8	34,2	57,5	30,8	11,7
-KZN	448	415	289	129	56,3	43,7	53,6	41,7	4,7
-HOD	312	252	127	125	50,8	49,2	42,7	40,7	16,6
-DET	403	377	226	151	56,9	43,1	52,5	39	8,5
-HOR	189	174	136	38	78,1	21,9	72	20,1	7,9
ERAGE					62	38	55,6	34,6	9,8
TAL %	1811	1607	1051	556					
					100		100		

3.7.5 ENGINEERING MATHEMATICS

It is evident from Table 40 that the large majority of students in technical colleges are performing poorly in Mathematics. Table 40 shows that ex-KwaZulu [56,3%], ex-HOD [50,8%] and ex-DET [56,9%] had pass rates below the average of 62% suggesting that these colleges had serious problems in Mathematics. The pass rates in ex-Natal [65,8%] and ex-HOR [71,1%] colleges, if compared with the other three ex-departments are reasonable, suggesting that the teaching of Mathematics in these colleges is more effective.

When a few principals of technical colleges were asked about this high failure in Mathematics, they explained that students who were admitted into the N1 programmes often did not have a Science and Mathematics background in their high school qualifications and no provision was made for bridging courses in their colleges. It does appear that the lack of bridging programmes is problematic for technical college students considering the fact that Science and Mathematics are the key subjects in the Engineering studies programmes.

Apart from these observations, another important picture emerges from Table 40. In almost all ex-Departments quite a number of students who enrolled for the course did not sit for examination. The table shows that ex-Natal [11,75] and ex-HOD [16,6%] colleges had the highest number of students who did not write examination. This is due to the fact that students who were unable to obtain at least a 40% pass in the course during the trial examination could not sit for the national examination. Another reason could be the fact that once students were absent from lectures for 10 days, those students were automatically disqualified and were not be allowed to sit the examination. In ex-KwaZulu colleges only 4,7% of students were unable to sit for examination. The reason for this could be the fact that certain students are unable to pay examination fees and some got employment before completing their N1 programmes. In the ex-DET and ex-HOR colleges only 8,5% and 7,9% students did not write the examination. This is quite a large number of students [41]. On average 9,8% of students who enrolled for Mathematics did not write the examination. This suggests that there is serious problem with college systems where money is being wasted on students who do not write examinations. Evidence in table 40 suggested that colleges do not contribute much to the building of the country's economy but, instead they let the country down and deprive public and private sectors of opportunities to get better qualified people capable of doing the work properly.

3.8 CONCLUSION

The examination results are of paticular importance if they are to:

- identify those colleges in KwaZulu Natal where teaching and learning appear to be ineffective;
- identify constraints affecting the quality of training and results;
- identify those colleges that are most affected by constraints.

The use of examination results in this study has therefore succeeded in fulfilling these objectives.

CHAPTER FOUR

RESULTS OF EMPIRICAL STUDY

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CHAPTER FOUR

RESULTS OF EMPIRICAL STUDY: LECTURERS

4.1 INTRODUCTION

Lecturing is a common method of teaching used in technical colleges for the transmission of theoretical knowledge. The process of lecturing includes the structuring and conveying of ideas and facts to groups of students who receive interpret and respond to the messages forwarded. The most important task of lecturers is that of transmitting information and stimulating students to become active learners in their own right.

Lecturing at technical colleges embraces some important features that differentiate it from lecturing in other areas of education. The first salient feature is that the knowledge and skills of the college lecturer can quickly become outdated as a result of rapid technological changes. Secondly, technical college lecturing requires more advanced management skills than lecturing in other institutions since technical lecturers are required to:

a] organise and manage workshops and laboratories;

b] distribute tools, supplies and equipment;

c] maintain workshops at appropriate levels of efficiency;

d] teach students the importance of safety when using tools and equipment.

Allied to these management skills are the administrative skills of budgeting and record keeping that most technical lecturers need.

If college lecturers are to be effective it is necessary that they establish and maintain close relationships with commerce and industry, i.e. the working world for which they are preparing their students. Thus, a significant component of their task is that of public relations, viz. relating competently with industry, employers, unions, professional associations and other related bodies. These skills are not only required with respect to the effectiveness of programmes, but also with respect to counselling and in the advising of students in matters relating to their careers. The development of these skills should, therefore, be included in the preparation of technical lecturers.

This chapter outlines the data collected from nineteen principals who completed questionnaires regarding staffing at technical colleges. The focus is on staff provision, [including qualifications and recruitment], as well as staff development and in-service training at colleges.

4.1.1 LECTURING STAFF AT COLLEGES

The provision of lecturing posts for colleges is determined by a prescribed personnel provision scale in accordance with general policy which is related to the total full-time equivalent [number of students] of the preceding year. The total number of lecturers at the nineteen colleges included in this study was 467.

Although lecturers are classified as educators within the CollegeSecondary sector, teaching staff at colleges are known as lecturers at post levels 1-6 in accordance with the prescribed post level ratio norms. Table 41 shows the rank designation posts at technical colleges.

Table 41: RANK DESIGNATION POSTS AT TECHNICAL COLLEGES

RANK	POST LEVEL
Principal	3, 4, 5 or 6
Senior deputy principal *	5
Deputy principal or senior head of division *	3 or 4
Head of division	3
Senior lecturer	2
Lecturer	1

* *Source: Department of Education* [1995:8]

4.2 STAFF QUALIFICATIONS

TABLE 42: QUALIFICATIONS OF LECTURERS IN KWAZULU NATAL TECHNICAL COLLEGES [This Table Continues on the Following Page]

N = 19

NUMBER OF LECTURERS					COLLEGE IN SAMPLE	PERCENTAGE OF LECTURERS				
TECH. ONLY	PROF. ONLY	TECH. & PROF.	OTHER	TOTAL		TECH. ONLY	PROF. ONLY	TECH. & PROF.	OTHER	TOTAL
					EX-NED					
5	1	4	1	11	2	46	9	34	10	99
10	1	0	0	11	3	90	9	0	0	99
0	0	0	18	18	8	0	0	0	100	100
2	0	6	2	10	10	20	0	60	20	100
7	0	7	0	14	15	50	0	50	0	100
0	0	5	0	5	17	0	0	100	0	100
11	7	24	0	42	18	26	17	57	0	100
35	9	46	21	111	Total	31,5	8,1	41,4	19	100
					EX-KWAZULU					
19	6	12	0	37	5	51,3	16,3	32,4	0	100
6	8	8	0	22	6	27,2	36,4	36,4	0	100
22	0	42	0	64	9	34,3	0	65,7	0	100
8	0	2	0	10	11	80	0	20	0	100
9	0	12	0	21	19	43	0	57	0	100
9	0	0	0	9	22	100	0	0	0	100
73	14	76	0	163	Total	44,8	8,6	46,6	0	100
					EX-HOD					
6	2	20	0	28	1	21,4	7,2	71,4	0	100
3	2	14	0	19	12	15,8	10,5	73,7	0	100
3	10	13	4	30	20	10	33	43	14	100
12	14	47	4	77	Total	15,6	18,2	61	5,2	100
					EX-DET					
0	0	0	0	0	4	0	0	0	0	0
17	9	4	0	30	16	56,6	30	13,4	0	100
15	21	23	12	71	21	21	30	32	17	100
32	30	27	12	101	Total	31,7	29,7	26,7	11,9	100
					EX-HOR					

N = 19										
NUMBER OF LECTURERS					COLLEGE IN	PERCENTAGE OF LECTURERS				
3	0	12	0	15	7 SAMPLE	20	0	80	0	100
3	0	12	0	15	Total	20	0	80	0	100
155	67	208	37	467	Grand Total	33,2	14,3	44,5	8	100

The qualifications of lecturers from ex-Departmental colleges are reflected in Table 42. Evident from the figures in this table is that 31.6% of the lecturers from ex-Natal colleges possess only technical qualifications and not professional certificates while 44,8% of the lecturers from ex-KwaZulu colleges hold only technical qualifications without any professional certificates. It can therefore be deduced that ex-KwaZulu colleges have the highest percentage of lecturers who only have technical qualifications [44,8%], compared with ex-Natal [31,5%], HOD [15,6%, DET [31,7%] and HOR [33,2%].

A technical qualification for lecturers [without a professional or teaching certificate] is defined as follows: a three-subject *National Technical Certificate III* [N3], *which must include Trade Theory/Technology as a subject, plus a completed* apprenticeship or a pass in a trade test as well as two years appropriate trade experience.

OR

an equivalent qualification plus a completed apprenticeship or a pass in a trade test and two years appropriate trade experience. Trade Theory/Technology on the N3 level should form part of the completed trade training.

OR

a three-subject *National Technical Certificate III* [N3] *which must include Electronics as a subject*, plus two years appropriate trade experience. [Evaluation of Qualifications for Employment in Education: Department of Education 1996: 11-18].

Clearly observable from Table 42 is that ex-KwaZulu technical colleges have the most lecturers [44,8%] who are technically qualified but who lack didactic or teaching skills.

Discernable from Table 42 is that 8,6% of the lecturers from ex-KwaZulu , 8,1% ex-Natal, 18,2% ex-HOD and 29,7% ex-DET have professional qualifications only. This data implies that these lecturers lack technical and workshop experience and they are therefore not in a position to deal with the practical training of the students in the engineering workshops. Although this appears to be a general problem in all technical colleges, there is evidence to suggest that the problem is most serious in ex-DET technical colleges. The possible reason for this could be that ex-KwaZulu technical colleges are unable to recruit adequately qualified lecturers because these colleges are situated in unsafe rural townships and they are forced to employ staff who lack technical qualifications.

The figures in Table 42 show that ex-Natal colleges have [41,4%] of lecturers who are both technically and professionally qualified. Ex-KwaZulu colleges have only 46,6%of lecturers who are technically and professionally qualified, compared with ex-Natal who have 41,4%.

Data in Table 42 further displays that ex-DET colleges employ only 26,7% of lecturers who are technically and professionally qualified compared with ex-HOD who employ 61,7% and ex-HOR who employ 80%. As already suggested, it would appear that ex-KwaZulu [46,6%] and ex-DET [26,7%] continue to experience problems in attracting doubly-qualified lecturers to their institutions. This, in most cases, becomes clear if one compares the responses of black colleges situated in the township and rural areas with those of white, Indian and coloured colleges situated in the urban and peri-urban areas. The fact that ex-DET colleges had 26,7%, suggests that these colleges have difficulty in attracting lecturers of other racial groups to their institutions.

Table 42 discloses that 19% of the lecturers from ex-Natal colleges have additional qualifications, including university degrees, Technician Diplomas, Commercial Diplomas and other qualifications obtained from industries. This could imply that ex-Natal colleges are in a position to recruit lecturers from other tertiary institutions into their colleges. One advantage of this is that ex-Natal colleges boast highly qualified lecturers, thereby putting them in a superior situation to that of the ex-KwaZulu and ex-DET colleges.

Clearly, the ex-KwaZulu lectures are, on paper better qualified than ex-NED lecturers. The main difference between these two is that a high percentage of ex-NED lecturers have "other" qualifications. These "other" qualifications include bacherls/masters degrees from Universities and Bachelor of Technologies degrees and Masters Diploma in technology from technikons.

The reason why ex-KwaZulu colleges are weak could be that lecturers do not do thier work (despite their good qualifications) or that supervision is poor or that their qualifications were obtained from ineffective institutions or because thier Mathematics and Science are wek or because there is a weak culture of learning. It does not relate to poor qualifications, because thier qualifications are the same as ex-NED lecturers.

TABLE 43: PERCEPTIONS OF STAFFING AND IN-SERVICE TEACHER TRAINING

N = 19

		Q 2	Q 5	Q 6	Q 7
EX-DEPARTMENTS	COLLEGE NUMBER	STAFF QUALIFICATIONS AND EXPERIENCE	STAFF DEVELOPMENT PLANS	RECRUITMENT PROGRAMMES	IN-SERVICE TRAINING
EX-NATAL	2	4	3	4	3
	3	5	4	4	4
	8	5	4	4	4
	10	5	5	3	3
	15	5	4	4	4
	17	5	4	4	2
	18	4	4	4	3
AVERAGE		4,7	4	3,8	3,2
EX-KWAZULU	5	4	1	1	1
	6	3	1	2	1
	9	4	2	3	2
	11	4	2	2	2
	19	4	2	1	1
	22	3	1	1	1
AVERAGE		3,6	1,5	1,6	1,3
EX-HOD	1	5	3	1	1
	12	5	3	4	3
	20	4	2	1	1
AVERAGE		4,7	2,6	2	1,7
EX-DET	16	4	3	4	4
	21	4	3	4	3
AVERAGE		4	3	4	3,5
EX-HOR	7	1	2	2	1
AVERAGE		1	2	2	1
GRAND TOTAL		3,6	2,7	2,7	2,3

KEY: 1: *Very Unsatisfactory* 2: Rather Unsatisffactory 3: Neither Satisfactory nor Unsatisfatory 4: Fairly Satisfactory 5: Very Satisfactory

4.3 PERCEPTIONS OF STAFF QUALIFICATIONS

These percptions were obtained from responses to the principals questionnaires which were distributed to all technical colleges principals in KwaZulu Natal (see ANNEXURE A). Data in respect of the respondents' perceptions of staff qualifications, recruitment and staff development programmes is captured in Table 43. For questions 2, 5, 6 and 7 the Likert Scale Formula [Likert, 1932] was used. Respondents were offered a five point scale and requested to indicate their opinions regarding the questions.

QUESTION 2 [TABLE 43]

According to the responses to Question 2 indicated in this table, the qualifications of lecturers at ex-Natal colleges are the most satisfactory [Average 4,7%]. This implies that respondents from these colleges believed that a high percentage of lecturers possessed technical as well as professional skills. If this perception is true, it would mean that ex-Natal colleges are better positioned to produce good results and marketable students. The good examination results, produced by ex-Natal colleges, as given in Tables 12 [Motor Trade Theory], 13 [Electrical Trade Theory], 14 [Engineering Science] and 15 [Engineering Drawing], seem to prove that staff at these colleges are in fact more effective teachers, especially when compared with ex-KwaZulu colleges .

Table 43 exposes that respondents from ex-HOD colleges have an equally high regard of their lecturers' qualifications as those from ex-Natal colleges. Their high regard seems to be justified by figures in Table 42, which shows that ex-HOD colleges employed 61% of lecturers with both technical and professional qualifications. The fact that students from ex-HOD colleges achieve good examination results [see Tables 30 - 33] indicates that the perceptions of respondents from ex-HOD colleges are accurate.

Another perception revealed by the responses in Table 43 was that ex-DET college respondents[Average for Q 2 is 4] expressed satisfaction regarding staff qualifications , the implication being that staff believed themselves to be competent to lecture at technical colleges. According to the opinions expressed, ex-HOR college staff posited that they employed lecturers with very unsatisfactory qualifications [Average for Q 2 is 1]. This information contradicts that of Table 42 which reveals that these colleges had 80% of lecturers who are technically and professionally qualified. As Table 43 provides perceptions and not facts, the data in Table 42 must be taken as evidence in indicating that ex-HOR colleges are adequately staffed with qualified lecturers. This is confirmed by the good examination in results ex-HOR colleges as shown in Tables 24 [Motor Trade Theory], 27 [Electrical Trade Theory], 26 [Engineering Science] and 28 [Engineering Mathematics].

Staff opinions as shown in Table 43 are that staff qualifications as ex-KwaZulu colleges were percived as being fairly satisfactory [Average for Q 2 is 3,6]. This means that ex-KwaZulu college respondents were less satified with staff qualifications than the staff of ex-Natal, ex-HOD and ex-DET colleges. This conflicts with data in Table 42 where it is shown that ex-KwaZulu colleges had 46,6% technically and professionally qualified staff, compared with ex-Natal 44,4%], ex-HOD [61%] and ex-HOR [80%]. Clearly, the majority of ex-KwaZulu respondents in Table 43 felt the reason why their examination results were poor, was partly due to their staff not being properly qualified. In actual fact, on paper the qualifications of ex-KwaZulu lecturers are fairly satisfacotry and reason for poor examination results are more complex than merely unsatisfactory qualification. As has already been implied, the location of the ex-KwaZulu colleges, their historical background and the failure on behalf of the Education Department to pay satisfactory salaries to adequately qualified lecturers [see Table 44] contribute to the problems which these technical colleges face.

This concludes the discussion of results to Question 2 (staff qualification and experience). The other results contained in Table 43 (Questiions 5, 6, & 9) will be discussed later in the chapter.

4.4 REPORTED NUMBER OF LECTURERS WHO LEFT COLLEGES TO PURSUE OTHER CAREERS

The following table presents data of the reported number of lecturing staff who left colleges of the various ex-Departments to follow other careers.

This section deals mainly with the reported number of lecturers who left colleges to pursue other careers. This is question four from the quastionnaire (see APPENDIX A).

TABLE 44: LECTURERS WHO LEFT COLLEGES FOR OTHER CAREERS

N = 19

EX-DEPARTMENTS	COLLEGES	NO. OF LECTURERS WHO LEFT
EX-NATAL	2	2
	3	3
	8	0
	10	3
	15	1
	17	0
	18	4
TOTAL		13 [17%]
EX-KWAZULU	5	7
	6	4
	9	5
	11	6
	19	5
	22	6
TOTAL		33 [43%]
EX-HOD	1	6
	12	1
	20	9
TOTAL		16 [21%]
EX-DET	16	6
	20	6
TOTAL		12 [15%]
EX-HOR	7	3
TOTAL		3 [4%]
GRAND TOTAL		77 (100 %)

There is evidence that the majority of lecturers who left colleges for other careers came from ex-KwaZulu colleges (43%) are lured by business and industry where salaries are such that educational institutions can rarely compete, and they left the colleges during the last three years.

Loss of staff appears to be a general problem experienced by all colleges which, during the past three years experienced the following losses:

•	ex-Natal	13	[12%]	(17% of those who left)
•	ex-KZ	33	[20%]	(43% of those who left)
•	ex-HOD	16	[12%]	(21% of those who left)
•	ex-DET	12	[20%]	[15% of those who left]
•	ex-HOR	03	[20%]	(4% of those who left)

on the whole, the survey showed that colleges which have mostly white staff [ex-Natal and ex-DET] lose less teachers than colleges which have mostly non-white staff [ex-KwaZulu and ex-HOD]. Frequent reasons proffered by staff leaving the teaching profession are:

a] The inability of National Education Departments to pay satisfactory salaries to adequately qualified lecturers who possess both technical and professional qualifications.

b] The lack of other benefits such as car allowance and overtime payment.

c] How job satisfaction due to location of colleges, poor culture of learning, shortage of equipment, work overload and othe frustrations.

This outflow of teachers exacerbates the already unsatisfactory staffing situation at colleges. Since there are 163 lecturers at ex-KwaZulu colleges and there was a turnover of 33 over the past three years, this means that an average of 11 left per annum [7%]. Although 7% might not seem too dramatic, it nevertheless remains a disturbing factor that thus many vacancies occur every year. In KwaZulu Natal, generally, approximately 77 lecturers resign every three years, viz. an average of 26 per annum. Considering that there are 467 lecturers overall, an average of 5,5% of lecturers at technical colleges leave their posts each year. Although these posts need to be filled, the difficulty of finding suitably qualified staff remains unresolved.

4.5 PERCEPTIONS OF STAFF DEVELOPMENT PROGRAMMES

QUESTION 5 [TABLE 43]

According to principals of ex-Natal colleges [Question 5, shown in Table 43] staff development programmes in their institutions are very good as six of the seven rated this as 'good' or 'excellent'. It would appear that ex-Natal colleges, through staff development programmes, were able to:

- maintain the knowledge and skills of lecturers;
- afford staff the opportunity of expanding and improving their knowledge and teaching capacities;
- give staff guidance on how to prepare students for new economic, social and cultural challenges;
- enable staff to gain additional qualifications, thereby developing their special talents, skills and knowledge;
- raise the professional ethos of the teaching force in the college as a whole, strengthening vigour and creativity;
- orientate teachers with regard to revised syllabus and policy changes, and
- ensure that all lecturers have an opportunity to participate and agree on standards.

In direct contrast to this, Table 43 [Question 5] shows that staff development programmes at ex-KwaZulu colleges were perceived as being ineffective, with three rating them as unsatisfactory and another three reporting that such programmes were non-existent. This finding is most significant as it could explain the crucial role which staff development plays in achieving good examination results.

It is important and relevant at this stage to mention that, according to Table 42, there was not much difference [5,2%] between doubly-qualified lecturers in ex-KwaZulu [46,6%] and ex-Natal [41,4%] colleges. [see Table 42].

Concerning Questions 5 and 7, what Table 43 does reveal, however, is that there is a marked difference between these two ex-Departments with regard to staff-development programmes. It would therefore seem that qualifications on their own do not lead to high student achievement and that qualifications have to be supplemented with in-service training and staff-development if student achievement is to be raised. Apparently the certificates which lecturers obtain merely provide them with the theoretical training whilst staff development provides them with the necessary practical experience. Without learning how to bridge the gap between theory and practice [in the form of staff development] most lecturers are unable to attain good examination results for their students. It would therefore be a fallacy to claim that qualifications are the major factor resulting i good or poor examination results. The above table siggests that effective staff development leads to improved results. It seems clear that continuous in-service training is essential for lecturers who are to train skilled workers, especially for those who train technicians, as it is in the technical field that the greatest changes are occurring. In this regard it is disturbing to note the ex-KwaZulu colleges, already hampered by a high percentage of lecturers who only have technical qualifications [44,8%: Table 42], offer an extremely weak staff-development plan for lecturers.

The averages from the respondents of ex-HOD colleges (2.6), ex-DET colleges (3) and the ex-HOR colleges (2) in Table 43 suggest that they were slightly more satisfied with the existing staff/development programmes at their colleges than the respondents from ex-KwaZulu colleges. In summary, then the findings show that the ex-Natal colleges are the only ones in which the respondents belive that they have well-defined plans for staff development and in-service training to supplement the qualifications of lecturers and raise the level of student achievement. This support apparently enables the lecturers to keep up to date with technological advances and changes and also with current teaching methods.

4.6 PERCEPTIONS REGARDING THE RECRUITMENT OF LECTURING STAFF

QUESTION 6 [TABLE 43]

The general pattern in Table 43 [Question 6] reveals that principals from ex-Natal colleges were fairly satisfied with procedures to recruit suitable staff who were both technically and professionally qualified and who also had experience in industry. Obviously, these principals were far more satisfied with their recruitment success than principals from ex-KwaZulu colleges, where a weak average of 1,6 (rahter unsatified) was found, and who seem to experience considerable difficulty in attracting staff to their institutions.

- Natal - 3, 8
- KwaZulu - 1, 6
- HOD - 2
- DET - 4
- HOR - 2

The low rate of satisfaction with the recruitment programmes in ex-KwaZulu colleges can, in part, be explained by the fact that these colleges are historically non-white and situated in townships and rural areas. These circumstances may contribute towards their inability to employ well qualified lecturers, especially when considering the fact that these colleges cannot ensure the safety of their staff. As ex-KwaZulu colleges also have the weakest staff development programmes, this means that it is extremely difficult for them to produce satisfactory examination results.

Both ex-HOD and ex-HOR colleges also produced an average of 2 rather unsatisfactory in their opinion about recruitment programmes. This means that in these colleges there is also a need for improvement and upgrading. Ex-DET colleges, with an average satisfaction index of 4, (fairly satificatory) imply that ex-DET colleges have effective recruitment strategies in place. A reason for satisfactory results in both areas is that, whilst ex-DET colleges were non-white institutions, they were state controlled with white lecturers and administrative staff and this led to their having good examination results [see Tables 36, 37, 38 and 40].

4.7 PERCEPTIONS REGARDING IN-SERVICE TRAINING PROGRAMMES

QUESTION 7 [TABLE 43)]

With reference to Table 43 [Question 7], the respondents from ex-Natal [average 3,2] and ex-DET [average 3,5] colleges believed that the in-service training education programmes provided by their institutions were neither satisfactory nor unsatisfactory.

In-service training provides lecturers with the required training to adequately involve themselves in the theoretical and practical training of students. This includes the development of the capacity for both teaching and research; the upgrading of qualifications and management training. The difference between staff-development and in-service programmes is that staff development focuses mainly on the specific institution, with the aim of enhancing the quality of performance. In- service training, on the other hand, is broader in that it affects the entire Education Department or all colleges within the college sector and entails:

- the development of the capacity for lecturing on a broad scale
- management training
- upgrading of qualifications
- organisation of workshops and seminars
- industrial placement
- membership schemes and staff-appraisal.

Noticeable from Table 43 is that ex-Natal and ex-DET colleges (apparantely) had better in-service training education programmes available than the other colleges. Respondents felt that there was a fair range of programmes which included:

- periodic review and updating of knowledge and skills in the special fields
- periodic updating of professional skills and knowledge. As was showing in Chapter 3 ex-Natal and ex-DET colleges have very good examination results. This seems to confirm that, for technical college-based training to be effective, there must be a well-defined staff development and in-service training programme in place to supplement all levels of teacher qualifications.

Not yet satisfied with the in-service training programmes at their colleges were the respondents from ex-KwaZulu, ex-HOD and ex-HOR [average 1,3; 1,2; and 1 respectively]. It seems as if these respondents feel very strongly about the lack of well defined and effective in-service training in their institutions. If lecturers do not have the support of the necessary staff-development and in-service training programmes, it stands to reason that the effective teaching and practical training of students will be hampered. The situation becomes even more problematic when the lecturers are already impeded by the lack of qualifications, as in the case of ex-KwaZulu colleges where 44,8% of the lecturers have only technical qualifications. This is a display of the extent to which current technical-college based training is ineffective in KwaZulu colleges where the skills of the lecturers are not being updated timeously.

4.8 PRESENTATION OF QUALITATIVE RESULTS

4.8.1 INTRODUCTION

In this section the qualitative results are presented under the following headings:

- Orientation of new lecturers
- Problems experienced by lecturers at colleges
- Suggestions by lecturers for improvement of teaching at technical colleges.

These results emanated from:

a] the informal interviews which were conducted

b] responses to the open-ended question [Question 15] on the principals' questionnaire

c] personal observations, informal discussions and personal experiences of the researcher in his capacity as a principal of a technical college near Durban.

Interviews were conducted at ten colleges which were chosen from the five ex-Departments. Two Senior staff members, namely the Deputy Principal and a Head of Department or a Senior Lecturer, at each of these colleges were interviewed [see Section 1.7.2.3.[d]]. In total 20 interviewees participated in this phase of the research project.

The information obtained is presented below according to the ex-Departments.

4.9 INDUCTION OF NEW LECTURERS

TABLE 45: Induction practices in technical colleges according to ex-departments

N = 20

INDUCATION PRACTICES		PERCENTAGES OF RESPONDENTS IN EACH CATEGORY WHO MENTIONED THIS PRACTICE				
		EX-KWAZULU N = 6	EX-NATAL N = 4	EX-DET N = 4	EX-HOD N = 4	EX-HOR N = 2
1.	Head of department does the induction	17 %	100 %	25 %	50 %	0%
2.	Senior staff members assist	33 %	50 %	50 %	0 %	0%
3.	Introduced to facilities by principal	50 %	50 %	25 %	0 %	0%
4.	Issue with curriculum material	17 %	50 %	25 %	25 %	0%
5.	Class visits by Deputy Principal or H.O.D.	17 %	50 %	0 %	0 %	0%
6.	Workshop for all Staff	17 %	50 %	0 %	25 %	50%
NUMBER OF TIMES WHEN INDUCTION WAS MENTIONED IN INTERVIEWS		9	14	6	5	2

4.9 GENERAL TRENDS REGARDING INDUCTION OF NEW LECTURERS

Generally, newly appointed lecturers are orientated by their Heads of Departments, Deputy Principals or Principals, and these lecturers are linked to Senior staff members who are competent in their subject. New appointees are supplied with the syllabi, files, text books, stationery, work programmes, a set of instruments [if they are to teach science, mathematics or other engineering courses], previous examination papers, etc. If the lecturer is employed for practical training of students, she/he is then provided with a fully equipped workshop and is requested to sign for responsibility for all equipment. An effort is then made to acquaint the new lecturer with all the other employees with the view of making it easier to work with all the staff on campus.

4.9.1 COMPARISON BETWEEN EX-KWAZULU AND EX-NATAL COLLEGES

There is evidence in Table 45 which suggests that the overwhelming majority [100%] of the respondents from ex-Natal colleges are of the opinion that the induction of lecturers is conducted by Heads of Departments, whilst only a quarter of the lecturers from ex-KwaZulu colleges share this opinion. What Table 45 did reveal however, is that there is a marked difference between these two ex-Departments concerning the induction of new lecturers as there is a gap of 83,4% which is unduly wide and cause for concern. The following are posited as possible reasons for this chasm:

- ex-Natal colleges have a greater number of Heads of Department
- it may also be that Heads of Department from ex-Natal colleges are more highly qualified and more competent at the induction of lecturers than those at ex-KwaZulu colleges.

Effective orientation of newly appointed lecturers is accompanied by efficient organisation of teaching programmes and activities. Some respondents from ex-KwaZulu colleges reported that they had not experienced any orientation or assistance when they had been appointed at the college, and, it would thus appear that they did not have the support of a programme to guide them in their tasks. The implication of this is that ex-KwaZulu colleges are unlikely to perform at a satisfactory level due to the absence of an effective induction programme [supported by the figures of examination results in Tables 36 - 40 which make it clear that ex-Natal colleges produce the best results]. These good results can, in part, be attributed to the fact that new lecturers are exposed to an effective orientation programme which familiarises them with the work and with the expectations of the colleges.

4.9.2 DISCUSSION REGARDING INDUCTION

Data in this category [Table 45] reveal that in all ex-department except in the ex-HOR lectures were orientated by Heads of Departments and Senior lecturers and most are also exposed to the training facilities of the college. From Table 45 it is obvious however, that induction is done much more thoroughly in the ex-Natal colleges than in the ex-KwaZulu colleges. The reason can be either that ex-Natal colleges have better funding or that they are better organised. It could also be that ex-DET, ex-Natal and ex-HOD colleges regard orientation of newly appointed lecturers as important and necessary for the effective teaching, learning and practical training of students at the colleges. Evident from Table 45 is that respondents [50%] from ex-HOR stated that no formal induction of newly appointed lecturers is carried out, instead an ordinary workshop for all lecturers is organised for the purpose of assisting new staff through providing information and also through exposure to other members of staff. It is likely that at this college induction receives fair attention.

4.10 PROBLEMS EXPERIENCED BY LECTURERS

TABLE 46: PROBLEMS EXPERIENCED BY LECTURERS [Table continues on the following page]

N = 20

PROBLEM	PERCENTAGES OF RESPONDENTS WHO MENTIONED THIS				
	EX-KWAZULU N = 6	EX-NATAL N = 4	EX-DET N - 4	EX-HOD N = 4	EX-HOR N 2
1. LACK OF TRAINING EQUIPMENT	83%	25%	50%	50%	0%
2. NO BACK-UP SYSTEM FROM EDUCATION DEPARTMENT	83%	25%	0%	0%	0%

N = 20					
PROBLEM	PERCENTAGES OF RESPONDENTS WHO MENTIONED THIS				
	EX-KWAZULU N = 6	EX-NATAL N = 4	EX-DET N - 4	EX-HOD N = 4	EX-HOR N 2
3. LACK OF ADEQUATELY TRAINED LECTURERS	50%	0%	50%	25%	0%
4. LACK OF FINANCIAL SUPPORT FOR FACILITIES	50%	0%	25%	25%	0%
5. STUDENT ABSENTEEISM	17%	100%	50%	25%	0%
6. LANGUAGE PROBLEMS EXPERIENCED BY STUDENTS	17%	75%	25%	50%	0%
7. STUDENT LACK OF MOTIVATION	33%	100%	50%	100%	0%
8. LACK OF MOTIVATION AMONG LECTURERS	100%	0%	25%	0%	0%
9. NO STAFF-DEVELOPMENT PROGRAMME	67%	25%	50%	25%	0%
10. OUTDATED AND IRRELEVANT CURRICULA	67%	75%	50%	50%	50%
11. OTHER - a] LACK OF POLICY GOVERNING THE PROCUREMENT OF EQUIPMENT	67%	0%	0%	0%	50%
b] LACK OF PLACEMENT PROGRAMME FOR STUDENTS	33%	0%	0%	0%	50%
c] LACK OF COMMUNICATION BETWEEN COLLEGES	33%	0%	50%	50%	50%
d] STUDENT INABILITY TO COPE WITH MATHEMATICS	67%	25%	50%	50%	0%
e] LACK OF EXCHANGE PROGRAMMES FOR STUDENTS	33%	25%	0%	0%	0%
Number of times when problems where mentioned in intervies	44	20	17	17	4

Table 46 is a reflection of problems experienced by lecturers from different ex-Departments. This type of information is obviously of special importance in order to identify constraints effecting the quality of teaching and practical training of students. Definite evidence of general problems experienced by college lecturers in their dealings with students, college management and senior management from the Department of Education can be gleaned from Table 46. Information, as given in this table, explains why certain colleges within KwaZulu Natal are unable to function effectively and efficiently.

4.10.1 COMPARISON BETWEEN EX-KWAZULU AND EX-NATAL COLLEGES

4.10.1.1 LACK OF TRAINING EQUIPMENT

The general pattern in Table 46 is that the majority of the respondents [83%] from ex-KwaZulu colleges as compared with 25% from ex-Natal colleges expresses the view that there is a lack of machinery and equipment for practical training. This seems to confirm that there is a shortage of teaching material and equipment for practical training of students in ex-KwaZulu colleges. Although this appears to be a general problem in a number of ex-Departments [ex-Natal 25%, ex-DET 50%, ex-HOD 50%], there is evidence to suggest that the problem is most serious in ex-KwaZulu colleges [83%]. This problem will be discussed in detail in Chapter 5.

4.10.1.2 LACK OF A BACK-UP SYSTEM

Table 46 highlights the fact that the majority of lecturers from ex-KwaZulu colleges express the view that there is a weak back-up system in their colleges. These lecturers are very concerned about the lack of support systems from the Department of Education to assist them to do their work effectively. Five of the six respondents from ex-KwaZulu colleges were adament that they were receiving very little support from the Department of Education. Where the Department of Education does not provide support systems for lecturers, these lecturers generally do not know whether they are doing good work or not. It does appear that ex-KwaZulu college lecturers expect a better back-up system from the Department of Education for them to be able to be efficient and effective in their duties, to be of benefit to their students and also for them to be able to adequately assess their functioning and student progress. The reason why the other ex-departments did not discuss this problem as pertinently as respondents from the ex-KwaZulu colleges may very well be that the ex-KwaZulu lectures trusted the interviewer more since he was Zulu like themselves, while the interviewees from ex-DET, ex-HOD and ex-HOR colleges may have been afraid to express thier views openly since they belonged to different cultures than the interviewer. The results of this item may, therefore, be biased.

4.10.1.3 LACK OF ADEQUATELY TRAINED LECTURERS

Table 46 indicates that 50% of the respondents from ex-KwaZulu and ex-DET colleges believe that there is a lack of adequately trained lecturers employed at their colleges. As shown before the perception that lectures are not properly qualified appears to be inccorect. What is, in fact lacking in ex-KwaZulu colleges is staff development and in-service training. The excellent examination results [Tables 36 - 40] in the ex-Natal colleges can be attributed to the fact that these colleges had adequate staff development programmes and a well-defined induction procedure [Table 43]. and not to the formal qualification of lecturers (see Table 42).

4.10.1.4 LACK OF FINANCIAL SUPPORT FOR FACILITIES

The figures in Table 46 indicate that 50% of the respondents from ex-KwaZulu colleges expressed dissatisfaction regarding the manner in which the Education Department allocate the budget to colleges. This has manifested as a serious problem as technical colleges need to buy and update training equipment and consumables, maintain buildings, service equipment and provide staff development. Insufficient financial support would obviously impact negatively on the learning and practical training of students. Ex-Natal colleges [0% - Table 46] do not appear to be experiencing the same financial constraints, as also the case with the ex-HOD [25%] and ex-DET [25%] colleges. This situation makes it possible for colleges from these three ex-Departments to budget for the purchasing and updating of equipment and are in a position to offer effective learning and training for their students.

4.10.1.5 STUDENT ABSENTEEISM

The fact that the majority [100%] of the respondents from ex-Natal colleges stated that students absent themselves from lectures reveals the gravity of this problem. Possible reasons for the absenteeism could be:

- many of the students are employed and this often prevents them from attending college regularly
- some students are not allowed to attend lectures because they have not paid their fees in full.

Table 46 clarifies that white lecturers in Ex-Natal colleges 100%] are more concerned about the problem than ex-KwaZulu lecturers [17%]. Absenteeism is confirmed in Tables 36 - 40 where it is evident that a considerable number of students from ex-Natal colleges were absent on days when they were expected to write examination. As shown in Table 46, 50% of the respondents from ex-DET and 25% from ex-HOD colleges maintained that there was a problem due to absenteeism. Naturally, continuous absenteeism from classes has a negative impact on student performance, especially when students to not write examinations [see Tables 36 - 40] because they were inadequately prepared.

4.10.1.6 LANGUAGE PROBLEMS

Difficulty experienced by students with English as a medium of instruction was reported by 75% of the respondents from ex-Natal colleges, whereas ex-HOD [50%], ex-KwaZulu [17%] and ex-DET [25%] expressed this problem to a lesser degree. The difficulty that students have in expressing themselves in English is exacerbated by the fact that they often cannot understand or interpret examination questions. This is an issue of more concern to lecturers who do not speak Zulu than to lecturers in ex-KwaZulu colleges who can speak to students in thier mothertongue, of necessary. When lecturers and students cannot effectively communicate, the teaching and learning performances are curtailed. One side-effect of the matter is that white , Indian and Coloured lecturers are unable to explain details to student in their own language and the students often do not understand the English used by lecturers.

4.10.1.7 LACK OF MOTIVATION AMONG STUDENTS

All ex-Natal and ex-HOD college respondents expressed conviction that students lacked motivation. They report that students are severely demotivated and not actively involved in their learning. Student demotivation was reported to a lesser degree by ex-KwaZulu [33%] and ex-DET [50%] lectures. Motivation involves the direction of behaviour, the strength of response and the persistence of the behaviour. It directs or channels behaviour in that it provides goal orientation. In order to maintain and sustain behaviour, the surrounding environment must reinforce the intensity and direction of individual drives or forces [Hoy and Miskel, 1991: 68]. Since one of these forces is empathy between students and lecturers, it may be that students are more motivated when they are taught by lecturers who belong to the same language group as themselves. Other possible explanations for lack of motivation among students may be due to circumstances where the environment of the college is not conducive to learning. In this case it could be that the college does not have adequate training equipment; there is a staff shortage; student riots; faction fights in the area or the teachers do not regularly attend class. Students are also frequently torn between attending college and working to pay for tuition and colleges give no direction, guidance or counselling to assist them in their dilemma.

In some colleges there is also a lack of safety and security. Finally, some students may become stressed and frustrated by their inability to perform well in courses due to language, Mathematical, Science and transport problems, as well as lack of parental support.

4.10.1.8 LACK OF MOTIVATION AMONG LECTURING STAFF

It is a sad fact that all the respondents from ex-KwaZulu colleges [see Table 46] reported that they are demotivated and do not have the strength or drive to teach. As the focus is on work behaviour, motivation is defined as complex forces, drives, needs, tension states or other mechanisms that start and maintain work-related behaviours toward the achievement of personal goals.

From ex-DET colleges, 25% of the respondents experienced the problem of lecturer demotivation. Factors which might have contributed to this problem are:

- ⇒ Insufficient learning material or equipment.
- ⇒ Colleges are not linked with industrial, commercial and agricultural enterprises which would supply information on the changing needs of employers.
- ⇒ Low teacher salaries.
- ⇒ No support from staff-development and in-service training programmes [Table 43].
- ⇒ Student demotivation [4.10.1.7].
- ⇒ Outdated and irrelevant curricula.
- ⇒ Inadequate financial support from the Department of Education.
- ⇒ Student inability to cope with the Science and Mathematics courses [Tables 36 - 40].

4.10.1.9 LACK OF STAFF DEVELOPMENT PROGRAMMES

Most of the respondents [67%] from ex-KwaZulu , 25% from ex-Natal, 50% from ex-DET and 25% from ex-HOD colleges [Table 46] reported that here is no effective staff development programme for college lecturers. This is clarified in Table 43 and makes clear that the problem is extensive in ex-KwaZulu colleges due to the large percentage of respondents who expressed dissatisfaction because they felt that there were no development programmes for capacity building which means that students in turn do not receive quality training or teaching. A major concern of the lecturers is the adverse effect that this has on the examination results as reflected in Tables 36 -40.

4.10.1.10 OUTDATED AND IRRELEVANT CURRICULA

That most of the respondents [ex-KwaZulu 67%, ex-Natal 75%, ex-DET 50%, ex-HOR 50%, ex HOD 50%] consider the curricula to be outdated and irrelevant is obvious from the data in Table 46 .

According to the respondents, the updating of a programme of study is easier if it presented in modular form. According to staff from these colleges, modular programmes have the advantage of allowing flexible time for self-learning and for rapid responses to some specific and new training needs. Respondents, agree that technical colleges need to adopt a strategy that will:

- ★ improve and accelerate the flow of information to technical and vocational institutions regarding the work prospects and training needs of employers
- ★ decentralise decision making regarding curricula content to provincial or to individual institutions, and
- ★ encourage colleges to establish closer cooperation with various industrial and business enterprises inorder to meet their training needs. Instead of simply being regarded as "course providers", staff wish that technical colleges become "flexible learning service providers"

4.10.1.11 LACK OF POLICY GOVERNING THE PROCUREMENT OF EQUIPMENT

A further problem relates to the lack of a policy governing the procurement of both consumable materials and training equipment. Respondents from ex-KwaZulu (67%) and ex-HOR (50%) seem to believe that there is no well defined policy governing the provision of training to colleges [Table 46]. This is a more serious concern in these colleges in the other ex-departments. The lack of policy has led to some colleges receiving the required equipment whilst others remained unsupplied.

4.10.1.12 LACK OF PLACEMENT PROGRAMMES FOR STUDENTS

Table 46 shows that 33% of the respondents from ex-KwaZulu and ex-HOR colleges maintain that they do not have placement programmes for students. Reasons for this include:

- ✗ Lack of collaboration or working relationship between colleges and the private sector
- ✗ Due to financial constraints no effective apprenticeship programme is offered by industries to students after they have completed their NTC- 1-6 programmes.

Consequently, after the completion of their training, students are unable to find firms or companies that will admit them to an apprenticeship programme which will enable them to qualify for the trade diplomas they seek. In this respect ex-KwaZulu and ex-HOR college students are less advantaged due to their limited exposure to these opportunities. This situation has dire implications for the future as the required trade diploma certificate is only issued by the South African Certificate Council to students who have completed an apprenticeship and students are only able to obtain employment in their desired field after obtaining this certificate.

4.10.1.13 LACK OF COMMUNICATION, WORKING RELATIONSHIPS AND MERGING BETWEEN COLLEGES

A serious problem which emerged from the study is that which relates to the poor communication between the different racial groups in colleges. Respondents from ex-KwaZulu [33%] and ex-HOR (50%) staff are of the view that many of the problems which they experienced at their colleges could be attributed to poor working and communication relationships between various colleges. They experience the brunt of the fact that technical colleges in KwaZulu-Natal do not share their resources, expertise, skills and knowledge and that communication at any meaningful level does not exist.

The strategy concerning the rationalisation of resources in technical education works on the basis that colleges within a certain radius share lecturers, physical as well as other resources in the provision of education and training. This is a system of specialisation in certain areas of provision and thus eliminates the multiplicity of resources. It also neutralises the problem of under and over provision of facilities and resources, still a legacy of apartheid.

The 33,3% responses from ex-KwaZulu and (50%) from ex-HOR see Table 46, Item 11 (c) seem to confirm that the system to rationalise resources [human, building, financial, machinery and equipment] and to ensure the efficient and effective delivery of education and training leaves much room for improvement. These problems must be regarded in a serious light when considering that ex-KwaZulu colleges are not yet adequately equipped (see Chapter 5).

4.1.10.14 STUDENT INABILITY TO COPE WITH SCIENCE AND MATHEMATICS

Result of the interviews with senior staff [see Table 46, Item 11 (d)] show that two-thirds of the respondents from ex-KwaZulu and a quarter of the respondents from ex-Natal colleges are of the view that the majority of the students lack the necessary grounding in Science and Mathematics, a view supported by 50% of the respondents from ex-DET and ex-HOD colleges. This deficiency in grounding is evident from the examination results as given in Tables 38 and 40.

Unfortunately, Science and Mathematics are fields in which the present systems for the provision of secondary and tertiary education do not always succeed in providing for the needs of the country. Research has shown that these subjects have become unpopular amongst the Black community and that, for a considerable time now, there has been a sustained decrease in the percentage of Bachelor's degrees awarded in these subjects. Explanations for this include:

- shortcomings in the syllabi

- inappropriate training of teachers and teaching methods
- inadequate laboratory equipment
- problems experienced in the understanding of the content, especially where this involves cultural transition
- inadequate guidance in respect of subject fields of study and vocational choices
- the relatively poor earnings of scientists
- poor achievements of pupils and students.

What has come to the fore in this study is that students, by the time they embark upon their college education for the Engineering courses [Electrotechnology, Motor Trade Theories, Engineering Science, Mathematics and Drawing, Technology, etc] are deficient in the required Science and Mathematics qualifications and this impacts negatively on their results.

4.1.10.15 LACK OF EXCHANGE PROGRAMMES FOR LECTURERS

Viewing Table 46 [item 11(e)] shows that 33,3% of the respondents from ex-KZ and 25% from ex-Natal stated that they experience a shortage of teacher exchange programmes which involve the private sector. These respondents perceived that there is no working collaboration with industry. Consequently, lecturers are concerned that this situation will impede the learning progress of their examination students.

4.10.2 DISCUSSION REGARDING LECTURERS' PROBLEMS

The qualitative data provided by Table 46 is evidence that Ex-KwaZulu technical colleges lack:

- training equipment
- back-up systems
- adequately trained lecturers
- financial support from the Department of Education
- staff-development programmes
- meaningful communication and efficient working relationships between colleges
- close links and working relationships with commerce and industry
- students who are without the necessary background in Science and Mathematics
- placement programmes
- updated and relevant curricula
- policies governing the procurement of equipment and consumables for the practical training of students.

f technical colleges are uncertain about the policies of the Department regarding the procurement of training equipment and other related matters, then the lack of effective communication between the Department of Education and the

- inappropriate training of teachers and teaching methods
- inadequate laboratory equipment
- problems experienced in the understanding of the content, especially where this involves cultural transition
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- policies governing the procurement of equipment and consumables for the practical training of students.

If technical colleges are uncertain about the policies of the Department regarding the procurement of training equipment and other related matters, then the lack of effective communication between the Department of Education and the colleges must be seen as a major constraining factor which is likely to impact negatively upon the future of technical colleges. What was also revealed by the average responses per college in Table 46 is the fact that ex-KwaZulu staff experience more problems than the staff of the other colleges. Such a high percentage of problems at ex-KwaZulu colleges [Table 46] compared with those experienced by ex-Natal and other ex-departments does not ensure effectiveness and efficient delivery of education and training.

TABLE 47: <u>SUGGESTIONS FOR IMPROVEMENT</u>

N = 20

SUGGESTION	PERCENTAGE OF RESPONDENTS WHO MENTIONED THIS				
	EX-KWAZULU % N = 6	EX-NATAL % N = 4	EX-DET % N = 4	EX-HOD % N = 4	EX-HOR % N = 2
1. INCREASE BUDGET	83	50	75	25	0
2. IMPROVE TRAINING FACILITIES	67	25	25	0	100
3. STAFF DEVELOPMENT AND IN-SERVICE TRAINING	100	100	100	100	100
4. INDUCTION PROGRAMME	67	25	50	50	50
5. PARTNERSHIP/LINK WITH INDUSTRY	67	50	50	50	50
6. CLOSE WORKING RELATIONSHIP WITH OTHER COLLEGES OR MERGING WITH OTHER COLLEGES	33	-	50	25	0
7. IMPROVE QUALIFICATIONS OF LECTURERS	83	50	50	25	0
8. OTHER a] PLACEMENT OF STUDENTS	33	-	-	-	50
b] PRINCIPAL TO BE PART OF DECISIONS MADE BY DEPARTMENT	50	-	-	-	-
c] MARKETING OF TECHNICAL COLLEGES TO THE PUBLIC	33	50	25	25	50
d] UPDATE TRAINING MACHINERY	67	25	50	50	-
e] TEACHER SALARIES TO BE IMPROVED	33	25	25	50	50
f] CONTROL BY SUBJECT ADVISORS	17	-	0	0	0
Number of times when suggestions were mentioned during interviews	43	15	18	14	7

4.11 <u>SUGGESTIONS FOR IMPROVEMENT</u>

4.11.1 <u>GENERAL TRENDS REGARDING VIEWS ON IMPROVEMENT</u>

The general feeling from ex-Departments is that the Department of Education [Table 47] should provide substantial budget allowances so that colleges can upgrade their facilities which are necessary for training and thereby produce better equipped students for the industry. Through the provision of adequate financial support, colleges will be able to update their training equipment, purchase consumables and also avail a budget for practical projects and models.

Many respondents [43%] from all ex-Departments [Table 47, Item 2] expressed of the opinion that there is a need to improve training facilities. It is apparent that many staff in colleges are dissatisfied with the degree to which their institutions are equipped.

Every respondent [100%] (100% - see Item 3) expressed a desire for well-defined staff development and in-service training programmes. If technical institutions are to address the human resource and manpower predicaments which the country faces, then it would be necessary to offer these programmes which would contribute towards the professional status of technical and vocational education. Each respondent [100%] from the colleges included in the study believed that, for teaching, managerial and administrative personnel to be able to participate effectively in the running of their institutions, staff at all levels need to be provided with exposure to continuing upgrading and development opportunities. As it is regarded that the resources of any nation are the talents, skills, creativity and the will of the people, it is therefore imperative that, if South Africa is to advance and keep pace with countries leading in technology, new vision needs to focus on capacity building and support programmes.

Table 47 also provides evidence that colleges from the ex-Departments opined that induction programmes for lecturers, which are intended to form a link between colleges and industries, as well as providing a means of communication between colleges, have failed to fulfil their aims and need to be improved in order to benefit the students. Knowledge and practical experience can be improved through links between technical and vocational education institutions and industry and commerce, providing facilities for in-service programmes which give ample opportunity for training and updating in the work situation.

UNESCO [1990: 28] argues that "developing countries, which are currently becoming urbanised, are frequently concerned with training a multi-skilled work force to meet their changing labour market needs, which may result from the establishment of large-scale industries. This has implications for technical and vocational education in terms of both curriculum content and teaching methods." They further state that "some countries have developed curricula linked with periodic evaluation and programme revision relevant to changing industrial and commercial needs." The link or co-peration between technical colleges and industries/commercial institutions [Table 47] will increase the relevance of technical education to the industry and provide good opportunity to meet industrial standards.

It appears from Table 47 (item 7) that a fair number of interviews expressed the view that there is an obligation on the part of the Department of Education to provide viable means for the upgrading and advancement of qualifications of lecturers.

Shown in Table 47, ex-Departments detail the following areas for improvement:

- placement of students [17%]
- principals to be part of decisions made by the Department [10%]

- marketing of technical colleges [37%]
- updating of training programmes [38%]
- teacher salaries to be improved [37%]
- control of budget by Subject Advisors [3%].

Arising from their comments on how participation by principals in decision making could be enhanced [Table 47], the majority of the respondents seem to think that the following points were important:

- the Department should take the initiative by creating opportunities for the principals to become involved;
- there should be wide consultation with principals on all curriculum matters including syllabus, selection of text books, appointment of examiners, markers, the manner in which the results are issued to colleges, allocation of budgets, formulation of college policy, changing and updating of college programmes, adjustment of teacher salaries and withdrawal of certain courses from the lists of courses to be offered by colleges;
- principals need to be accorded professional recognition.

4.11.2 COMPARISON BETWEEN EX-KWAZULU AND EX-NATAL COLLEGES

4.11.2.1 INCREASE BUDGET

The situation reflected in Table 47 [Item 7] reveals that the majority of respondents [83%]from ex-KwaZulu colleges compared with ex-Natal colleges [50%] felt that the Department of education needs to increase the budget. One reason forwarded for this is that the ex-KwaZulu and ex-DET colleges do not have adequate resources for their needs - including training and equipment.

4.11.3 IMPROVE TRAINING FACILITIES

Comparatively speaking, Item 2 from Table 47, sets forth that respondents from ex-Natal colleges [25%] and ex-DET [25%] colleges are not yet desperately in need of additional training facilities, when compared with ex-KwaZulu (67%) and ex-HOR (100 %) colleges, where the need is dire and cause for grave concern. Contributing towards this situation is the fact that ex-KwaZulu colleges lacked policy governing the procurement of equipment and consumables. It may therefore be necessary to give priority to the improvement of training facilities in ex-KwaZulu and ex-HOR colleges for the benefit of staff and students as well as to enhance examination results.

4.11.4 STAFF DEVELOPMENT AND IN-SERVICE TRAINING

With regard to Table 47 (Item 3) it was interesting to observe that all respondents [100%] interviewed were in agreement that staff development and in-service training programmes need to be designed and implemented, taking into account the needs of the lecturers. Suggested aims to be included in consideration of these programmes include:

- to update teachers' knowledge base as well as their teaching methods and use of audio-visual aids;
- the need to orientate teachers with regard to revised syllabi and policy changes;
- the need to perpetuate a "National Policy" on technical education and to ensure that certain norms and standards are maintained;

4.11.5 INDUCTION PROGRAMMES

Most of the interviewees, ex-KwaZulu 67%, ex-Natal 25%, ex-DET 50%, ex-HOD 50% and ex-HOR 50%, are eager to experience successful induction programmes for both staff and students. This is important if one considers the fact that newly appointed lecturers need orientation with regard to the syllabus, college policies, workshop operation, teaching methods, testing programmes, control of equipment and other conditions of service.

4.11.6 LINK WITH INDUSTRIES

According to the statistics of Table 47, 67% of the respondents from ex-KwaZulu, 50% ex-Natal, 50% ex-DET, 50% ex-HOD and 50% ex-HOR colleges, expressed the view that there must be a link between technical colleges and industries and commercial institutions. This link or working relationship will offer industries a chance to make a preliminary selection of future employees from amongst the students on work placements. Such links will further expose lecturers to all changes occurring withing industries and help to update their knowledge, skills and expertise.

4.11.7 MERGING OF COLLEGES

One-third of the respondents from ex-KwaZulu, half from ex-DET and a quarter of those from ex-HOD colleges are anxious for the system of merging colleges to be effective. One benefit which would result from merging is that lecturers from ex-KwaZulu colleges would be better positioned to access resources from colleges of other racial groups as a vast number of these colleges are inadequately equipped.

4.11.8 IMPROVE QUALIFICATIONS OF LECTURERS

Evident from Table 47 is that the majority of respondents [83% - ex-KwaZulu, 50% ex-Natal and ex-DET, 25% - ex-HOD] express that qualifications of lecturers need improvement. Lecturers from ex-KwaZulu colleges displayed desperation for a mechanism that would assist in improving their qualifications, knowledge, skills and abilities.

4.11.7.1 PLACEMENT OF STUDENTS

In examination of the percentage of the responses, it is clear that ex-KwaZulu and ex-HOR colleges find it necessary to have a revised placement programme for students [Table 47] as these colleges did not have well-defined placement programmes.

4.11.7.2 PRINCIPALS TO PARTICIPATE IN THE DECISION MAKING PROCESS BY THE DEPARTMENT OF EDUCATION

As depicted in Table 47, 50% of the interviewed staff from ex-KwaZulu colleges thought it vital that principals be included in decision making to a greater degree. Increased participation would result in principals having a greater say in the allocation of the budget and details regarding the college curricula and this collaboration would lead to the elimination of some of the problems they presently experience which hamper the smooth running of their institutions.

4.11.7.3 MARKETING OF TECHNICAL COLLEGES

The fact that the larger community is frequently ignorant of the possible courses and opportunities offered by technical colleges is borne out by the responses in Table 47 [33% - ex-KwaZulu, 50% ex-Natal; 25% - ex-DET and ex-HOD and, 50% ex-HOR colleges]. These respondents considered it necessary that the marketing of their institutions be upgraded and broadened. The general perception of the public is that technical colleges are far inferior to other tertiary institutions and that they do not cater for students of higher intellect and ambition and only provide a second-class future for low achievers. As a principal, the researcher experienced this attitude when potential students had to select an institution for further study, and technical colleges barely received serious consideration. This erroneous view exacerbates the urgency for colleges to be marketed correctly and widely in order to inform all communities of the true and real situation and of the contribution technical colleges make in all aspects of the advancement of South Africa.

4.11.7.4 UPDATE TRAINING MACHINERY

To varying degrees [67% ex-KwaZulu, 25% ex-Natal, 50% ex-HOD and ex-DET], approximately forty percent of respondents concurred with the need to have the training machinery and heavy equipment updated for the effective practical training of students [see Table 47 and also Chapter 5]. This necessary updating has been brought about due to the fact that ex-KwaZulu has been unable to replace equipment which has become obsolete in the context of rapid technological advances, thus disenabling them to provide students with the training which they expected and which the colleges promised. Such a situation has led to these colleges losing credibility, to a drop in student numbers due to poor reputation and therefore, to a further decrease in funding. It is obvious that to rectify the situation, that they have to acquire, the better equipment in order to fulfil their promises and achieve thier aims.

4.11.7.5 TEACHER SALARIES TO BE IMPROVED

The opinion was forwarded [ex-KwaZulu (33%) and ex-HOD 50%; ex-Natal (25%), ex-DET (25%) and ex-HOR 50%] that, if teacher salaries were to be improved, this would assist in curbing the outflow of lecturers who are attracted to other jobs by industries or the private sector where the salaries are higher and where there are more benefits and support systems.

This aspect was dealt with in depth in the analysis of Table 44.

4.11.7.6 CONTROL OF SUBJECT ADVISORS

Half of the respondents from ex-KwaZulu colleges stated that they would prefer it if the subject advisors were under the control of the Department. From experience as a college principal, the researcher has witnessed that some subject advisors tended to manipulate, abuse and threaten principals in order to realise their demands. Such manipulation has included nepotism and preferential treatment of some principals by subject advisors, especially in the area of budget allocation, servicing of equipment, filling of teaching posts and in other matters related to the control of colleges. This situation has led to some colleges being better staffed and equipped than others and it is therefore necessary to have subject advisors under the control of the Department of Education, with strict guidelines to ensure that all colleges are treated equally.

4.12 DISCUSSION REGARDING VIEWS ON IMPROVEMENT

With reference to the first item in Table 47, namely an increase in budget, it is not surprising that a large percentage (47%) of interviewees indicated that they desired that the conditions at their colleges be improved. Such improvements can only be brought about by an increase in the budget as the present allocation is insufficient and prevents colleges from updating facilities and from running the college effectively.

That every respondent wanted the staff-development and in-service training programmes improved is an indication that, despite changes in education, the Department of Education has continued to ignore this problem. Obvious from this section of the study is that ex-KwaZulu colleges are not performing well [see examination results in Tables 36 - 40] due to the constraints referred to above in 4.5 [Table 43] as well as an inadequate budget. One has to assume that constraints of such a nature impact adversely upon the quality of student abilities and skills.

The item reflecting the average response per college shows that 56% of the interviewees from ex-KwaZulu colleges wanted all areas listed in Table 47 to be improved, and staff from the other ex-Departments concurred. In to many of these views consideration of how these improvements could be implemented, the following points were raised:

- the KwaZulu Natal Education Department should take the initiative by creating opportunities for principals to become involved in decision making, budget allocation and designing of capacity building programmes for lecturers

- there should be wider consultation with principals on all curriculum matters, including the syllabus. Consultation needs to be extended to include industries, commercial institutions and other stake holders.

4.13 CONCLUSION

From the findings discussed in this chapter, it became clear that the number of constraints which colleges face have negatively affected the quality of learning and the practical training of students at technical colleges. Unless these constraints are addressed, there can be no improvement, especially at ex-KwaZulu colleges. At present there is no effective mechanism in place for development of any kind and this is affecting the morale and motivation of the staff and the students as well as the reputation of all technical colleges and technical education.

CHAPTER 5

RESULTS OF EMPIRICAL STUDY: EQUIPMENT

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CHAPTER 5

RESULTS OF EMPIRICAL STUDY: EQUIPMENT

5.1 INTRODUCTION

In a teaching and learning situation where there is a shortage of training equipment, tools, machinery and teaching aids for the practical training of engineering students, it is apparent that the transfer of theory into practice is hampered. Training equipment for the practical training of students, as well as teaching aids such as drawing tables, T-squares and models, contribute greatly to ensuring that what students have learnt at colleges can be applied meaningfully in life's endless variety of problem situations. It is also true that what engineering students learn from workshops and laboratories is retained for a longer period if their learning is based on actual concrete representations.

The National Integrated Training and Education Project [NITE: 1996: 3] states that equipment and diagnostic aids are important to strengthen and support the theoretical courses offered in key technological and engineering related fields. NITE [1996: 3] further indicate that technical colleges need to modernise, upgrade and expand their range of practical training equipment and machinery in order to improve their responsiveness to the needs of industry and their ability to keep pace with technological developments. NITE [1996: 3] argue that training in modern engineering and technology skills is currently seriously neglected at both technical colleges and training centres. This is mainly due to lack of suitable training equipment and didactic aids to facilitate such education and training. It is thus recommended that the supply of relevant engineering and other technological training equipment should be accepted as top priority. The information provided by NITE is highly relevant to KwaZulu Natal colleges as the supply, upgrading, updating and relevance of equipment make a considerable contribution towards improving the quality of training.

This chapter outlines the data collected from nineteen principals who completed a questionnaire [questions 8 – 13 see Appendix A] regarding training equipment at technical colleges. The focus is on:

- relatedness of equipment and accreditation
- exemplification of equipment needed
- didactic rationale for the need of equipment
- perception of principals regarding equipment
- results of inventory

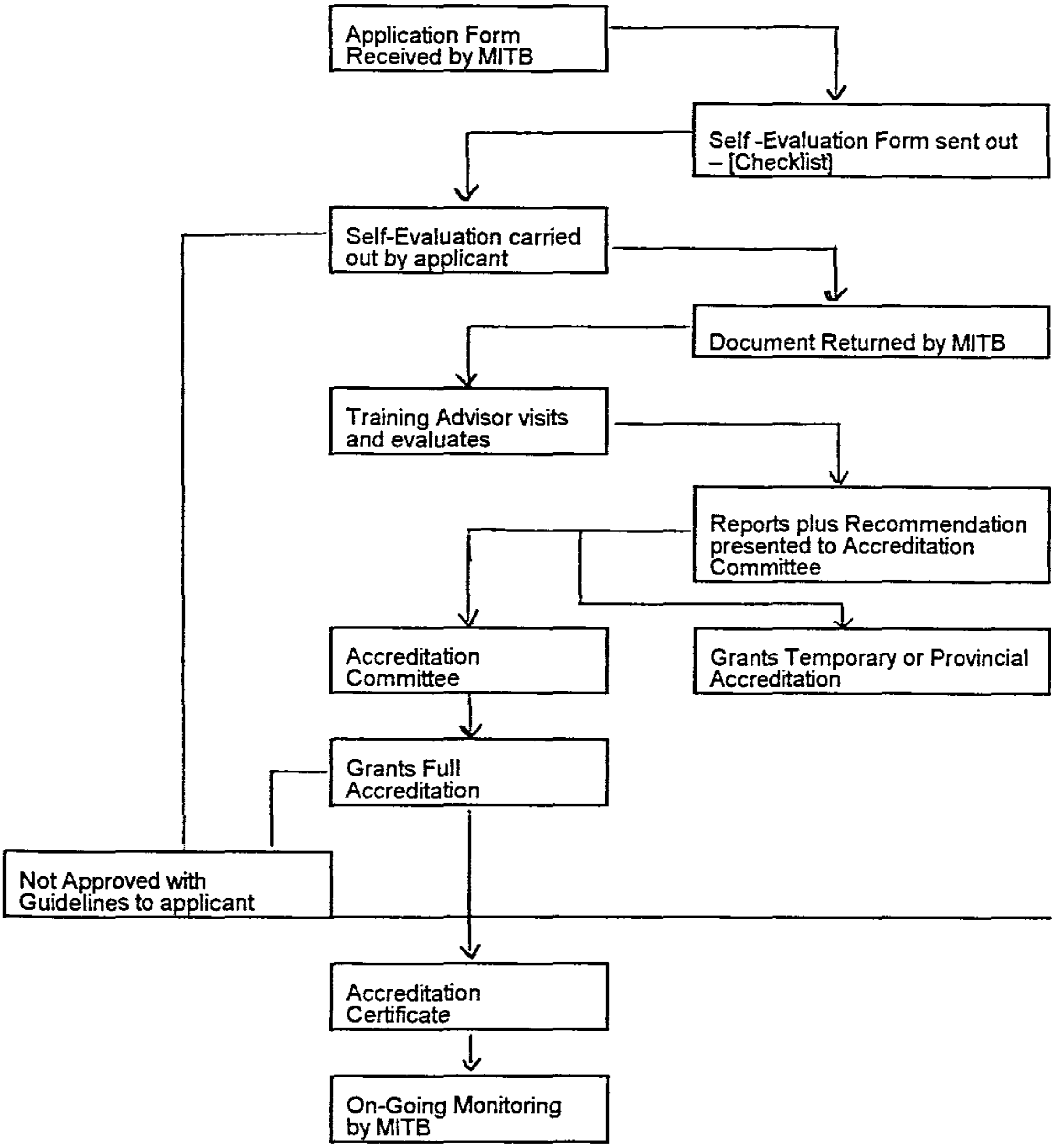
- comparison between principals' perceptions and inventory, and
- principals' priorities.

5.2 RELATEDNESS OF EQUIPMENT AND ACCREDITATION

The writer has used the MITB as an examply only, to explain the accreditation process. In other trades the process works in a similar way. The term accreditation means that the establishment needs to meet the requirements as determined by the Motor Industry Training Board [MITB] in order to carry out training in terms of the Competency Based Modular Training [CBMT]. These institutions can be technical colleges, training centres and employer establishments or any other institution which meets the MITB's requirements.

Training institutions and employers who want to train apprentices according to the CBMT system are expected to apply formally for accreditation to the MITB. The accreditation process goes as follows:

THE ACCREDITATION PROCESS



Source: Motor Industry Training Board
The New CBMT System
Vol. 1 No. 1 July 1996

To get accreditation a college must:

- be adequately equipped.
- have up-to-date tools, equipment and machinery, and
- meet each standard as required by MITB.

According to the system followed by the National Qualifications Framework [NQF] and the South African Qualification Authority [SAQA], accreditation must come from the MITB. NITE [1996: 3] states that within the framework of NQF and SAQA there is a need for an integrated education and training system. Presently the suppliers of technical and vocational education and training services are functioning in isolation.

In 1995, the National Qualifications Framework Bill was passed, finalising the establishment of a National Qualifications Framework [NQF] for South Africa. According to the Bill, the objectives of the NQF are to:

[a] create an integrated national framework for learning achievements;

[b] facilitate access, mobility and progression within education and training; and

[c] enhance the quality of education and training.

In terms of the Bill, the South African Qualifications Authority was established to:

- oversee the development of the NQF and formulate and publish policies and criteria for

  1] the registration of bodies responsible for establishing education and training standards or qualifications; and

  2] the accreditation of bodies responsible for monitoring and auditing achievements in terms of such standards or qualifications.

- oversee the implementation of the NQF including:

  1] accreditation of bodies referred to in the above point and the assigning of functions to them;

  2] the registration of national standards and qualifications;

  3] steps to ensure compliance with provisions for accreditation; and

  4] steps to ensure that standards and registered qualifications are internationally comparable. [Department of Education, June 1996, NQF, Working Document: PP 2-6].

NITE [1996: 3] further argue that this system of training requires:

- upgrading of facilities and the supply of equipment to colleges
- colleges to adhere to strict guidelines and training contracts aimed at meeting the training needs,
- that training institutions will require the correct infrastructure and capacity to offer earmarked/contracted training.

Employers and training institutions, including technical colleges who intend to train apprentices according to the Competency Based Modular Training [CBMT] system, must be accredited by the MITB. The modular testing is done in-house at the various Training Institutions/Employer Establishments whilst the level testing is done at MITB accredited venues throughout the country. For every module and level test, the apprentice is allowed three attempts within a predetermined period. If the apprentice fails a module or level test on the third attempt, her/his contract of apprenticeship is cancelled.

When an apprentice has passed the level test of the final level of a trade, she/he is deemed to then be a qualified artisan and a National Certification to that effect is issued to her/him by the MITB and this certificate is co-signed by the Department of Labour.

The system is based solely on specific and precisely stated skills outcomes [usually called competency] which are provided in terms of NQF and SAQA and which have been verified as being important for successful employment in the occupation for which the apprentice is being trained. What is also required by the system is that each individual apprentice needs to perform each task to a pre-determined level of proficiency in a job-like setting before receiving credit for succeeding at each task.

The MITB only gives accreditation to colleges which adhere to CBMT, a system of training which allows an individual to reach her/his natural level of competency with the aid of clearly identified procedural steps at her/his own pace [within reason] [The new CBMT system, Volume 1 No. 1, July 1996: 4].

The Human Science Research Council [HSRC]/National Training Board [NTB] describes MITB as: A system which is designed to enable individuals to achieve a defined level of competence in performing job related tasks [The New CBMT System Volume 1 No. 1 July 1996: 4].

5.2.1 THE DIFFERENCE BETWEEN THE OLD SYSTEM AND THE COMPETENCY BASED MODULAR TRAINING SYSTEM

OLD SYSTEM	CBMT SYSTEM
System is time based	a) System is based on performance outcome.
In the event of an apprentice not completing his/her prenticeship, he/she will be put on the street with no mal recognition of experience gained.	b) In the event of an apprentice not being able to pass a level test, he/she will be certificated on a lower level of competency with recognition for modules successfully completed.

OLD SYSTEM	CBMT SYSTEM
) System is usually based on textbooks, reference ıaterial, course outlines or other resources removed from ıe occupation itself.	c) System is based solely on specific, precisely stated skills outcomes (usually called competencies or tasks) that have been recently verified as being essential for successful employment in the occupation for which the apprentice is being trained.
) System relies primarily on the instructor to ersonally deliver most of the instructions through live emonstrations, lectures, discussions and other instructor-entred learning activities. Apprentices have little control ver the pace of instruction.	d) System provides apprentices with high quality carefully designed, apprentice-centred learning activities, media and materials designed to help them master each task. Materials are organised so that each individual apprentice can stop, slow down, speed up or repeat instruction as needed to learn effectively. An integral part of this instruction is periodic feedback throughout the learning process with opportunities for apprentices to correct their performance as they go.
) System usually requires a group of apprentices to pend the same amount of time on each unit of instruction.	e) System provides each apprentice with enough time (within reason) to fully master one task before being allowed to move onto the next.
System relies heavily on paper and pencil tests and ach apprentice's performance is usually compared to the roup norm.	f) System requires each individual apprentice to perform each task to a predetermined level of proficiency in a job-like setting before receiving credit for attaining each task.

5.2.2 MOTOR INDUSTRY TRAINING

[The New CBMT System, Volume 1 No. 1 July 1996: 5].

The system functions as follows:

- The fourteen designated trades in the Motor Industry are divided into a number of levels, ranging from two levels to four levels, depending on the course content of a particular trade.

- A level consists of a number of modules, each module having to be mastered by the apprentice within a predetermined period before she/he can progress to the next module [This is referred to as Modular Training].

- Once all the modules have been successfully completed, the apprentice must spend a predetermined period in the work place of an employer to gain experience in the modules completed. This is referred to as on-the-Job-Training [O.J.T.].

- When all modules, and the O.J.T. have been completed, the apprentice is then eligible to do the level test for that level.

- If successful with the level test, the apprentice progress to the next level of training and follows the same procedure until all the levels for that trade have been completed. [The New CBMT System: Vol. 1 No. 1 July 1996: 5].

Unesco [1990:28] is of the opinion that a modular training programme increases the relevance of technical and vocational education to industry and provides a good opportunity to meet required industrial standards even at training stage.

This situation gives technical colleges an opportunity to update the curriculum so it is relevant to actual needs. Unesco also believe that the updating of programmes of study is easier when it is presented in modular form. Modular programmes of study have the added advantage of allowing flexible time for self-learning and rapid responses to some specific and new training needs [Ibid 1990: 28].

5.2.3 THE KWAZULU NATAL [KZN] COLLEGES AND MITB

This study has established that, at present, very few KZN Colleges are registered with MITB. The reason for this is the fact that colleges are unable to meet the requirements as determined by the MITB. What is noticeable from this study is that most KZN colleges follow the old system, excepting for colleges 1 and 21 i.e. one from Ex-HOD and one from Ex-DET. Even the Ex-NED colleges are not accredited because they, like the others in KZN, do not meet the requirements, including equipment. At colleges 1 and 21 MITB is followed as these institutions are adequately equipped and capable of updating and maintaining all tools and machinery but no other college can reach this standard and one of the main reasons is the alleged deficiencies related to equipment.

5.3 EXEMPLIFICATION OF EQUIPMENT NEEDED

To get to grips with problems related to equipment at technical colleges, it is useful to look at specific equipment needed. But to list all equipment from all study fields is too cumbersome and unnecessary. It is essential to indicate that technical colleges offer programmes [courses] in the following six vocational fields of study:

MAIN FIELDS		SUB-FIELDS
Engineering studies	:	Chemical, Civil, Mechanical, Electrical and Electronics and Industrial
Business Studies	:	Secretarial Management, Accounting, Public Administration
Agriculture	:	Agriculture Management, Agriculture Engineering
Utility Services	:	Clothing, Food Services, Interior Decorating, Hair Care and Cosmetology
Social Services	:	Care of children, Care of the Aged, Care of the Handicapped, Educare
Arts	:	Visual Arts, Performing Arts

Therefore, to avoid vagueness and to illustrate what is meant by the term equipment, only two study fields from Engineering are used in this chapter as examples to illustrate the types of equipment a college needs if it is to offer effective training. The fields of Motor Mechanics and Electrical Trades have been chosen. The following are some of the workshop equipment needed for these two study fields:

TABLE 48: <u>SAMPLE LISTS OF WORKSHOP EQUIPMENT NEEDED IN TWO STUDY FIELDS</u>

NO.	MOTOR MECHANIC WORKSHOP EQUIPMENT & CONSUMABLES REQUIRED	NO.	ELECTRICAL TRADE WORKSHOP EQUIPMENT & CONSUMABLES REQUIRED
1.	Arc Welding Machines	1.	Ballpein Hammers
2.	Battery Charger	2.	Bradawl
3.	Beam Headlight	3.	Bolts Soldering (Medium)
4.	Brake Bleeder	4.	Cable Extention (Heavy Duty)
5.	Braking AModle à	5.	Cable Smear
6.	Feeler Gauge	6.	Clamp Metre (Robin)
7.	Carburettors	7.	Chisel Cold 15 mm
8.	Computers in the workshops	8.	Combination of Spanners
9.	Cylinder Leakage Tester	9.	Computers in the Workshops
10.	Dial indicators vernier	10.	Conduit Dies
11.	Diffs	11.	Crimping Tools
12.	Display boards for engine parts	12.	Carpenters Brace
13.	Distributor Tester (Machine)	13.	Digital Multi Metre
14.	Electrical Drilling Machines	14.	Dividers
15.	Engine Compression Tester	15.	Drill (Hammer) size 13 mm, 16 mm etc.
16.	Engine stand for handling engine block whil repair	16.	Drill Sets
17.	Gearboxes Automatic & Manual	17.	Drill Press
18.	Hacksaws	18.	Dust Pole Tester
19.	Hand Files	19.	Engineer Squares
20.	Hydraulic Press for Bearings	20.	File Double Cut (250 mm) (Hard File)
21.	Hydraulic Trolley Jack	21.	File Round Cut (100 m)
22.	Hydrometer	22.	Fixed Hook Bender
23.	Injector Nozzle Tester	23.	Fish Tape
24.	Jacks	24.	Frequency Counter
25.	Lubrication System	25.	Gas Pliers
26.	Micrometers 0-100 mm	26.	Grindes
27.	Oxy-Acetylene Set	27.	Grindes Benches
28.	Pneumatic Tools Wheel nuts etc.	28.	Hacksaw
29.	Pressure Tester	29.	Hammer (4 pound/500 g)
30.	Radiator Pressure Testing Kit	30.	Heat Gun

NO.	MOTOR MECHANIC WORKSHOP EQUIPMENT & CONSUMABLES REQUIRED	NO.	ELECTRICAL TRADE WORKSHOP EQUIPMENT & CONSUMABLES REQUIRED
31.	Ring Expander	31.	Iron Soldering
32.	Ring Squeezer	32.	Insulation Tester
33.	Running Diesel Engines	33.	Jacksaw Junior
34.	Running Petrol Engines	34.	Loose Hook Bender
35.	Scribes	35.	Metres (OM 50 Robin)
36.	Spring Clamps	36.	Meters (OM 92 Robin)
37.	Steel Rules	37.	Meters (OM 2000 Robin)
38.	Straight edges	38.	Meters (OM IIIV Robin)
39.	Squares	39.	Overhead Project
40.	Tachometer	40.	Plier Combination
41.	Taps and Dies	41.	Plier Diagonal
42.	Testing Kits for different things	42.	Plier Long Nose
43.	Timing lights	43.	Plier Water Pump
44.	Tyre changing machine	44.	Pipe Wrenches
45.	Tools & Spanners	45.	Pipe Vice
46.	Torque Wrenches (5 - 225 nm)	46.	Portable Grinder
47.	Trestles	47.	Punch Set Centre
48.	Valve Grinder Machine	48.	Ruler Steel
49.	Video & Television in the Workshop	49.	Screw Drivers Set
50.	Welding Aprons	50.	Scriber
51.	Welding Gloves	51.	Shifting Spanner 300 mm
52.	Welding Goggles	52.	Side Cutter
53.	Wheel Balancing Machine	53.	Step Ladders 2m
54.	Workbenches with vice Robin Engines and holes for fitting engines	54.	Strings Bending
55.	Workstation with Diagnostic (Machine) equipment for checking spark, timing & distributor	55.	Spirit Levels
56.		56.	Stripper Wire
57.		57.	Tap and Die Set
58.		58.	Tin Snip

NO.	MOTOR MECHANIC WORKSHOP EQUIPMENT & CONSUMABLES REQUIRED		NO.	ELECTRICAL TRADE WORKSHOP EQUIPMENT & CONSUMABLES REQUIRED	
59.			59.	Universal Pipe Wrench	
60.			60.	Vice Grip	
61.			61.	Volt Metre 380/500 v	
62.			62.	Work Benches	
TOTAL		55	TOTAL		62

The range of equipment itself, is not the only issue, but other factors also affect the training:

- relevance of equipment to course needs
- up datedness of equipment
- budget for replacing equipment which becomes obsolete in the context of rapid technological advances, and
- maintenance of equipment.

The inability to provide appropriate equipment to institutions and to replace and maintain such equipment results in situations where technical colleges are unable to meet the needs of their students and the new requirements of industrial and commercial enterprises.

Unesco [1990: 42] believe that some countries alleviate this problem through co-operation between advanced industries and training establishments involving:

- use of industrial equipment by trainers and educators on company premises;
- implementation of co-operative, joint programmes of research and development involving company staff, educators, trainers and teacher trainers; and
- donation of specific equipment to the training institutions by industrial and commercial enterprises. [Unesco 1990: 42].

Unesco [1990: 28] forwards that the relevance of theoretical knowledge and practical skills imparted by the programmes of technical and vocational institutions depends mainly on the knowledge and practical experience of those responsible for education, the relevance, availability, updatedness, and maintenance of equipment.

The quantity of equipment needed for NTC 1 to NTC 3 programmes is determined by the number of students taking a course, but in colleges offering CBMT programmes [college 1 and 21] the equipment is prescribed by MITB, and therefore this study could not venture to indicate the quantities that are needed of each item. These lists, however, were useful in this study since they formed the basis of the inventory of equipment currently used in 9 colleges. The results of the inventory will be presented later in this chapter.

5.4 DIDACTIC RATIONALE FOR THE NEED OF EQUIPMENT

Equipment forms the backbone of student training at technical colleges as it increases the students' capability to engage confidently with the practical training process and with the technological world. The didactic necessity of equipment is to enable the students to relate theory to practice. The use of equipment in the didactic situation enables the students to develop appropriate skills, knowledge and attitudes and an understanding of the principles and processes of the Motor Mechanics and Electrical Trades. This situation allows students to be active participants in the learning process and enables them to build a meaningful understanding of concepts which they can apply in their lives. The understanding of principles and processes of Motor Mechanics and Electrical Trades contribute to the:

- development of students= capability to perform effectively in the workplace
- effective use of equipment in different environments, and
- understanding of and ability to apply knowledge, skills and values working as individuals or as group members.

In the training programme that follows, Motor Mechanics training is used as an example, but this rationale is relevant to equipment needed in all technical courses. The four goals of Motor Mechanics are to:

- provide highly specialised training programmes sensitive to labour market;
- provide students with the necessary Motor Mechanics skills;
- produce employable and competent students; and
- provide all tasks described in the NTC 1 to 3 syllabus to students.

To achieve these goals, students need to receive an effective practical training which includes the servicing of engines, repairs, tracing faults, tune-ups, assembling of engine blocks, bearings, cooling systems, servicing fuel systems, transmission systems, suspension systems, braking and steering systems, exhaust systems and electrical systems.

For example, NTC 3 Engineering students need to do the following tasks from their syllabus:

Motor mechanic Training Programme for NTC 3 Students

TASK DESCRIPTION	LEARNING OBJECTIVES/CONTENTS
Remove, Service and replace engine components:	1. Purpose - application of hand tools - cylinder surfacing hones - valve spring compressors - piston ring compressor - piston ring expander - ridge reamer - fixed and adjustable reamer - valve reseating machine - valve refacing machine - valve reseating Mira cutter 2. Remove, measure and replace cylinder head - remove a cylinder head - inspect and measure a cylinder head - replace a cylinder head 3. Remove, measure and replace overhead camshaft and valve assembly - remove overhead camshaft and valve assembly - measure overhead camshaft and valve assembly - check valve spring tension - clean and inspect hydraulic lifter - replace an overhead camshaft and valve assembly

TASK DESCRIPTION	LEARNING OBJECTIVES/CONTENTS
Dismantle, service, repair and assemble engine block	1. Remove, measure and replace pistons and connecting rods - remove pistons and connecting rod assemblies - remove pistons and rings from connecting rods - measure and inspect pistons and connecting rods - measure cylinder wear - clean cylinder wear - measure block warpage - replace pistons and connecting rods 2. Remove, measure and replace crankshaft - undersize bearing markings - check crankshaft straightness - install crankshaft bearings - install rear main oil seal - replace crankshaft - tongue main bearing caps - check crankshaft end play 3. Remove, service and replace an oil pump - remove oil pump - measure and inspect oil pump - replace oil pump

TASK DESCRIPTION	LEARNING OBJECTIVES/CONTENTS
Remove, diagnose and replace fuel system component	1. Carburettor - stages of carburation - remove a carburettor - disassemble, adjust and reassemble a carburettor - measure pressure to the carburettor 2. Service fuel and air filter and adjust carburettor - service a disposable plastic type fuel filter - service a glass bowl type fuel filter - service an air filter - adjust idle mixture with a Co metre
Understand basic electronics	1. Identify various types of resistors 2. Identify various types of capacitors 3. Identify inductors 4. Identify and test diodes 5. Identify and test transistors
Engine tuning	Adjust and tune the following - Carburettors/fuel injection - ignition/electronic, plugs, points, timing, tappets
Servicing	Interpret information in lubrications and maintenance guides
Engines and accessories	Trace and repair faulty components. Identify and recall the functions of the following major components: - cylinder head assembly - rocket shaft assembly - cylinder block - camshaft - flywheel - dampers - timing gear train - connecting rod and bearings

The didactic significance of equipment usage rests on the six pillars, viz, identification, retention, comprehension, transfer, practice, problem-solving and creativity.

5.4.1 IDENTIFICATION

Students must learn to identify the numerous parts of car engines and that can only be learned through the use of equipment. For example, NTC 1 - 3 Motor Mechanics students must be able to identify cylinder blocks, cylinder heads, cylinder liners, pistons, piston rings, crankshafts, bearings, connecting rods, piston pins, camshafts and camshaft gears, timing chains, cam followers, manifolds, packings, seals, waterpumps and timing chains in the car engine.

On this basis there can be no doubt that equipment is essential for students to develop identification skills. Identification lessons must be supported by a certain amount of information or theory in order that the student understands what is being done and why. Before an identification lesson is conducted, the student should be given enough theory or information so as to be able to observe the identification accurately and to discuss and evaluate it afterwards. The students should then be given an opportunity to practice the identification skills during technical college-based training and this can only be done if the college is adequately equipped with up-to-date equipment, tools and machinery.

5.4.2 RETENTION

Students cannot make use of material only covered in a theoretical way. They need to work intensively and repeatedly with the equipment to retain the knowledge and should not only be given theory, especially when engineering students are involved, but they should be afforded the opportunity to handle equipment as much as possible.

5.4.3 COMPREHENSION

For students to learn meaningfully they need to observe mechanical processes in action. For example, students' understanding of how carburettors or injectors work and the application of that knowledge and skills in a range of technological contexts is important. Students must understand that the carburettor is a device for breaking up the fuel into a fine mist or spray and mixing it with the air in automatically varying proportions to meet the variable running conditions of an engine. Its function is to:

- atomize the fuel as finely as possible;
- provide the correct strength of mixture to suit engine speed and load;
- provide the correct amount of fuel mixture to the cylinders for varying speeds and load;
- provide an enriched mixture for easy starting when the engine is cold;
- enable the engine to idle or run steadily at a low speed;
- provide maximum acceleration without flat sports, when the throttle is opened, and
- provide the maximum fuel economy possible under all operating conditions.

An understanding of the process of how a carburettor works is fundamental to the acquisition of comprehension skills. Through this process of learning students will be:

- equipped with the knowledge and comprehension of Motor Mechanics Skills that will enable them to play a vital role in technological contexts;
- able to understand and apply the process to solve problems, needs and wants.

The teaching of how carburettors work or function is important for students to develop comprehension skills and it is therefore essential that equipment be available in the college.

5.4.4 TRANSFER

Students need to learn to transfer knowledge from one situation to another similar situation and that can only be done if they are thoroughly versed with practical work. For example, Motor Mechanics students must learn to transfer their knowledge of one type of car engine to other cars or engines. For this, they need to become familiar with many types of equipment.

5.4.5 PRACTICE

Skills can only be learned through practice and motor mechanics have to be able to master complicated skills. For example:The students need to learn and practice the following about injectors and nozzles:

- The injectors are mainly used to introduce an atomised spray of fuel under high pressure in the correct direction into the combustion chamber near the end of the compression stroke in a diesel engine. The injection pressure must be high enough to ensure:

  1] that the fuel is atomised as it is injected into the highly compressed charge of air in the combustion chamber;

2] that the correct spray pattern is produced; and

3] that the spray has the correct penetration in order to reach the required portions of the combustion chamber.

The students need to practice skills for operating injectors and these include:

- During each delivery stroke of the injector pump, fuel under high pressure is forced through the fuel gallery into the dome activity.
- The fuel then exerts pressure on the lifting face of the needle value.
- When this pressure exceeds the pressure of the spring, the valve move away from its seat.
- The fuel which is under high pressure then escapes past the needle valve and its seat in the form of an atomised spray.
- When the injector pump reaches the end of its delivery stroke, the pressure in the dome cavity collapses.
- The needle valve is immediately returned to its spring thus ending injection.

For students to be able to master complicated skills such as these they clearly need equipment with which to practice.

5.4.6 PROBLEM-SOLVING AND CREATIVITY

Students are expected to develop an ability to solve problems, use creativity and be resourceful and that can only be learned through the handling of equipment. This is especially important with most black students from deprived backgrounds where they did not grow up with mechanical equipment; for example, their fathers did not teach them to work with cars and engines. They also have weak knowledge in Science and Mathematics, which makes it even more important that they should work with good equipment during training and engage in as much practical work as possible. They require problem-solving skills in order to diagnose faults in cars and be creative in thinking of solutions.

5.5 PERCEPTIONS OF PRINCIPALS REGARDING EQUIPMENT

The researcher investigated six aspects related to principals' perceptions about equipment: range, relevance, updatedness, budgets, availability and maintenance. Data was derived from the principals' questionnaire starting from question 8 through to question 13 [see Appendix A], and this section of the study deals with each of these aspects in turn. No data was received from colleges 8, 17 and 18 because neither colleges 8 nor 17 offer Motor or Electrical Trades and college 18 failed to complete the questionnaire.

5.5.1 PERCEPTIONS ABOUT RANGE OF EQUIPMENT

TABLE 49: THE COMPREHENSIVE RANGE OF WORKSHOP EQUIPMENT

N - 16

Ex-Departments	Colleges	Range of workshop equipment
Ex-Natal	2	3
	3	4
	10	3
	15	3
Average		3,3
Ex-KZ	5	2
	6	2
	9	1
	11	4
	19	4
	22	2
Average		2,5
Ex-HOD	1	4
	12	2
	20	4
Average		3,3
Ex-DET	16	4
	21	3
Average		3,5
Ex-HOR	7	1
Average		1
Grand Average		2,9

KEY

1. Very unsatisfactory
2. Rather unsatisfactory
3. Neither satisfactory nor unsatisfactory
4. Fairly satisfactory
5. Very satisfactory

Implicit in this table is that principals are, on the whole, neither satisfied nor dissatisfied with the range of equipment, since the grand average of the sixteen principals who responded to this questions was 2,9. A breakdown of responses indicate that:

- two principals were very dissatisfied [12,5 %] - see Colleges 9 and 7
- four principals were rather dissatisfied [25 %] - see Colleges 5, 6, 22 and 12
- four principals were neither satisfied nor dissatisfied [25 %] - see Colleges 2, 10, 15 and 21
- six principals were fairly satisfied, and [37,5 %] - see Colleges 3, 11, 19, 1, 20 and 16
- none were very satisfied.

Thus, if we disregard the category of respondents who were neither satisfied nor unsatisfied, we notice that an equal number of principals were satisfied and dissatisfied with the range of equipment [37,5 %].

Least satisfied [scoring 1] was the principal from the Ex-HOR college while those from the Ex-DET were most satisfied [scoring 3,5]. The respondents from Ex-KwaZulu Colleges, however, also seemed rather dissatisfied [scoring 2,5], and, to a lesser extent, principals from Ex-Natal and Ex-HOD colleges [3,3].

It is clear that the majority of college principals take a rather dim view of the range of equipment at their colleges, since two of them express severe dissatisfaction [colleges 7 and 9] and not a single one was fully satisfied with the current situation. In sum, then, the finding was that only the principals from the two Ex-DET colleges were fairly satisfied with the range of equipment in their colleges, whilst the principal from the Ex-HOR college was extremely dissatisfied. Respondents from the other Ex-Departments were, on average, neither satisfied nor dissatisfied. Once again the Ex-KwaZulu respondents reveal the lowest satisfaction index, apart from the Ex-HOR respondent.

5.5.2 PERCEPTIONS ABOUT RELEVANCE OF EQUIPMENT

TABLE 50: THE TELEVANCE OF EQUIPMENT TO COURSE NEEDS

N - 16		
Ex-Departments	Colleges	Relevance of workshop equipment
Ex-Natal	2	4
	3	4
	10	4
	15	4
Average		4
Ex-KZ	5	2
	6	2
	9	2
	11	4
	19	5
	22	2
Average		2,8
Ex-HOD	1	5
	12	4
	20	3
Average		4
Ex-DET	16	4
	12	3
Average		3,5
Ex-HOR	1	3
Average		3
Grand Average		3,4

KEY

1. Very unsatisfactory
2. Rather unsatisfactory
3. Neither satisfactory nor unsatisfactory
4. Fairly satisfactory
5. Very satisfactory

Respondents felt more positive about the relevance of equipment than about its range. In fact, responses to this question were more favourable than to any other question related to equipment, although the grand average of 3,4 still falls in the neither satisfied nor dissatisfied category. On closer scrutiny one observes that only four principals [25 %] were rather dissatisfied in contrast to seven [43,75 %] who felt fairly satisfied, and two [12,5 %] who felt very satisfied. This means that, of the sixteen principals who responded to the question, approximately 56 % were satisfied that their equipment was relevant as apposed to only 25 % who were dissatisfied.

Looking at the averages of the various Ex-DepartmentS, the two Ex-Departments in which principals were most satisfied were those from the Ex-Natal and Ex-DET colleges, whereas the principals who came closest to describing their equipment as irrelevant were from Ex-KwaZulu colleges [average 2,8]. The general pattern however, was that most principals did not perceive the relevance of equipment to be a serious problem. In the final analysis, only four principals from Ex-KwaZulu Colleges expressed concern about the relevance of equipment while the remaining twelve principals were either non-committal or satisfied.

5.5.3 PERCEPTIONS ABOUT UPDATEDNESS OF THE EQUIPMENT

TABLE 51: THE UPDATEDNESS OF THE EQUIPMENT TO COURSE NEEDS

Ex-Departments	Colleges	Updatedness of workshop equipment
Ex-Natal	2	3
	3	4
	10	2
	15	3
Average		3
Ex-KZ	5	1
	6	2
	9	2
	11	3
	19	4
	22	1
Average		2
Ex-HOD	1	2
	12	1
	20	4
Average		2,2

Ex-DET	16	4
	21	4
Average		4
Ex-HOR	7	3
Average		3
Grand Average		2.7

In this table the row reflecting grand average reveals that principals are on the whole neither satisfied nor dissatisfied with the range of equipment since the average of the sixteen college principals who responded to this question was 2,7. A closer examination of these results reflects that principals from three colleges [19%] were very dissatisfied, four [25 %] were rather dissatisfied, four were neither satisfied nor dissatisfied, in contrast with five [31 %] who felt fairly satisfied. What is clear from this information is the fact that of the sixteen principals who responded to the question, 31% were satisfied that their equipment was updated, yet others voiced dissatisfaction [44%].

Data in this category revealed that principals of only one Ex-Department [Ex-DET, scoring 4] were fairly satisfied as compared with Ex-Natal [scoring 3] and Ex-HOR [scoring 3]. The principals of Ex-KwaZulu colleges [scoring 2,2] and Ex-HOD [scoring 2,3] were most dissatisfied. Flowing from the above point is that principals from Ex-KwaZuluAND Ex-HOD are most dissatisfied compared with other colleges [Ex-DET, Ex-Natal, and Ex-HOR].

In summary, none pf the Ex-Departments, except Ex-DET, expressed satisfaction about updatedness of their equipment.

The findings confirm the research conducted by the National Integrated Training and Education Project [NITE] [1996: 50] which showe that the existing equipment in the South African Technical Colleges is inadequate and does not represent the latest technology. Therefore, students are being trained with old or obsolete technology which is not representative of the most competitive organisations. In the technical college sector over 60 % of the institutions reported that they have 10 year old equipment in their workshops. In addition, some 30 % of the colleges have equipment which is either in a poor state or beyond repair.

This information confirms that equipment being used in most technical colleges in South Africa, including KwaZulu Natal, is outdated and of questionable educational value in terms of imparting the skills required to enable qualified manpower to be effective in a modern industrial environment.

5.5.4 PERCEPTIONS ABOUT BUDGETS AND EQUIPMENT

TABLE 52: PROVISION IN THE ANNUAL BUDGET FOR REPLACING TOOLS AND EQUIPMENT

N - 17		
Ex-Departments	Colleges	Budgets and Equipment workshop
Ex-Natal	2	3
	3	4
	10	4
	15	3
	18	5
Average		3,8
Ex-KZ	5	1
	6	2
	9	1
	11	3
	19	4
	22	1
Average		2
Ex-HOD	1	2
	12	2
	20	4
Average		2,7
Ex-DET	16	1
	21	4
Average		2,5
Ex-HOR	7	2
Average		2
Grand Average		2,7

KEY

1. Very unsatisfactory
2. Rather unsatisfactory
3. Neither satisfactory nor unsatisfactory
4. Fairly satisfactory
5. Very satisfactory

From Table 52 it appears that principals of colleges are, on average, neither satisfied nor dissatisfied with the budget allocated to colleges for replacing equipment as is evident from the responses of the seventeen principals who responded to this question.

As shown in the table, responses indicate that:

- four principals were very dissatisfied [23,5%]
- *four principals rather dissatisfied [23,5%]*
- three principals were neither satisfied nor dissatisfied [18%]
- five principals were fairly satisfied, and [29%]
- one principal who was very satisfied [6%].

This means that 47 % were dissatisfied about the budget allocation to colleges compared with 35 % who were satisfied. The general pattern however was that the principals of colleges from Ex-KwaZulu, Ex-HOD, Ex-DET, and Ex-HOR looked at inadequately budget allocation as a problem or threat to the effective practical training of students, *while only the ex-Natal colleges were fairly satisfied with their* budget allocation.

5.5.5 PERCEPTIONS ABOUT AVAILABILITY OF EQUIPMENT

TABLE 53: THE AVAILABILITY OF EQUIPMENT AND CONSUMABLES AND THEIR USE IN THE WORKSHOP

N - 17		
Ex-Departments	Colleges	Availability of workshop equipment
Ex-Natal	2	4
	3	4
	10	4
	15	4
	18	5
Average		4,2

KEY

1. Very unsatisfactory
2. Rather unsatisfactory
3. Neither satisfactory nor unsatisfactory
4. Fairly satisfactory
5. Very satisfactory

N - 17		
Ex-KZ	5	1
	6	2
	9	1
	11	3
	19	4
	22	1
Average		2
Ex-HOD	1	3
	12	4
	20	2
Average		3
Ex-DET	16	4
	21	4
Average		4
Ex-HOR	7	2
Average		2
Grand Average		3,1

KEY

1. Very unsatisfactory
2. Rather unsatisfactory
3. Neither satisfactory nor unsatisfactory
4. Fairly satisfactory
5. Very satisfactory

Evident from Table 53 is that, generally, principals were neither satisfied nor dissatisfied with the range of equipment, since the average of the seventeen colleges who responded to this question was 3. According to the responses, three principals [17,6 %] were very dissatisfied, compared with three who felt rather dissatisfied, and two [11,7 %] who felt neither satisfied nor dissatisfied. Table 53 further shows that one principal [6 %] felt very satisfied with the availability of equipment.

Noticeable from Table 53 is that about 53 % of the principals [nine] were satisfied with the availability of the equipment in their colleges as opposed to 36 % [six principals] who were dissatisfied. This study has exposed that the principals who were least satisfied were those from Ex-KwaZulu colleges [scoring an average of 2] and Ex-HOR [also scoring 2]. Ex-DET colleges were fairly satisfied [scoring 4]. The respondents from Ex-HOD [scoring 3] colleges seemed to be neither satisfied nor dissatisfied. Evidently principals from Ex-Natal, Ex-HOD and Ex-DET colleges were more satisfied with the available equipment at their colleges, than principals from Ex-KwaZulu and Ex-HOR colleges.

5.5.6 PERCEPTIONS ABOUT MAINTENANCE OF EQUIPMENT

TABLE 54: MAINTANANCE OF EQUIPMENT BY COLLEGES

N - 17

KEY

1. Very unsatisfactory
2. Rather unsatisfactory
3. *Neither satisfactory nor unsatisfactory*
4. Fairly satisfactory
5. Very satisfactory

Ex-Departments	Colleges	Maintenance of workshop equipment
Ex-Natal	2	4
	3	4
	10	3
	15	5
	18	5
Average		4,2
Ex-KZ	5	1
	6	1
	9	1
	11	3
	19	5
	22	1
Average		2
Ex-HOD	1	2
	12	4
	20	3
Average		3
Ex-DET	16	4
	21	4
Average		4
Ex-HOR	7	2
Average		2
Grand Average		3,1

There is evidence in Table 54 [average 3,1] which suggests that the principals were neither satisfied nor dissatisfied with the maintenance of equipment at technical colleges. Data in the table shows that four principals [24 %] were very dissatisfied, two [11 %] were rather dissatisfied and three [18 %] who were neither satisfied nor dissatisfied, compared with five [29 %] who felt fairly satisfied and three [18 %] who were very satisfied with the maintenance of the equipment.

This means that, of the seventeen principals who responded to the question, approximately 47 % were satisfied with the maintenance programme at colleges compared with 35 % who were dissatisfied.

If one looks at the averages of the various Ex-Departments in which principals were most satisfied, they were those from the Ex-Natal [average 4,2] and Ex-DET [average 4]. In direct contrast to this information was that principals from Ex-KwaZulu [average 2] and Ex-HOR [average 2] were dissatisfied with the maintenance of equipment at their colleges. The general pattern was that most principals from Ex-KwaZulu and Ex-HOR were not satisfied with the maintenance programme at their colleges. Finally, only Ex-Natal and Ex-DET colleges were fairly satisfied with the maintenance programme compared with Ex-KwaZulu, Ex-HOR and Ex-HOD principals who expressed dissatisfaction about the existing maintenance programmes.

5.6 RESULTS OF INVENTORY

The perceptions of principals proved highly subjective and the researcher needed more objective data to obtain greater accuracy regarding equipment. To this end, the researcher conducted an inventory of Motor Mechanics and Electrical Trades at nine colleges, two from each Ex-Department and one college from the Ex-HOR.

INVENTORY OF MOTOR MECHANICS WORKSHOP EQUIPMENT

The information obtained from Motor Mechanics workshop is presented below according to the Ex-Departments

TABLE 55: MOTOR MECHANICS WORKSHOP EQUIPMENT, TOOLS AND CONSUMABLES

	N = 9	Ex-Natal		Ex-KZ		Ex.DET		Ex-HOD		Ex-HOR
NO.	EQUIPMENT	Col. 3	Col. 10	Col. 9	Col. 22	Col. 16	C ol. 21	Col. 1	Col. 12	College 7
1.	Arc Welding Machines	T	T	T	T	T	T	T	T	T
2.	Battery Charger	T	T	T	T	T	T	T	T	T
3.	Headlight Beam	T	T	V	V	T	T	T	T	V
4.	Brake Bleeder	T	T	V	V	T	T	T	T	T
5.	Braking models	T	T	T	T	T	T	T	T	T
6.	Feeler Gauge	T	T	T	T	T	T	T	T	T
7.	Carburettors	T	T	T*	V	T	T	T	T*	T*
8.	Computers in the workshops	T	V	V	V	V	T	T	V	V
9.	Cylinder Leakage Tester	T	T	V	V	T	T	T	V	T
10.	Dial indicators vernier	T	T	T	V	T	T	T	T	T
11.	Diffs	T	T	T	T	T	T	T	T	T
12.	Display boards for engine parts	T	T	T	T	T	T	T	T	T
13.	Distributor Tester (Machine)	T	T	T	T	T	T	T	T	T
14.	*Electrical Drilling Machines*	T	T	V	V	T	T	T	V	V
15.	Engine Compression Tester	T	T	T	T	T	T	T	T	T
16.	Engine stand for handling engine block whil repair	T	T	T	T	T	T	T	T	T
17.	Gearboxes Automatic & Manual	T	T	T	T	T	T	T	T	T
18.	Hacksaws	T*	T	T	T*	T	T*	T	T	T*
19.	*Hand Files*	T	T	T*	T*	T	T	T	T*	T*
20.	Hydraulic Press for Bearings	T	T	T	T	T	T	T	T	T
21.	Hydraulic Trolley Jack	T	T	T	T	T	T	T	T	T
22.	Hydrometer	T	T	V	V	T	T	T	T	V
23.	Injector Nozzle Tester	T	T	T	T	T	T	T	T	T
SUB-TOTAL: SUFFICIENT		22	22	14	13	22	22	22	18	16
SUB-TOTAL: NEVER HAD		0	1	7	8	1	0	1	3	4
SUB-TOTAL: INSUFFICIENT		1	0	2	2	0	1	0	2	3

U : Sufficient
V : Nevr had
UV : Insufficient

TABLE 55: <u>MOTOR MECHANICS WORKSHOP EQUIPMENT, TOOLS AND CONSUMMABLES</u> [continued]

	N = 9	Ex-Natal		Ex-KZ		Ex.DET		Ex-HOD		Ex-HOR
NO.	EQUIPMENT	Col. 3	Col. 10	Col. 9	Col. 22	Col. 16	C ol. 21	Col. 1	Col. 12	College 7
SUB-TOTAL: SUFFICIENT		22	22	14	13	22	22	22	18	16
SUB-TOTAL: NEVER HAD		0	1	7	8	1	0	1	3	4
SUB-TOTAL: INSUFFICIENT		1	0	2	2	0	1	0	2	3
24.	Jacks	T	T	T	T	T	T	T	T	T
25.	Lubrication System	T	T	T	V	T	T	T	V	V
26.	Micrometers 0-100 mm	T	T	T	T	T	T	T	T	T
27.	Oxy-Acetylene Set	T	T	T	T	T	T	T	T	T
28.	Pneumatic Tools Wheelnuts etc.	V	V	V	V	V	T	T	V	V
29.	Pressure Tester	T	T	V	V	T	T	V	T	T
30.	Radiator Pressure Testing Kit	T	T	T	T	T	T	T	T	T
31.	Ring Expander	T	T	T	T	T	T	T	T	T
32.	Ring Squeezer	T	T	T	T	T	T	T	T	T
33.	Running Diesel Engines	T	T	T*	V	T	T	T	T	V
34.	Running Petrol Engines	T	T*	T*	V	T	T	T	T	T*
35.	Scribers	T	T	T	T	T	T	T	T	T
36.	Spring Clamps	T	T	T	T*	T	T	T*	T	T*
37.	Steel Rules	T	T	T	T	T	T	T	T	T
38.	Straight edges	T	T	T	V	T	T	T	T	T
39.	Squares	T	T	T	T	T	T	T	T	T
40.	Tachometer	T	T	T	V	T	T	T	T	T
41.	Taps and Dies	T	T	T	T	T	T	T	T	T
42.	Testing Kits for different things	V	T	V	T	T	T	T	V	T
43.	Timing lights	T	T	T	T	T	T	T	T	T
44.	Tyre changing machine	T	T	V	V	T	T	T	T	V
45.	Tools & Spanners	T*	T	T*	T*	T	T	T	T	T*
46.	Torque Wrenches (5-225 nm)	T	T	T	T	T	T	T	T	T
SUB-TOTAL: SUFFICIENT		43	43	30	26	44	45	43	38	32
SUB-TOTAL: NEVER HAD		2	2	11	16	2	0	2	6	8
SUB-TOTAL: INSUFFICIENT		1	1	5	4	0	1	1	2	6

U : Sufficient
V : Never had
UV : Insufficient

TABLE 55: MOTOR MECHANICS WORKSHOP EQUIPMENT, TOOLS AND CONSUMMABLES [continued]

	N = 9	Ex-Natal		Ex-KZ		Ex.DET		Ex-HOD		Ex-HOR
NO.	EQUIPMENT	Col. 3	Col. 10	Col. 9	Col. 22	Col. 16	C ol. 21	Col. 1	Col. 12	College 7
SUB-TOTAL: SUFFICIENT		43	43	30	26	44	45	43	38	32
SUB-TOTAL: NEVER HAD		2	2	11	16	2	0	2	6	8
SUB-TOTAL: INSUFFICIENT		1	1	5	4	0	1	1	2	6
47	Trestles	T	T	T	T	T	T	T	T	T
48.	Valve Grinder Machine	T	T	T	V	T	T	T	T	V
49.	Video & Television in the Workshop PS	T	T	V	V	T	T	T	V	T
50.	Welding Aprons	T	T	T	T	T	T	T	T	T
51.	Welding Gloves	T	T	T	T	T	T	T	T	T
52.	Welding Goggles	T	T	T	T	T	T	T	T	T
53.	Wheel Balancing Machine	T	T	T	T	T	T	T	T	T
54.	Workbenches with vice RibinEngines and holes for fitting engines	T	T	T	T	T	T	T	T	T
55.	Workstation with Diagnostic (Machine) equipment for checking spark, timing & distributor	T	T	T	V	T	T	T	T	V
TOTAL: SUFFICIENT		52	52	38	32	53	54	52	46	39
TOTAL: NEVER HAD		2	2	11	19	2	0	2	7	10
TOTAL: INSUFFICIENT		1	1	6	4	0	1	1	2	6
TOTAL ITEMS		55	55	55	55	55	55	55	55	55

U : Sufficient
V : Never had
UV : Insufficient

5.7 DISCUSSION OF INVENTORY OF MOTOR MECHANICS WORKSHOP EQUIPMENT

5.7.1 QUANTITY AND RANGE OF EQUIPMENT

The final figures at the end of Table 55 reveal the numbers of equipment that was found to be sufficient in the nine colleges where the inventory was conducted:

College 3 [Ex-Natal had 51 of 55 items of equipment
College 10 [Ex-Natal] had 52 of 55 items of equipment
College 9 [Ex-KZ] had 98 of 55 items of equipment
College 22 [Ex-KZ] had 32 of 55 items of equipment
College 16 [Ex-DET] had 53 of 55 items of equipment
College 21 [Ex-DET] had 54 of 55 items of equipment
College 1 [Ex-HOD] had 53 of 55 items of equipment
College 12 [Ex-HOD] had 46 of 55 items of equipment
College 7 [Ex-HOR] had 39 of 55 items of equipment

The trend exposed here shows that colleges 16 and 21 [Ex-DET] are better equipped, followed by Ex-Natal [colleges 3 and 10] and Ex-HOD [colleges 1 and 12], and that Ex-KwaZulu [colleges 9 and 22] and Ex-HOR [college 7] were inadequately or poorly equipped.

5.7.2 BEST EQUIPPED COLLEGES IN THE SAMPLE

Evident from Table 55 is that colleges 16 and 21 [Ex-DET] and college 1 [Ex-HOD] are the best equipped colleges in the sample. Noticeable from item 8 is that colleges 21 [Ex-DET] and 1 [Ex-HOD] have computers in the workshops and they are used mainly for the training of students.

In today' s fast-paced, technologically complex world of service and maintenance, the lecturer needs a teaching tool that permits cost effective education, efficient student instruction and flexible course outlines. The computer provides a cost-effective way to present a lesson to a student without sacrificing accuracy or completeness. With computer simulation, no set-up or tear-down time is required. All of the class time is devoted to learning and there are no rote mechanical procedures. The computer further provides a quick and easy method of tracking the student's performance and a printer can supply a permanent record of each student' s session so that the lecturer is not bogged down in paper work. As technologies change and advance, new computer programmes are released to update the training system. The lecturers from colleges 21 [Ex-DET] and 1 [Ex-HOD] [Table 55] add and modify training programmes from year to year or even course to course to meet the changing needs of commerce and industry.

Traidco Education Products [1990:4] state that "in order to satisfy the ever growing demands on today's educational and vocational programmes to produce qualified and competent technicians, technical colleges' workshops or laboratories must be equipped with computer or teaching tools that are cost-effective and efficient".

This information provided by Traid Education Products is highly relevant to KwaZulu Natal colleges as the presence of computers in the colleges will afford lecturers an opportunity to provide effective and efficient training to students.

What is also noticeable from Table 55 is that colleges 16 and 21 [Ex-DET] and 1 [Ex-HOD] are equipped with running Diesel and Petrol engines [items 34 and 35] as well as with tyre changing machines [item 44]. The running engines are used mainly for the following functions:

- to teach students how to adjust engine tappets
- trace and repair faults on worn and faulty components, including:
  - cylinder head assembly
  - rocker shaft assembly
  - cylinder block
  - camshaft and followers
  - bearings, piston and rings
  - connecting rod and bearings
  - timing chain
  - oil pump assembly
  - flywheel, and
- to set valve and fuel injection timing.

Colleges 21 and 16 [Ex-DET] and 1 [Ex-HOD] are equipped with tyre changing machines used for teaching students how one changes, balances and aligns wheels on a motor car [see Item 44]

The availability of computers, petrol and diesel engines as well as tyre changing machines in colleges 21 and 16 [Ex-DET] and 1 [Ex-HOD] set these institutions apart and better positioned them to offer quality training when compared with the other colleges. It is important to indicate that another reason why colleges 21 [Ex-DET] and 1 [Ex-HOD] are the best equipped in KwaZulu Natal is the fact that both colleges are registered with MITB [see 5.2.2.]

5.7.1 WORST - EQUIPPED COLLEGES IN THE SAMPLE

In direct contrast to point 7.1.2, Table 55 reveals that colleges 9 and 22 [Ex-KZ] and 7 [Ex-HOR] are the worst equipped colleges in the sample. According to the figures in the table, Ex-KZ [colleges 9 and 22] and Ex-HOR [college 7] do not have the following equipment in their workshops:

Beams - headlight [item 3]
Brake bleeders [item 4]
Computers in the workshops [item 8]
Cylinder leakage tester [item 9]
Hydrometers [item 22]
Pneumatic Tools wheelnuts [item 28]
Pressure testers [item 29]
Running Diesel Engines [item 33]
Running Petrol Engines [item 34]
Tyre changing macjines [item 44]
Video recorders and televisions [item 49].

In addition there are various other items which are available at only one of these two cplleges, as well as a serious shortage of tools and spanners at both of them [item 45].
A number of factors which may contribute to this situation include the following:

a] Ex-KwaZulu Colleges were inadequately funded and, as a result, they were unable to purchase tools, equipment and heavy machinery required for the practical training of students [see Table 46 as well as points 4.10.1.4 and 4.10.1.11].

b] Ex-HOR College [college 7] did not have workshops for practical training of students, instead they used demonstration rooms not big enough to accommodate all the equipment, tools and machinery.

Insufficient financial support to Ex-KwaZulu colleges [colleges 9 and 22] appeared to be a serious problem as technical colleges need to buy and update training equipment tools and machinery and the fact that they are unable to do so impacts negatively on the practical training of students.

According to data in Table 55, colleges 9 and 22 [Ex-KZ] and 7 [Ex-HOR] have neither petrol nor diesel running engines. This is a serious concern to these colleges as students in these institutions are not yet in the position to practice engine tuning, which includes:

carburettors/fuel injection
ignition/electronic

plugs
points
timing
tappets

It is therefore a sad situation that Ex-KwaZulu and Ex-HOR colleges do not possess running engines as they are naturally extremely important for NTC I to NTC 4 Motor Mechanics students and these colleges are therefore not adequately equipped for the effective training of students.

5.7.4 COMPARISON OF EQUIPMENT FROM AN EX-DEPARTMENTAL PERSPECTIVE

The situation reflected under **TOTAL SUFFICIENT** from Table 55 shows that Ex-DET colleges [college 16 and 21] are best equipped when compared with other Ex-Departments. According to data in Table 55, out of 55 items of equipment, the position was a s follows:

Ex-DET Colleges:	Colleges 16 and 21 respectively had 53 and 54 items of equipment;
Ex-Natal Colleges:	Colleges 3 and 10 respectively had 51 and 52 items of equipment
Ex-HOD Colleges:	Colleges 1 and 12 respectively had 53 and 46 items of equipment
Ex-KZ Colleges :	Colleges 9 and 22 respectively had 39 and 32 items of equipment
Ex-HOR Colleges:	College 7 had 39 items of equipment.

This table reveals that Ex-KwaZulu [9 and 22] as well as Ex-HOR [7] colleges are the worst equipped compared with Ex-DET, Ex-Natal and Ex-HOD. Apart from the fact that Ex-KZ and Ex-HOR colleges lack the crucial equipment listed in the previous section [5.7.1.3], most of them also do not have carburettors [item 9], electric drilling machines [item 14], lubrication systems [item 25], spring clamps [item 36], valve grinding machines [item 48] and workstations with diagnostic equipment [item 55]. This could exacerbate the fact that these Ex-Departments [Ex-KZ, and Ex-HOR] are experiencing serious problems regarding the practical training of their students. The fact that colleges 22 [Ex-KwaZulu] and 7 [Ex-HOR] as well as 12 [Ex-HOD] do not have lubrication systems in their workshops means that these institutions are unable to expose their students to the servicing of:

engine crankcase
differential
gearbox
wheel bearings
transmissions
brakes
power steering

power shift
clutch
fuel filters
out filters, and
air cleaner filters

The implications here is that, in the absence of a lubricating system in these colleges, the students cannot learn to dismantle, replace, adjust and calibrate components in various types of fuel systems. This further suggests that students will not be able to trace faults or repair fuel systems.

Table 55 reflects that Ex-DET [16 and 21], Ex-Natal [3 and 10] and Ex-HOD [1 and 12] colleges are better equipped, suggesting that teaching and the practical training of Motor Mechanics students in these colleges is of a higher quality than that of the other colleges.

5.8 INVENTORY OF ELECTRICAL TRADE WORKSHOP EQUIPMENT

The result of the inventory of electrical trade workshop equipment at the different colleges appear in Table 56.

TABLE 56: ELECTRICAL TRADE WORKSHOP EQUIPMENT AND CONSUMMABLES

	N = 9	Ex-Natal		Ex-KZ		Ex.DET		Ex-HOD		Ex-HOR
NO.	EQUIPMENT	Col. 3	Col. 10	Col. 9	Col. 22	Col. 16	C ol. 21	Col. 1	Col. 12	College 7
1.	Ballpein Hammers	T	T	V	V	V	T	T	T	V
2.	Bradawl	T	T	T	T	V	T	T	T	T
3.	Bolts Soldering (Medium)	T	T	T*	T	T	T	T	T	T
4.	Cable Extention (Heavy Duty)	T	T	T*	T*	T	T	T	T	T
5.	Cable Smear	T	T	T	T*	T	T	T	T	T
6.	Clamp Metre (Robin)	T	V	T	V	T	T	T	T	T
7.	Chisel Cold 15 mm	T	T	T	T	T	T	T	T	T
8.	Combination of Spanners	T*	T*	T*	T*	T	T*	T	T*	T*
9.	Computers in the Workshops	V	V	V	V	V	T	T	V	V
10.	Conduit Dies	T	T	V	V	T	T	T	T	V
11.	Crimping Tools	T	T	T	T	T	T	T	T	T
12.	Carpenters Brace	T	T	V	V	V	T	T	T	V
13.	Digital Multi Metre	T	T	T	V	T	T	T	T	T
14.	Dividers	T	V	V	V	T	T	V	T	V
15.	Drill (Hammer) size 13 mm, 16 mm etc.	T	T	T	T	T	T	T	T	T
16.	Drill Sets	T	T	T*	T*	T	T	T	T*	T*
17.	Drill Press	T	T	V	V	T	T	T	T	V
18.	Dust Pole Tester	T	T	V	V	V	T	T	V	T
19.	Engineer Squares	T	T	V	T	T	T	T	T	T
20.	File Double Cut (250 mm) (Hard File)	T	T	T	T	T	T	T	T	T
21.	File Round Cut (100 mm)	T	T	T	V	T	T	T	T	T
22.	Fixed Hook Bender	T	T	T	V	T	T	T	T	V
23.	Fish Tape	T	T	T	T	T	T	T	T	T
24.	Frequency Counter	T	T	T	T	T	T	T	T	T
25.	Gas Pliers	T	T	T	V	T	T	T	T	V
SUB-TOTAL: SUFFICIENT		23	21	13	9	20	24	24	21	15
SUB-TOTAL: NEVER HAD		1	3	8	12	5	0	1	2	8
SUB-TOTAL: INSUFFICIENT		1	1	4	4	0	1	0	2	2

TABLE 56: ELECTRICAL TRADE WORKSHOP EQUIPMENT AND CONSUMMABLES [Cont.]

	N = 9	Ex-Natal		Ex-KZ		Ex.DET		Ex-HOD		Ex-HOR
NO.	EQUIPMENT	Col. 3	Col. 10	Col. 9	Col. 22	Col. 16	C ol. 21	Col. 1	Col. 12	College 7
SUB-TOTAL: SUFFICIENT		23	21	13	9	20	24	24	21	15
SUB-TOTAL: NEVER HAD		1	3	8	12	5	0	1	2	8
SUB-TOTAL: INSUFFICIENT		1	1	4	4	0	1	0	2	2
26.	Grindes	T	T	T	V	T	T	T	T	T
27.	Grinder Benches	T	T	V	T	T	T	T	T	T
28.	Hacksaw	T	T	T	T	T	T	T	T	V
29.	Hammer (4 pound/500 g)	T	T	T	T	T	T	T	T	T
30.	Heat Gun	T	T	T	T	T	T	T	T	T
31.	Iron Soldering	T*	T	T	T*	T	T	T	T*	T*
32.	Insulation Tester	T	T	T	V	T	T	T	T	T
33.	Jacksaw Junior	T	T	T	V	T	T	T	T	T
34.	Loose Hook Bender	T	T	T	V	T	T	V	T	V
35.	Meters (OM 50 Robin)	T	T	T	V	T	V	V	V	V
36.	Meters (OM 92 Robin)	T	T	T	V	T	V	V	V	V
37.	Meters (OM 2000 Robin)	T	V	V	T	V	V	T	T	V
38.	Meters (K 3 IIIV Robin)	T	V	V	T	V	V	T	T	V
39.	Overhead Projector	T	T	T	T	T	T	T	T	T
40.	Pliers Combination	T*	T*	T*	T*	T	T	T	T*	T*
41.	Plier Diagonal	T	V	V	T	T	V	T	T	T
42.	Pliers Long Nose	T	T	T	T	T	T	T	T	T
43.	Pliers Water Pump	T	T	T	T	T	T	T	T	T
44.	Pipe Wrenches	V	T	V	V	T	T	T	T	T
45.	Pipe Vice	T	T	V	V	V	T	T	V	V
46.	Portable Grinder	T	V	V	V	T	T	T	T	V
47.	Punch Set Centre	T	T	T	T	T	T	T	T	T
48.	Ruler Steel	T	T	T	T	T	T	T	T	T
SUB-TOTAL: SUFFICIENT		43	39	28	22	40	42	44	39	28
SUB-TOTAL: NEVER HAD		2	7	15	20	8	5	4	5	16
SUB-TOTAL: INSUFFICIENT		3	2	5	6	0	1	0	4	4

TABLE 56: ELECTRICAL TRADE WORKSHOP EQUIPMENT AND CONSUMMABLES (Cont.)

	N = 9	Ex-Natal		Ex-KZ		Ex.DET		Ex-HOD		Ex-HOR
NO.	EQUIPMENT	Col. 3	Col. 10	Col. 9	Col. 22	Col. 16	C ol. 21	Col. 1	Col. 12	College 7
SUB-TOTAL: SUFFICIENT		43	39	28	22	40	42	44	39	28
SUB-TOTAL: NEVER HAD		2	7	15	20	8	5	4	5	16
SUB-TOTAL: INSUFFICIENT		3	2	5	6	0	1	0	4	4
49.	Screw Drivers Set	T	T*	T	T*	T	T	T	T	T*
50.	Scriber	T	T	T	T	T	T	T	T	T
51.	Shifting Spanner 300 mm	T	T	T	T	T	T	T	T	T
52.	Side Cutter	T	T	T	T	T	T	T	T	T
53.	2 Step Ladders 2m	T	T	T	T	T	T	T	T	T
54.	Strings Bending	V	T	T	T	T	T	T	T	T
55.	Spirit Levels	T	T	T	T	T	T	T	T	T
56.	Stripper Wire	T	T	T*	T*	T	T	T*	T*	T
57.	Tap and Die Set	T	T	T	T	T	T	T	T	T
58.	Tin Snip	T	T	T	V	T	T	T*	T	T
59.	Universal Pipe Wrench	T	T	T	T	T	T	T	T	V
60.	Vice Grip	T	T	T	T	T	T	T	T	T
61.	Volt Metre 380/500 V	V	V	T	T	T	T	T	T	V
62.	Work Benches	T	T	T	T	T	T	T	T	T*
SUB-TOTAL: SUFFICIENT		55	51	41	33	54	56	56	52	38
SUB-TOTAL: NEVER HAD		4	8	15	21	8	5	4	5	18
SUB-TOTAL: INSUFFICIENT		3	3	6	8	0	1	2	5	6
TOTAL ITEMS		62	62	62	62	62	62	62	62	62

T: Sufficient

V: Never had

T*: Insufficient

5.8.1 QUANTITY AND RANGE OF EQUIPMENT

The row reflecting *sub-total Sufficient* from Table 56 exposes the following:

- Colleges 3 and 10 [Ex-Natal] had 55 and 51 of 62 items of equipment respectively.
- Colleges 9 and 22 [Ex-KwaZulu] had 41 and 33 of 62 items of equipment respectively
- Colleges 16 and 21 [EX-DET] had 54 and 56 of 62 items of equipment respectively.
- Colleges 1 and 12 [Ex-HOD] had 56 and 52 of 62 items of equipment respectively, and
- College 7 [Ex-HOR] had 38 of 62 items of equipment.

What is also remarkable in this table is that the row reflecting *Never had* shows that college 9 has never had 15 of the items and college 22 has never had 21 of the items of the inventory – both of these colleges are Ex-KwaZulu – whilst college 7 [Ex-HOR] has never had 18 items of equipment of the inventory.

The general pattern displayed from Table 56 is that colleges 16 and 21 [Ex-DET], 1 and 12 [Ex-HOD] and 3 and 10 [Ex-Natal] are adequately equipped compared with Ex-KwaZulu [9 and 22] and Ex-HOR [7] colleges.

5.8.2 BEST EQUIPPED COLLEGES IN THE SAMPLE

Table 56 shows that colleges 21 [Ex-DET - 56 of 62 items of equipment], 1 [Ex-HOD - 56 of 62 items of equipment] and 3 [Ex-Natal - 55 of 62 items of equipment] are the best equipped colleges in the sample. Of special significance is that college 21 [Ex-DET] and 1 [Ex-HOD] are equipped with computers in the workshops [item 9] for start-up training programmes. Also noticeable is that the three colleges above are equipped with drill sets [item 16] and drill presses [item 17], which are essential basic tools to produce a workpiece.

Flowing from the above information it appears that colleges 21 [Ex-DET], 1 [Ex-HOD] and 3 [Ex-Natal] are special colleges in that they are better positioned to offer quality and effective practical training to students.

5.8.3 WORST-EQUIPPED COLLEGES IN THE SAMPLE

The data provided in Table 56 reveals that colleges 9 and 22 [Ex-KwaZulu], as well as college 7 [Ex-HOR] are the worst equipped institutions in the sample. Noticeable is that these colleges do not have the following equipment in their workshops/inventories.

ballpein hammers	[Item 1]
computers in the workshops	*[Item 9]*
conduit dies	[Item 10]
carpenters brace	[Item 12]
dividers	[Item 14]
drill press	[Item 17]
pipe vice	[Item 45], and
portable grinder	[Item 46]

This is quite a large quantity [8 items] of essential training equipment which is not available at these colleges and this inevitably has a negative influence on the practical training of students attending these colleges. To make the situation worse, there are many other items which at least TWO of these three colleges [9, 22 and 7] have never had or possess in insufficiebt numbers:

cable extension [heavy duty]	[item 4]
combination of spanners	[item 8]
drill sets	*[item 16]*
fixed hook bender	[item 22]
gas pliers	[item 25]
iron soldering	[item 31]
loose hook bender	[item 34]
meters [OM 50 Robin]	[item 35]
meters [OM 92 Robin]	[item 36]
meters [OM 2000 Robin]	*[item 37]*
meters [K3 IIIV Robin]	[item 38]
pliers combination	[item 40]
pipe wrenches	[item 44]
screw driver set	[item 49]
stripper wire	[item 56].

This situation makes colleges *9 and 22* [Ex-*KwaZulu]* and *7* [Ex-HOR] *the worst-equipped colleges in* the sample. An explanation for this could be the fact that Ex-KwaZulu colleges are under-funded and that Ex-HOR colleges do not have workshops or laboratories available for practical training. Consequently, the quality of the training of electricians at these colleges is far inferiour to that og colleges 16, 21 and 1.

5.8.4 COMPARISON OF EQUIPMENT FROM AN EX-DEPARTMENT PERSPECTIVE

Table 56 reflects that Ex-DET colleges [16 and 21] followed by Ex-HOD colleges [1 and 12], as well as colleges 3 and 10 [Ex-Natal] are better equipped than the other Ex-Departments [Ex-KZ and Ex-HOR].

Evident from this table is that Ex-DET colleges [16 and 21] are equipped with components in the workshops which other Ex-Departments are sorely lacking. The computers in the workshops better position the Ex-DET colleges and make them more up to date as they are capable of storing, controlling and providing information through these machines.

According to data in Table 56:

Ex-DET:	college 16 had 54 of 62 items of equipment
	college 21 had 56 of 62 items of equipment
Ex-HOD:	college 1 had 56 of 62 items of equipment
	college 12 had 52 of 62 items of equipment
Ex-Natal:	college 3 had 55 of 62 items of equipment
	college 10 had 51 of 62 items of equipment
Ex-KZ :	college 9 had 41 of 62 items of equipment
	college 22 had 33 of 62 items of equipment
Ex-HOR:	college 7 had 38 of 62 items of equipment

This means that, of the five Ex-Departments, three Ex-Departments [Ex-DET, Ex-HOD and Ex-Natal] are the best and most adequately equipped of the sample.

5.8 COMPARISON BETWEEN PERCEPTIONS AND INVENTORY

Data in respect of the perceptions about the range, relevance, updatedness and availability of equipment is captured in Tables 49-54. This section of the study is a comparison between the perceptions of principals and the real position regarding equipment according to the inventory from Tables 55 and 56. An essential reason for comparing principals' perceptions [Table 49-54] and the actual equipment according to inventory [Table 55 and 56] is to establish whether principals' perceptions were correct/true or not.

5.8.1 EX-NATAL COLLEGES

The evidence from Ex-Natal colleges shows:

Table 53: Principals' perceptions about equipment, scoring 4,2 [who felt fairly satisfied]
The Ex-Natal principals' satisfaction indexes were:

Range	3,3
Relevance	4
Updatedness	3
Budgets	3,8
Availability	4,2
Maintenance	4,2
Average	3,8

Table 55: Inventory for Motor Mechanics - college 3 with 51 of 55 items of equipment and college 10 with 52 of 55 items of equipment - both colleges are Ex-Natal,

Table 56: Inventory for Electrical Trade - college 3 with 55 of 62 items of equipment and college 10 with 51 of 62 items of equipment,

This data confirms that there is similarity between the perceptions of the Ex-Natal colleges principals concerning the equipment and the real situation. Further calculations show that college 3 possessed 91% of the equipmnt needed for Motor mechanics and Electrical Trade combined, while college 10 possessed 88% of similar equipment. Such percentages are high.

This picture is further confirmed by Ex-Natal figures:

Table 50: principals' perceptions about relevance of equipment, scoring 4,2 [fairly satisfied]

Table 52: principals' perceptions about budget allocation, scoring 3,8 [between neither satisfactory, nor unsatisfactory, and fairly satisfactory], and

Table 54: principals' perceptions about maintenance, scoring 4,2 [fairly satisfied].

This implies that respondents from Ex-Natal colleges were correct in saying that their colleges were adequately equipped and it is obvious that they are better positioned to offer effective and efficient practical training to Mechanical and Electrical Trade students.

5.9.2 EX-KWAZULU COLLEGES

There is similarity between the principals' perceptions about the availability, maintenance, relevance, updatedness and range of equipment from Ex-KwaZulu [Tables 49-54] colleges and the range of the equipment according to inventory. Information obtained from Ex-KwaZulu colleges revealed that their average satisfacyion index on equipment was 2,2 [rather unsatisfactory]. This statistic rests on the following data:

Table 49:	principals' perceptions about range of equipment, scoring average 2 [rather unsatisfactory]
Table 50:	principals' perceptions about relevance of equipment, scoring average 2,2 [*neither satisfactory nor unsatisfactory*]
Table 51:	principals' perceptions about updatedness of the equipment, scoring average 2,2 [rather unsatisfactory]
Table 52:	principals' perceptions about budget, scoring average 2 [rather unsatisfactory]
Table 53:	principals' perceptions about the availability of equipment, scoring average 2 [rather unsatisfactory].
Table 54:	principals' perceptions about maintenance of equipment, scoring average 2 [rather unsatisfactory].

Let us compare the above perceptions to the position of Ex-KwaZulu colleges shown in the inventory:

Table 55:	[Motor Mechanics] college 9 with 39 of 55 items of equipment; college 22 with 32 of 55 items of equipment as well.
Table 56:	[Electrical Trade] college 9 with 41 of 62 items of equipment college 22 with 33 of 62 items of equipment.

Here too, comparison between perceptions and reality seems to confirm that there is a similarity between the perceptions of the Ex-KwaZulu college principals and the equipment according to the inventory. As has already been indicated, Ex-KwaZulu principals indicate that they have insufficient equipment and the inventory confirms that their institutions are inadequately equipped. Percentage-wise, college 9 possedded 68% of equipment needed for Motor Mechanics and Electrical Trade combined, while college 22 had only 56% of the equipmnt needed in these areas.

What is perhaps most disappointing from Tables 55 and 56 [inventories] is that Ex-KwaZulu colleges [9 and 22] have insufficient gearboxes [automatic and manual], which means that students from the Motor Mechanics department cannot do practical work and learn how to trace and repair faults on worn and faulty components on the:

a] Manual gearbox and final drive
- front wheel drive
- rear wheel drive
- four wheel drive

b] Automatic gearbox and final drive
- front wheel drive
- rear wheel drive

c] Clutch System
- how to remove, repair and replace clutch systems.

The information reveals that Ex-KwaZulu colleges [9 and 22] are short of important equipment and this obviously affects the quality of teaching and learning and the practical training of students in the Motor Mechanics division. In Ewlectrical Trade alone, these colleges are even worse off since they have only half the amount of equipment [53%] that they need to train electricians effectively.

5.9.3 EX-DET COLLEGES

According to data in Table 53, colleges 16 and 21 [Ex-DET] are fairly satisfied with the availability of the equipment. The principals' satisfaction indexes regarding equipment were, on avarage,:

Range	3,5	satisfactory
Revevance	3,5	satisfactory
Updatedness	4	satisfactory
Budget	2,5	neither satisfactory nor unsatisfactory
Availablility	4	satisfactory
Maintenance	4	satisfactory
Average	3,6	satisfactory.

The inventory showed the following:

Table 55 [Motor Mechanics inventory]

- college 16 [with 53 of 55 items of equipment]
- college 21 [with 54 of 55 items of equipment]

as well as

Table 56 [Electrical Trade inventory]

- college 16 [with 54 of 62 items of equipment]
- college 21 [with 56 of 62 item of equipment]

Therefore, there is cohesion between the Ex-DET principals' perceptions about the availability of equipment and the equipment according to the inventory.

What is conspicuous in Tables 55 and 56 [inventory] is that both Ex-DET colleges [16 and 21] are supplied with important equipment when compared with other colleges. For example: Tables 55 and 56 show that college 21 has computers in both the Electrical and Motor Mechanics workshops. Table 55 also shows that the Motor Mechanics workshop had:

Distributor testers [Machines]
Running Diesel and Petrol engines
Pneumatic Tools Wheelnuts
Video and Televisions, and
Tyre changing machines

This situation places Ex-DET colleges in an advantageous position and contributes towards quality practical training of students. In summary, college 16 possessed 92% of equipment needed for Motor Mechanics and Electrical Trade conbined, while college 21 possessed 94% of similat equipment. Thus the Ex-DET colleges were better equipped than any other category of colleges.

5.9.4 EX-HOD COLLEGES

Evident from Table 53 is that, generally, the principals from colleges 1 and 12 [Ex-HOD] were neither satisfied nor dissatisfied with the equipment [scoring average 3] in their workshops. The principals' satisfaction indexes were:

Range	3,3
Relevance	3

Updatedness	2,3
Budget	2,7
Availability	3
Maintenabce	3
Average	2,9 *[neither satisfactry nor unsatisfactory]*

The Ex-HOD principals' perceptions about the availability, budget range of equipment and so on, are is not in agreement with the sitaution shown in the inventory. In direct contrast to principals' perceptions of equipment, Tables 55 and 56 show that *Ex-HOD colleges [1 and 12] were amongst the* best equipped colleges in the sample. Table 55 [Motor Mechanics inventory] reveal that:

- college 1 had 53 of 55 items of equipment
- college 12 had 46 of 55 items of equipment

and Table 56 [Electrical Trade inventory]:

- college 1 had 56 of 62 items of equipment
- college 12 had 52 of 62 items of equipment.

Flowing from the above point is that principals of colleges 1 and 12 [Ex-HOD] do not harbour correct perceptions about the equipment in their workshops. Information in the tables points out that Ex-HOD college principals *think they have insufficient equipment but the inventory shows that they have* enough. College 1 possessed 93% of equipment needed for Motor Mechanics and Electrical Trade combined, while college 12 possessed 80% of similar equipment. As has already been implied, college 1 [Ex-HOD] has a range of important equipment viz:

Computers in the workshops [Tables 55 & 56]

Running Diesel and Petrol engines

Tyre changing machines

Video and Television in the workshops

Workstations with diagnostic equipment for checking spark, timing, distributor

Thus, on the basis of the evidence in Tables 55 and 56 [Motor Mechanics and Electrical Trade inventories], it can be concluded that colleges 1 and 12 [Ex-HOD] are well-equipped and that principals of these institutions have unrealistic perceptions about equipment in their institutions.

5.9.5 EX-HOR COLLEGES

Data in Table 53 reveals that the perceptions of the college 7 principal [Ex-HOR] about the equipment in his college showed dissatisfaction. The principal's satisfaction indexes were:

Range	1	
Relevance	3	
Updatedness	3	
Budget	2	
Availability	2	
Maintenance	2	
Average	2,2	[rather unsatisfactory]

The figures in Tables 55 and 56 [inventories] stand as follows:

- Table 55 [Motor Mechanics inventory] revealed that college 7 had 39 of 55 items of equipment and Table 56 [Electrical Trade inventory] also show that college 7 had 38 of 62 items of equipment. The Ex-HOR college possessed 66% of equipment needed for Motor Mexhanics and Electrical Trade combined.

The above information brings to notice that there is a similarity between the principal's perception about the availability of equipment in his college and the equipment according to the inventory. Table 55 shows that college 7 [Ex-HOR] is short of important equipment which includes:

Carburettors	[Item 7]
Computers in the workshops	[Item 8]
Electric drilling machine	[item 4]
Hacksaws and hand files	[Items 18 and 19]
Gearboxes - automatic & manual	[Item 17]
Lubrication System	[Item 25]
Pneumatic tools wheelnuts	[Item 28]
Running Diesel and Petrol engines	[Item 34]
Tyre changing machine	[Item 44]]
Tools and Spanners - insufficient	[Item 45 and
Valve grinder machine	[Item 49]

It can therefore be confirmed that the Ex-HOR college [7] is short of necessary equipment for the practical training of students and this negatively affects the quality of learning, teaching and training.

Obvious from this section of the study, is that Ex-KwaZulu colleges [9 and 22] are in the most distressing postion regarding equipement *in their colleges, in comparison with colleges on other* categories. Data processing showed that sample colleges in various categories possessed the following percentages of the minimum equipment which they need to train students properly:

Ex-Natal	90%
Ex-KwaZulu	62%
Ex-DET	93%
Ex-HOD	89%
Ex-HOR	66%

The results of this investigation suggest that Ex-KwaZulu *colleges*, together with the Ex-HOR college, are extremely poorly equipped to deal with the technical training they are expected to provide. They are:

inadequately equipped [Tables 55 and 56] short of important equipment, and

lack adequate budgets for updating and maintaining of equipment [Tables 49 to 54].

The conclusion is that constraints of such nature impact adversely upon the quality of training.

5.10 PRINCIPALS' PRIORITIES

An essential reason for including a question about principals' priorities was to identify measures that could assist the colleges in improving training offered to students. This deals with Part 4 [Question 14] of the questionnaire with the purpose of assessing how the principals themselves felt about improving the training offered at their colleges. The principals were asked to indicate on a point scale using 1 next to the most important measure, number 2 next to the second most important measure etc., according to the rank order of importance.

The following measures were given to principals for prioritisation:

a] Improve equipment

b] Improve training materials

c] Upgrade lecturers

d] Improve the selection process for incoming students

e] Establish closer relations with employers industry

f] Improve the system of requisitioning material from department

g] Increase the number of professionally and technically qualified staff

h] Improve buildings

i] Other [explain]

It is important to indicate that this question does not deal with equipment only as the researcher wanted an overall view of priorities and to discover how high equipment is on the principals' list of priorities.

TABLE 57: PERCEPTIONS REGARDING PRIORITIES

			N = 19								KEY
			PRINCIPAL=S PRIORITIES								1 Most important = 5 points 2 Second most important = 3 points 3. Third most important = 1 point
-DPT	COL.	Improve Equipment	Improve Training Material	Upgrade Lecturers	Selection of students	Industry Relations	Improve Requisition system	Increase qualified staff	Improve Buildings	Other	Rank order of Priorities
-Ntl	2	-	1	3	-	-	-	5	-	-	1. Closer relations with industry. 2. Increase qualified staff. 3. Improve training materials.
	3	-	1	-	3	-	-	5	-	-	
	8	-	-	1	3	5	-	-	-	-	
	10	3	1	-	-	-	-	-	5	-	
	15	3	5	-	-	1	-	-	-	-	
	17	-	1	3	-	5	-	-	-	-	
otal		6	9	7	6	11	0	10	5	0	
x-KZ	5	3	-	-	-	5	1	-	-	-	1. Upgrade lecturers. 2. Improve Equipment. 3. Closer relations with industry.
	6	1	3	5	-	-	-	-	-	-	
	9	-	-	1	-	-	-	-	3	5	
	11	-	-	1	3	-	-	5	-	-	
	19	1	-	5	-	3	-	-	-	-	
	22	5	-	3	-	-	1	-	-	-	
Total		10	3	15	3	8	2	5	3	5	
Ex-HOD	1	1	3	-	5	-	-	-	-	-	1. Selection of students. 2. Improve Equipment. 3. Improve training erial

	12	5	-	-	3	1	-	-	-	-	
	20	-	-	1	5	-	-	3	-	-	
l		6	3	1	13	1	0	3	0	0	
ET	16	-	-	3	1	-	-	5	-	-	1. Upgrade lecturers. 2. Increase qualified staff. 3. Improve buildings.
	21	1	-	5	-	-	-	-	3	-	
al		1	0	8	1	0	0	5	3	0	
HOR	7	3	1	-	-	-	-	-	5	-	1. Improve buildings. 2. Improve equipment. 3. Improve training materials.
al		3	1	0	0	0	0	0	5	0	
nd al		26	16	31	23	20	2	23	16	5	
Dpt.. rity		2	5	1	3	4	7	3	5	6	

Table 57 reveals that Ex-Natal's first priority is a closer relation with industry, compared with Ex-KwaZulu's which is the upgrading of lecturers. Ex-Natal colleges concerns are to train students to meet their changing labour market needs and their first priority is a co-operation between their institutions and industry. This situation increases the relevance of technical and vocational education to industry and provides a good opportunity to meet required industrial standards, even at a training stage. This closer relations with industry will afford Ex-Natal college lecturers an opportunity to update their knowledge to meet current practice whilst the industry is afforded the opportunity to make a preliminary selection of future employees from the students on work placements.

Noticeable from Table 57 is that Ex-KwaZulu colleges wish to have their lecturers upgraded to ensure that their teaching staff possess appropriate, up-to-date knowledge and skills to meet the training needs of all students. Ex-DET colleges also listed the upgrading of lecturers as their first priority. As has already been indicated in Chapter 4, Table 57, both Ex-KwaZulu and Ex-DET colleges have a shortage of teaching staff who are technically as well as professionally qualified [also see section 1.3.1]. The problem is complicated by the shortage of teachers competent in emerging technologies, as this is a serious concern for technical colleges. The task of upgrading, retraining and updating lecturers' skills, scientific and technical knowledge is therefore the first priority for Ex-KwaZulu and Ex-DET. This situation will enable both Ex-KwaZulu and Ex-DET colleges to meet the growing demands for a higher level of knowledge in Science, Mathematics and Information Technology.

The colleges from Ex-HOD listed selection of students as priority number one. This could be because of the fact that most of students recruited from Black secondary schools into their colleges lack Science and Mathematics in their qualifications. Evident from Table 40 is that Ex-HOD colleges had pass rates [50,8] below the average of 62 % suggesting that these colleges had serious problems in Mathematics. The reason for this could be that Ex-HOD colleges are unable to recruit students with good Mathematics background. That is why Ex-HOD colleges are listing selection of students as their first priority. This situation will enable Ex-HOD colleges to select the best students for Science, Mathematics and other Engineering and Technological subjects.

Ex-HOR's first priority is the improvement of buildings. The reason for this could be the fact that Ex-HOR colleges do not have engineering workshops for practical training of students.

Table 57 displays that Ex-Natal colleges' second priority has to do with the increase of qualified staff. It does appear that although Ex-Natal colleges do have a resaonable number of qualified lecturers, they are still eager to recruit more adequately qualified teaching staff.

What is interesting from Table 57 is that Ex-DET colleges' second priority is also to increase qualified lecturing staff. It is imperative to note that Ex-KwaZulu, Ex-HOD and Ex-HOR colleges have similar choices as their second priorities as they all choose to have their equipment improved. This shows that the equipment, tools and machinery which these institutions have in their workshops are inadequate. It is therefore necessary for colleges to update and make their training equipment relevant so that the training given to students would be applicable in the place of work.

The table shows that Ex-Natal, Ex-HOD and Ex-HOR colleges have the same choice as their third priority which is the improvement of training material to improve the quality of the teaching and learning process as well as to increase the relevance of technical education to industry.

Ex-KwaZulu colleges' third priority is the establishment of closer relations with employers and industry. This situation would assist Ex-KwaZulu colleges to:

respond to the needs of employers
gain access to equipment and machinery from industry for the practical training of students
arrange for industry personnel to be seconded to technical colleges and for academic staff to have industry experience.

A closer working relationship between technical colleges and industry usually entails placing lecturers with training in areas of advanced technology with the focus on the learning process and teaching strategies.

Ex-DET colleges' third priority is to improve the buildings because many of them have old and outdated buildings and they cannot meet today's *industry standards*.

Implicit in this table is that, overall, principals from all five Ex-Departments listed the upgrading of lecturers as their first priority. The second and third principals' priorities were to improve equipment and to select students respectively. The fact that all principals from Ex-Departments preferred to have improvement of equipment as their second choice, once again highlights the fact that there is a need from the side of the Education Department to improve tools, equipment and heavy machinery at certain colleges [see Table 57].

To summarise, the Ex-Departments, priorities stand as follows:

Ex-Natal	:	1.	Closer relations with industry
		2.	Increase qualified staff
		3.	Improve training materials
Ex-KwaZulu	:	1.	Upgrade lecturers
		2.	Improve equipment
		3.	Closer relations with industry
Ex-HOD	:	1.	Selection of students
		2.	Improve equipment
		3.	Improve training materials
Ex-DET	:	1.	Upgrade lecturers
		2.	Increase qualified staff
		3.	Improve buildings
Ex-HOR	:	1.	Improve buildings
		2.	Improve equipment
		3.	Improve training materials

From the findings discussed above, it is evident that this section of the study had succeeded in identifying the principals' priorities which could assist colleges to improve the quality of teaching and learning offered to students.

5.10 CONCLUSION

This chapter has provided evidence that the equipment, tools and heavy machinery form the backbone of students' training at Technical Colleges as they increase students' capability to engage confidently with the practical training process. What has emerged is the fact that the didactic significance of equipment usage rests on the six pillars, viz, identification, retention, transfer, practice, problem-solving and creativity [see 5.4]. It can, therefore, be concluded that the use of equipment in the didactic situation enables the students to develop skills and knowledge and also to be active participation in the learning process and to build up a meaningful understanding of concepts which they can apply in the place of work.

From the findings discussed in section 5.9 [perceptions of principals regarding equipment], it is apparent that Ex-Natal and Ex-DET colleges were fairly satisfied [average scoring 3,8 and 3,6 respectively] with the equipment in their institutions compared with principals from Ex-KwaZulu [scoring 2,2], Ex-HOD [scoring 2,9] and Ex-HOR [scoring 2,2]. This section of the study has shown that colleges from: Ex-DET, Ex-Natal as well as college 1 from Ex-HOD colleges are the best equipped colleges, while those from Ex-KwaZulu and Ex-HOR were the worst equipped.

Findings of the section on principals' priorities, are that principals from all Ex-Departments overall, listed the upgrading of lecturers as their first priority followed by the improvement of equipment and then the selection of students. The fact that the improvement of equipment has been chosen as second priority confirms that Technical Colleges need to modernise, upgrade and expand their range of practical training equipment and machinery in order to improve their responsiveness to the needs of industry and their ability to keep pace with technological changes [NITE 1996:3].

CHAPTER 6

PARTICULARIZATION OF CONSTRAINTS ON FIVE EX-DEPARTMENTS' COLLEGES [EX-NATAL, EX-KZ, EX-DET, EX-HOD AND EX-HOR]

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CHAPTER 6

PARTICULARIZATION OF CONSTRAINTS ON FIVE EX-DEPARTMENTS' COLLEGES [EX-NATAL, EX-KZ, EX-DET, EX-HOD AND EX-HOR]

6.1 INTRODUCTION

Constraints refer to all existing factors which militate against effective technical college based training. These may relate to the attitudes and perceptions of lecturers with regard to the leadership styles of management staff at colleges, resources, equipment, departmental policies, prescriptions made by subject advisors, funding of staff-development and in-service training programmes and curricula. The writer is of the view that the effective teaching and training of students is not possible unless these constraints are alleviated.

The particularization of constraints in this chapter will be presented in these three sections:

- *Constraints related to students.*
- Constraints related to lecturing staff.
- Constraints related to facilities and equipment.

The presentation will be followed by the examination of consequences, as well as the rationale for using examination results as evidence of constraints.

6.2 CONSTRAINTS RELATED TO STUDENTS:

6.2.1 LACK OF SCIENCE AND MATHEMATICS BACKGROUND

One of the major constraints in respect to students enrolled at technical colleges is the lack of a Science and Mathematics background. This study has revealed that most of the NTC 1 - 3 engineering students, recruited mainly from black areas, do not have Science and Mathematics in their qualifications [see Section 3.1.1.1[c] i].

This situation makes it difficult for NTC 1 - 3 student to cope in courses like Motor and Electrical Trade Theories, Engineering Science and Mathematics [see Sections 3.1.1.1 [c] and [e], Tables 10, 11, 17, 23, 29, 29, 34, 35 and 40]. On the basis of data obtained from the principals' questionnaire, the following reasons were given for high failure rates in Ex-KwaZulu Technical Colleges:

- Lack of adequately qualified and competent Mathematics lecturers
- Students not sufficiently grounded in Science and Mathematics at the time when they start the course.

The information provided above would appear to confirm that technical colleges, particularly Ex-KwaZulu, Ex-DET and Ex-HOD colleges, are faced with the problems of not yet succeeding in recruiting students with good Science and Mathematics background in their qualifications. The 43,7 % [Ex-KwaZulu], 49,2 [Ex-HOD], 43,1 % [Ex-DET] 34,2 % [Ex-Natal] and 21,9 % [EX-HOR] failure rates in Mathematics [see Table 40] could be suggestive of the magnitude of the problem and this is further supported by information in Table 46, paragraph 4.1.10.14.

The 25 % [Ex-Natal], 43,1 % [Ex-KwaZulu], 32,8 % [Ex-HOD], 7,3% [Ex-DET] and 23,3 % [Ex-HOR] failure rates in Science [see Table 38]indicate the severity of the problem experienced by colleges. One can infer from the information above that Science and Mathematics are problematic to NT C1-3 [Engineering students] and have an adverse effect on colleges' results.

6.2.2 ENGLISH LANGUAGE CONSTRAINTS

Evidence emanating from both qualitative and quantitative results show that students experience difficulties when English is used as a medium of instruction at technical colleges [see sections 3.1.1.5 [a], 3.1.1. 6 [a], 4.9.2 and 3.1.1.1 [a] and [b]].

There is a communication gap between white lecturers and black [African] students in classroom situations as the black students are unable to interpret and understand scientific and mathematical concepts and they also find it difficult to understand examination questions. The problem of communication between students and lecturers negatively affects student performance, progress and examination results in general.

The reason for the language problem, from the side of African students at colleges, is the fact that they are recruited from black secondary schools where Zulu is the dominant language. This appears to be an issue of serious concern to white lecturers because, if lecturers and students can not effectively communicate with each other, the teaching and practical training of students is likely to be adversely affected [see Table 46 and paragraph 4.10.1.6].

6.2.4 ABSENTEEISM AMONG STUDENTS

The results of this study suggest that there is high level of absenteeism amongst students, to the extent that many end up not writing national examinations [see Tables 36-40]. Table 46 further reveals that white lecturers at Ex-Natal colleges [100 %] are more concerned about the problem of absenteeism than Ex-KwaZulu lecturers [25 %]. As given in Table 46, 50 % of the respondents from Ex-DET and 25 % from Ex-HOD colleges maintained that there was a problem of absenteeism.

This is an issue of serious concern to white lecturers, especially as it has a negative impact on students' performance [see paragraph 4.10.1.5] This problem is significant when considering the fact that the government pays high subsidies to technical colleges to train and develop students who in turn do not write National Examinations, consequently, this leads to a wastage of government and taxpayers' money.

6.2.5 LACK OF GUIDANCE AND COUNSELLING OR SUPPORT SERVICES

A further constraint facing technical colleges is the lack of guidance and counselling or student support services [see Table 46]. A guidance or counselling service is a vital element in technical education directed at aiding all students to make informed educational and occupational choices. Such a service should ensure that the individual student is provided with these necessary prerequisites:

a] to become aware of her/his interest and abilities and to set precise objectives,

b] to pursue a course of education,

c] to make decisions concerning her/his occupation, both in the initial and later stages, which lead to a satisfying career,

d] to facilitate transitions between education and employment at whatever level or stage [Unesco, 1990: 35].

Table 46 [qualitative data] shows that 50 % of the respondents from Ex-KwaZulu and 25 % from Ex-HOR colleges maintain that they do not have student support programmes. These lecturers are very concerned about the lack of counselling or student support services at their colleges that will inform them of the various possibilities open in the particular field of interest, the educational background required and the possibilities for later continuing education available. Where the Department of Education does not provide such a service to students, students then fail to make proper choices and end up wasting time.

6.3 CONSTRAINTS RELATED TO LECTURING STAFF

6.3.1 INEFFECTIVE RECRUITMENT

Technical college students are taught and trained by lecturers who are recruited mainly from industry, commercial and academic institutions. The appointment of lecturers into the college system is based on academic standing, industry experience and on their expertise.

Evidence from quantitative results [Table 43, question 6] is that Ex-KwaZulu colleges are unable to attract highly qualified lecturers into their institutions. The main reason for the low degree of satisfaction with the recruitment programmes in Ex-KwaZulu colleges can, in part, be explained by the fact that these colleges are historically non white and situated in townships and rural areas where the safety of the lecturers cannot be guaranteed.

For technical college-based training to be effective, it needs to be conducted by qualified and experienced lecturers - both technically and professionally. As has already been indicated, if technical colleges are unable to recruit quality lecturers [see table 43] into their institutions, and are also not capable of providing effective in-service training programmes [see table 43], it stands to reason that those colleges will not be able to produce satisfactory results [see Ex-KwaZulu colleges' results, Tables 36 - 40] and marketable students. As Ex-KwaZulu Colleges also have the weakest staff-development [see Table 43 and 47] as well as ineffective recruitment programmes [see section 4.6] this means that it is exceptionally difficult for these institutions to produce good examinations results.

6.3.2 INADEQUATE INDUCTION OF LECTURERS

Evident from Table 45 is that Ex-KwaZulu colleges have the weakest induction programmes of all Ex-Departments; which suggests that they were unable to prepare new staff to cope with lecture rooms and the practical workshop training of students.

The induction programme for lecturers is important for the effective provision of the technical and vocational training to students. In this regard, technical colleges should provide shorter and more practically orientated forms of training to lecturers to ensure a sufficient degree of adaptability and capacity building. The content of such courses should include:

- objectives of technical education
- facilities and equipment that are available in the workshops
- anything supporting subject matter
- future plans and objectives of the college
- types of students and staff the college has
- procedures for dealing with late coming, absenteeism, misconduct from the side of students
- colleges' mission statements and the question of financial control within the college
- testing programmes and evaluation of students' practical work
- expectations of the college regarding students' behaviour and performance.

If one compares Ex-KwaZulu colleges with those of Ex-Natal, Ex-DET and Ex-HOD, one realises that Ex-KwaZulu colleges lack effective induction programmes [see Table 45 and 4.9.1]. What Table 45 further reveals is that there is a marked difference between Ex-KwaZulu and Ex-Natal colleges concerning the induction of new lecturers as there is a gap of 75 % which is extremely wide and cause for concern.

6.3.3 UNDERQUALIFIED LECTURERS

One of the major problems facing technical colleges is that quite a number of lecturers are not yet adequately qualified. Evident from Table 42 is that Ex-KwaZulu colleges have more lecturers [55,9] who are technically qualified, yet lack professional certificates, compared with Ex-Natal [46 %], Ex-HOD [15,7 %], Ex- DET [38,8 %] and Ex-HOR [35,2 %]. Table 42 further reveals that Ex-KwaZulu [42,3 %] and Ex-DET [22,7 %] continue to experience problems in attracting doubly qualified lecturers to their institutions. This, in most cases, becomes clear if one compares the responses of black colleges situated in the township and rural areas with those of White, Indian and Coloured colleges situated in urban and peri-urban areas.

6.3.4 LECTURERS' RESIGNATIONS

Table 44 shows that many lecturers from Ex-KwaZulu colleges [33] resign from their posts to move to industry for more lucerative employment. This study reveals that colleges which have mostly white staff [Ex-Natal and Ex-DET] loose less staff than colleges with historically non-white staff. Loss of staff appears to be a general problem experienced by all colleges and figures for the past three years stand as follows:

Ex-Natal	13 [12 %]
Ex-HOD	16 [20 %]
Ex-DET	12 [12 %]
Ex-KwaZulu	33 [20 %]
Ex-HOR	33 [20 %].

This outflow of teachesr exacerbates the already unsatisfactory staffing situation at colleges, especially in Ex-KwaZulu Colleges. The main reason for the outflow of teachers is the low financial incentives in education compared with those in the manufacturing and service industry. The movement of lecturers from colleges to the private sector weakens the quality of teaching at colleges.

In KwaZulu, approximately 77 lecturers resign every three years, viz. an average of 26 per year [Table 44]. Considering that there are 467 lecturers overall, an average of 5,5 % of lecturers at technical colleges leave their posts each year. This constraint appears to be serious especially because colleges experience difficulty in finding adequately qualified lecturers to fill posts.

6.3.5 LACK OF STAFF DEVELOPMENT AND IN-SERVICE TRAINING PROGRAMMES

Staff development is an important factor in increasing the skills and capacities of the labour force and management within technical institutions. Table 43 [Question 5] indicates that staffdevelopment programmes at Ex-KwaZulu colleges are ineffective or non-existent [see Section 4.5]. The problem of unavailability of effective staff development and in-service training programmes is a serious matter, if one considers the fact that 55,9 % [Ex-KwaZulu] and 38,8 % [Ex-DET] of the lecturers [see Table 42] are inadequately qualified. An effective in-service training is absolutely essential for lecturers who are to train workers, especially for those who train technicians, as it is in the technical field that the greatest changes are occurring.

In this regard, it is disturbing to note that the Ex-KwaZulu colleges, already impeded by a high percentage of teachers who have inadequate qualifications, offer an extremely weak staff development plan for their lecturing staff.

What is clear from Table 43 [see Section 4.5] is that a well planned staff development programme and in-service training supplement the qualifications of lecturers and raise the level of student achievement. This support enables the teaching staff to keep up to date with technological advances and changes and also with current teaching methods.

6.3.6 <u>DISCRIMINATION</u>

One of the major problems facing technical colleges is that staff components are not reflective of recent changes which have taken place in respect of students gaining access to these institutions. *Although no statistical evidence is available to substantiate this allegation, most positions of higher* status at technical colleges still seem to be occupied by white staff members and those of lower status appear to be given to black staff members and women.

The discussion document for Policy and Implementation for technical colleges in KwaZulu Natal [1995: 45] has confirmed that:

- the participation of women in senior positions in technical and vocational education is lower than that of men

- female students at technical colleges concentrate in the business field with the majority of them qualifying as Secretaries while male counterparts participate in the engineering field

- senior positions at technical colleges are still occupied by whites, especially positions of Principals, Deputy Principals, Senior Heads, of Departments or Sectional Heads.

One must accept that the constraints of racial and sex discriminations are the result of the legacy of apartheid. Thus, the challenges faced with regard to the building of human resource capacity of technical college staff is that of equity, redress and development.

6.3.6 UNEQUAL TREATMENT BY SUBJECT ADVISORS

Displayed in Table 47, is that Ex-KwaZulu college principals experience difficulties with Ex-KwaZulu white subject advisors - the problem being that subject advisors treat Ex-KwaZulu white principals differently from those colleges with black principals [see Section 4.11.8 [f]].

The preferential treatment, nepotism, and favouritism by white subject advisers posed a serious problem and led to a situation where certain colleges were better resourced, staffed and supplied with buildings, workshops, administration blocks and good office equipments. Such tensions are hardly conducive to quality technical education.

6.3.7 LACK OF PARTNERSHIP AND SUPPORT BETWEEN COLLEGES AND INDUSTRY

Perceptions emanating from Tables 47 and 51 confirm that Ex-KwaZulu [75 %], Ex-Natal [50 %], Ex-DET [50 %], Ex-HOD [50 %] and Ex-HOR [25 %] colleges are not effectively linked to industries and commercial institutions. What became clear from Ex-Departments is that colleges find practical difficulties in interchanging teaching staff with industrial personal. The reason for this difficulty from the side of industry is the fact that it is an expensive exercise.

This survey further reveals [Table 47] that colleges have failed to extend decision making for technical education to include representatives of employers and a workforce and to have colleges adapted by industries for the sake of financial skills and material support. This information implies that training that takes place at technical colleges is not in line with the need of industry. The inability to involve industry in the technical college-based training programme, failure to meet the needs of students and requirements of industrial and commercial enterprise are serious problems which influence the future employment of college students.

In terms of Table 47, the majority [75 % - Ex-KwaZulu, 50 % Ex-Natal, 50 % Ex-DET, 50 % Ex-HOD and 25 % EX-HOR] of the lecturers from colleges believe that there is a lack of partnership, link and support from industry and commercial institutions [see 4.11.6]. Partnership here implies a close working relationship between colleges, labour and business. The aim of forming a partnership is to:

- ensure that there is a commitment between technical colleges and business/industry in order to keep education and training relevant

- ensure that the trades or programmes offered for study at college are concurrent to states economic projections for their industries, as well as

- ensure smoother and more effective transition from education to working life.

6.3.8 GEOGRAPHICAL LOCATION OF LECTURERS

One of the major constraints facing Ex-KwaZulu Colleges relates to the geographical location of the colleges. Ex-KwaZulu colleges are situated in black townships and rural areas which are rough, unsafe and fail to attract lecturers of other racial groups [Whites, Indians and Coloured] to their institutions [see Section 4.10.1.3 and Tables 42 and 46].

This is a major obstacle as colleges are unable to recruit quality lecturers with both technical and professional qualifications and, as a result, Ex-KwaZulu colleges do not have appropriately qualified lecturers [see Table 43].

6.4 CONSTRAINTS RELATED TO FACILITIES AND EQUIPMENT

6.4.1 LACK OF EQUIPMENT IN WORKSHOPS

Technical college-based training requires a more supportive infrastructure, facilities, equipment, tools and consumables to meet the needs of students and industry. The evidence in Tables 49, 50 and 51 prove that Ex-KwaZulu and Ex-HOR colleges are inadequately equipped compared with Ex-Natal, Ex-DET and Ex-HOD colleges.

Table 49 provides evidence that colleges 3 and 10 [Ex-Natal] have a total of 52 and 53 sets of tools/equipment respectively in their workshops compared with colleges 9 and 22 [Ex-KwaZulu] with 39 and 32 sets of tools/equipment respectively. Table 49 further reveals that colleges 16 and 21 [Ex-DET] have a total of 54 and 55 sets of tools/equipment respectively, as well as colleges 1 and 12 [Ex-HOD] with a total of 53 and 47 sets of tools/equipment respectively in their workshops. This table also shows that college 7 [Ex-HOR] have only 40 sets of tools out of 56. Evident from this table is that college 7 has never had 10 sets of tools/equipment in its inventory, which suggests that this college is inadequately equipped.

On the basis of the information provided above, it can be concluded that Ex-KwaZulu and Ex-HOR colleges are not yet adequately equipped to meet their required needs. The lack of material and training equipment [see Tables 50 and 51] in Ex-KwaZulu and Ex-HOR colleges naturally affects the quality of training and learning in these institutions.

This results in a situation where Ex-KwaZulu technical colleges produce students who lack competence and who are therefore unemployable. This reality further makes it impossible for Ex-KwaZulu colleges to be able to compete with Ex-Natal, Ex-HOD and Ex-DET colleges and to be in a position to offer effective learning and training for their students.

6.4.2 OUTDATED EQUIPMENT

Table 48, Question 2 revealed that Ex-KwaZulu Colleges do not have the mechanisms to update equipment which become obsolete in the context of rapid technological advances. Evidence from table 48, Question 10, is that Ex-Natal colleges appear to be satisfied with the frequency in which their tools and equipment are updated.

Relevant and updated equipment/tools and machinery guarantee effective and quality training. What Table 48, Question 10 [see 4.11.8.4] suggests is that practical training at Ex-KwaZulu colleges is dependent upon outdated tools and equipment which is problematic as industries expect all technical colleges to produce quality and adequately trained students.

6.4.3 MAINTENANCE OF EQUIPMENT.

According to Table 46 50 % of the respondents from Ex-KwaZulu colleges expressed dissatisfaction regarding the manner in which the Ex-KwaZulu Education Department allocated the budget to colleges. Ex-KwaZulu colleges received an inadequate budget from the Department of Education, and, as a result, these institutions do not have sufficient finance to puchase , update, maintain and service training equipment and consummables. This has manifested as a serious problem as technical colleges cannot be effective without having relevant and well-maintained training equipment and machinery [see Tables 49, 50 and 51]. Insufficient financial support impacts negatively on the learning and practical training of students, making it impossible for Ex-KwaZulu colleges to maintain equipment and also be capable of producing competent and adequately trained students.

6.5 DEPARTMENTAL CONSTRAINTS

6.5.1 LACK OF POLICY GOVERNING PROCUREMENT OF EQUIPMENT

One major problem facing Ex-KwaZulu colleges is the lack of policy governing procurement of both consumable material and training equipment. Evident from table 46 is that 75 % of the respondents seem to believe that there is no well defined policy governing the supply of facilities and equipment to colleges. This table shows that subject advisors harbour preferential treatment with regard to certain colleges within the Ex-KwaZulu Department of Education and Culture.

This situation benefits certain colleges and leaves other colleges without training material.

6.5.2 MARKETING OF COLLEGES

Evidence emanating from qualitative results [Table 47] confirms that Ex-KwaZulu [50 %], Ex-Natal [50 %], Ex-HOD [25 %] and Ex-DET [25 %] colleges lack an effective programme for the marketing of technical colleges to the public.

There is a growing concern that the public do not know exactly what it is that technical colleges are offering. Evident from this study [Table 47] is that staff from technical colleges do not:

- use local news papers
- visit local schools
- telephone students who enquire about colleges
- use local radio, surveys and technical advisors,

to inform the public about technical colleges offerings.

6.5.3 LACK OF FUNDING POLICY

In terms of Table 46, evidence shows that 50 % of the respondents from Ex-KwaZulu colleges believe that this Department lacks a policy for budget allocation and, therefore, state funding to state colleges seems to be the most problematic area.

Principals of colleges, especially those from Ex-KwaZulu colleges, feel that there is inadequate state funding and that their state programmes of education provisioning cannot be entirely fulfilled as a result of the funding shortage. Technical colleges are expected to buy and update technical equipment, machinery, audio-visual material, consumables and also develop staff, yet they are hampered by those who expect this of them.

Ex-Natal colleges have a more effective funding policy than Ex-KwaZulu colleges. Current funding for state-aided technical colleges [Ex-Natal colleges] is based on the fulltime equivalent [FTE] formula. This is worked out on the bases of the number of successful learners and other number of subjects taken over a period of time. The lack of a funding policy for state colleges is a major constraint and detrimental for technical college education.

6.5.5 TRAINING NOT IN LINE WITH NEEDS OF INDUSTRY

Evidence emanating from Table 46 reveals that technical college-based training is not in line with the needs of commerce and industry [see Section 4.10.1.10]. What comes out clearly here is that there is disparity between skills training being provided by colleges and the world of work.

This study has established that the training programmes offered by technical colleges are not yet demand - led programmes which have the ability to respond immediately to the changing needs of the work-place or industry. Such inferior training programmes result in a situation where technical college graduates are unable to obtain employment or become productive in the work place. One can infer from this situation that a number of students, after completing their training, are still without employment skills.

An explanation for this is that a number of colleges [Table 46]:

- Lack machinery and equipment for practical training [Tables 49, 50 and 51]
- Lecturers lack practical experience in commerce and industry [Table 42]
- Lack staff-development and in-service training programmes [Table 43]
- Lack linkage with private sector [Table 47]
- Lack financial support [Table 46] and
- Have irrelevant and outdated curricular [Table 46].

6.5.6 LACK OF CLOSE WORKING RELATIONSHIPS BETWEEN COLLEGES

Another problem facing all Ex-Departments [KwaZulu-Natal] is the lack of a close working relationship between technical colleges. Evident from table 47 is that Ex-KwaZulu [50 %], Ex-DET [50 %] and Ex-HOD [35 %] colleges have failed to forge partnership with each other in order to rationalise resources.

The system works on the basis that those colleges within a certain radius share lecturers, physical and other resources in providing education and training to the various communities. This is a system of specialisation and can eliminate the multiplicity of resources. The problem here is that the unavailability of partnerships or working relationships between institutions deprived those disadvantaged colleges of the opportunity to access equipment and other important resources from advantaged institutions.

6.6 EXAMINING THE CONSEQUENCES OF CONSTRAINTS

From the findings discussed in Chapters 3 to 6, it is evident that the study succeeded in identifying a number of constraints influence the quality of teaching and practical training of students from all Ex-Departments. It is important to mention the fact that certain findings which have emerged illustrate clearly that, unless these constraints are removed, effective technical college-based training will not be possible. This section of the study aim at examining the consequences of these constraints on:

- Examination Results
- Engineering Courses
- *Image of certain colleges*
- Employment after training, and
- Ex-Departments.

6.6.1 RATIONALE FOR USING EXAMINATION RESULTS AS EVIDENCE OF CONSTRAINTS

The examination results have been used to pinpoint those technical colleges in KwaZulu Natal where teaching, learning and practical training appear to be most and least effective. The examination results are of special importance in order to identify constraints affecting the quality of training, since colleges with good examination results may very well have fewer constraints then colleges with poor results. This study has used examination results as indicators of the existence of constraints at colleges in KwaZulu Natal.

Evidence from examination results [Tables 36 to 40] from all five Ex-Departments confirm that the colleges have constraints related to:

- Students [see Sections 6.2.1 to 6.2.8]
- Lecturing Staff [see Sections 6.3.1 to 6.3.7]
- Facilities and equipment *[see Sections 6.4.1 to 6.4.8]*
- The Department of Education [see Section 6.5] and
- Industries.

The examination results in this study further reveal that Ex-KwaZulu Colleges [Tables 36, 37, 38 and 39] are more affected by constraints *when compared with other Ex-Departments. These constraints* include those related to students, lecturers, equipment, funding and procurement of training material. The poor examination results from Ex-KwaZulu colleges [Tables 36, 38, 39 and 40] suggest that these colleges have problems compounded by constraints and also by a lack of a back-up system from the Department of Education.

6.6.2 ENGINEERING COURSES DEFINITELY AFFECTED BY CONSTRAINTS

There is evidence [Table 36] to confirm that Ex-KwaZulu colleges have a low pass rate [67,5 %] in

Motor Trade Theory compared with the other Ex-Departments. Table 36 also reveals that 40,1 % of the students from Ex-Natal colleges did not write the examination.

This information implies that a similar situation prevails in other courses offered at technical colleges, although Motor Trade Theory has been used as an example In Motor Trade Theory, of 72 students who enrolled [Ex-Natal], only 44 students wrote the examination. Ex-KwaZulu has the lowest pass rate [67.5 %], compared with Ex-Natal [96,6%], Ex-HOD [89,1%], Ex-DET [86,6 %] and Ex-HOR [80 %].

Data from Table 38 shows that Ex-KwaZulu colleges have the lowest pass rate [56,9 %] in Engineering Science . This could suggest that Engineering Science is affected by constraints discussed in paragraph 4.10.1.14 [Table 46].

According to Table 39 Engineering Drawing has also been affected by these constraints. Ex-DET colleges have the lowest pass rate [32,7%]. One explanation for this poor performance is the lack of motivation [see Table 46].

Engineering Mathematics seems to be the course most affected. Table 40 reveals that all Ex-Departments - excepting Ex-HOR - experience difficulty in dealing with Engineering Mathematics. An explanation for this situation is discussed in section 4.10.1.14 [Table 46].

6.6.3 COLLEGES MOSTLY AFFECTED BY CONSTRAINTS

This research has shown that Ex-KwaZulu colleges [Tables 36 to 40] appeared to experience the greatest difficulties in achieving their aims and meeting their purposes. This is noticeable from the section dealing with Examinations from which it can be seen [Table 36] that Ex-Natal colleges have the highest pass rate [96,6 %] in Motor Trade Theory, compared with Ex-KwaZulu colleges [67,5 %].

Ex-KwaZulu colleges seem to be the most severely affected due to the constraints discussed in Section 6.3.5 [Table 43] which deals with staff-development plan, recruitment and in-service training programmes. The salaries of the staff [see Section 6.3.4] impact upon the efficient running pf Ex-KwaZulu colleges. Although this appears to be a general problem in all Ex-Departments, [see table 44], there is evidence to confirm that the problem is most serious in Ex-KwaZulu colleges [20 %].

6.6.4 EMPLOYMENT AFTER TRAINING

This study has demonstrated the lack of provision of facilities for Ex-KwaZulu technical colleges [see Sections 5.5.2; 5.5.3, 5.5.6 and Tables 50; 51 and 56]. If one compares Ex-KwaZulu colleges with historically White, Indian and Ex-DET colleges, one notices that the latter workshops are well supplied with up to date and recent equipment. This results in a situation where certain technical colleges produce students who do not have sufficient practical skills. Lack of facilities in technical colleges means that many colleges' students are unable to cope with the required standards from commerce and industry. What is evident here is that Ex-KwaZulu colleges have to deal with a multitude of students who are unemployed and also unemployable because of their inadequate training. A constraint of this nature is serious and has adverse effects on the life of students and the image of the colleges.

6.7 CONCLUSION

This chapter attempts to particularize the constraints that affect the quality of teaching and practical training of students at technical colleges. It has been disclosed that constraints related to students, lecturing staff, training equipment, departmental constraints and those related to industries have adverse effects on the quality of teaching, learning and practical training of students. This situation seems to demonstrate the problematic nature of technical college based training and its effects on the students after training.

In summary, the following constraints have been identified:

- Lack of Science and Mathematics background
- English Language constraints
- Absenteeism among students
- Lack of guidance, counselling and support services
- Ineffective recruitment
- Inadequate induction of lecturers
- Underqualified lecturers
- Lecturers' resignations
- Lack of staff development and in-ervice training programmes
- Discrimination
- Lack of partnership and support between colleges and industry
- Geographical location of lecturers
- Lack of equipment in workshops

- Outdated equipment
- Maintenance of equipment
- Lack of policy governing procurement of equipment
- Marketing of colleges
- Lack of funding policy
- Training not in line with needs of industry
- Lack of close working relationships between colleges.

CHAPTER 7

ANALYSIS OF RESULTS

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CHAPTER 7

ANALYSIS OF RESULTS

7.1 INTRODUCTION

The analysis of results is based on the five criteria formulated in Chapter 2. The empirical findings are examined and compared with the theoretical framework in Chapter 2. The analysis of data gathered from twenty three KwaZulu Natal Technical Colleges is discussed in order to explain important aspects of the findings.

Basically data analysis [in the quantitative paradigm] entails a break down of data into constituent parts to attempt to obtain answers to research questions and to test research hypotheses. Mouton [1996: 161] states that the term "analysis" means the resolution of a complex whole into its parts. In quantitative approaches to empirical research, "analysis" refers to the stage in the research process where the researcher, through the application of various statistical and mathematical techniques, focuses separately on specific variables in the data set [Ibid, 1996: 161].

Miles and Huberman [1994: 10] regard data analysis as consisting of three steps - data reduction, data display and verification. Kerlinger [1986, 125 :126] elaborates by stating that analysis means the categorising, ordering, manipulating and summarising of data to obtain answers to research questions. The purpose of analysis is to reduce data to an intelligible and interpretable form so that the relations of research problems can be studied, tested, and conclusions drawn [Ibid 1986: 125 - 126].

From the foregoing views, it is evident that analysis is a useful tool to give the researcher a feel for the data and that it is also an essential stage in the quality check of a data set. This chapter is divided into five main sections according to the five identified criteria for technical college based training [see Chapter 2]:

1. Effective Partnership;
2. Adequately equipped workshops;
3. Effective evaluation;
4. Transfer of knowledge; and
5. Qualified lecturers

7.2 CRITERION ONE: EFFECTIVE PARTNERSHIP

7.2.1 GENERAL LACK OF PARTNERSHIP AND SUPPORT

a] The significance of partnerships and support

This criterion is discussed in detail in Chapter 2 [see Section 2.2]. The general view adopted in this section of the study was that no technical college-based training can be effective unless there is an equally effective partnership between technical colleges and the private sector [see Section 2.2]. A partnership between the private sector and technical colleges improves the practical training of students and affords them an opportunity to gain insight from the private sector regarding the latest trends and innovations [Ross and Smith, 1985: 5 - 13] [see Section 2.2]. The benefits of this partnership between technical colleges and the private sector is also emphasised by Unesco [1978: 28] who holds the view that co-operation between the two sectors increases the relevance of technical education to industry and provides students with a good opportunity to meet required industrial standards at training level [see Section 2.3].

Strengthening of the ties [see 2.2] between the two sectors could offer opportunities to attract resources and assistance to technical education. To rationalise resources [human, buildings, equipment, etc.] and to ensure effective and efficient delivery of education and training, partnerships between the private sector and colleges is of vital importance [see Section 2.2]. LangPow and Lillis [1988: 51] states that "there is a widespread agreement that partnership between enterprises and colleges should be formed and where they exist, they should be strengthened, so that the abyss separating the world of colleges from the world of work is closed" [see Section 2.2].

Banham [1989: 14] suggests that a partnership between colleges and the private sector [see Section 2.2] can be developed through site visits or work observation, teacher secondment, courses and seminars, students' placement and curriculum development. Such partnerships contribute to educator and student development and empowerment. There is a dire need for colleges to work closely with business and industry in order to empower students and lecturers with relevant and up to date knowledge [see Section 2.2].

b] Relevant research evidence of this constraint

Evidence emanating from the qualitative results showed that there is lack of partnership between colleges and the private sector [see Section 4.11.6]. According to the statistics of Table 47, 75 % of the respondents from ex-KwaZulu, 50 % ex-Natal, 50 % ex-DET, 50 % ex-HOD and 25 % ex-HOR colleges expressed the view that there a need for a more definite partnership between institutions and labour and business [see Section 4.11.6]. This suggests that colleges are operating without assistance or support from the private sector, which implies that technical college-based training is unable to afford students an opportunity to gain insight from the private sector regarding the latest trends and innovations [see Section 2.2].

c] **Problems created by lack of partnership, between colleges and private sector and their effects on students**

In order to create a trade training system that is responsive to the private sector labour market and business, technical colleges need to work in collaboration with industry which will allow students from colleges to:

- obtain experience with more up-to-date equipment which may not be available at the colleges; and
- learn about employer standards of punctuality and worksite behaviour.

Employer involvement in the training of engineering students ensures that the training meets their requirements as they have knowledge of the skills needed and they can easily determine whether or not a given curriculum and general training at technical colleges will lead to the fulfillment of these needs. According to Table 47 and section 4.11.6 there remains a lack of private sector or employer involvement in the training of students.

The gap in industry involvement in the technical college-based training programmes deprives students of the opportunity

- to ask questions about the nature of jobs for which they are training;
- of being hired;
- of being exposed to up-to-date training equipment;
- to gain knowledge of specific job requirements of local employers.

Scott [1966: 38] states that when employers participate in the classroom instruction:

- "they bring their knowledge of skill applications directly to the trainees;
- trainees become aware of the personal traits that are important to employers;
- trainers understand that the skills and disciplines being taught are relevant to the real world."

Lack of co-operation between colleges and industrial enterprises decreases the relevance of technical and vocational education to industry. This situation further deprives educators from colleges of their chances to update their knowledge or skills to meet current practices often linked with access to new technology.

The apparent lack of partnership between colleges and industrial enterprises obviously renders the technical college based-training ineffective. Due to a lack of partnership between these two sectors, the private sector is not in a position to assist colleges in:

- determining training occupations;
- developing the curriculum;
- assisting in outreach, recruitment and selection of trainees;
- providing instruction to students;
- donating cash, equipment, materials or training space;
- providing access to company facilities;
- planning for and participation in job placement efforts; and
- the conducting of the actual training programme [Scott 1986: 31].

7.2.2 TRAINING NOT IN LINE WITH THE NEEDS OF BUSINESS AND INDUSTRY

a] *The significance of training being in line with industry*

It was stated in Chapter 2 [2.2] that a number of theorists emphasized the need for technical college-based training to be relevant to and in line with needs of business and industry. It is always difficult for technical colleges to know precisely what skills employers need in their entry level workers. Employers on the other hand are usually quite clear regarding the skills they seek, but they may not be aware of the educational process necessary to attain those skills. It is therefore necessary for colleges to engage the private sector during planning, curriculum design and implementation of training in order to accommodate their needs.

The required co-operation between education and the private sector increases the relevance of technical education to industry and provides a good opportunity to meet standards at training stage [see Section 2.2]. Involvement of the private sector in planning a curriculum increases the likelihood that the training will be responsive to employer needs. Developing a curriculum with input from both colleges and private sector will enable the private sector to identify the types of skills they need in a particular occupation and the level of mastery required [see Section 2.2]. This theory is supported by Smith [1988: 76] [see Section 2.2] who voices the need for both colleges and the private sector to be engaged in curriculum planning and design to enable college training programmes to be in line with the needs of industry.

b] **Relevant research evidence of this constraint**

It was laid out in Chapter 2 that technical college-based training must meet the needs of the private sector. In continuance, the findings of this study reveal that technical college-based training is not yet relevant or in line with the demands of industrial enterprises [see Section 4.10: 1.10]. Table 46 [Section 4.10.1.10] shows that many of the respondents [ex-KwaZulu 75 %, ex-Natal 76 %, ex-DET 50 %, ex-HOR 50 %, ex-HOD 50 %] consider the curricula to be outdated, irrelevant and not able to meet the needs and demands of the private sector. This suggests that the training programmes offered by technical colleges in KwaZulu-Natal and in South Africa as a whole are not yet demand-led programmes which have the ability to respond immediately to the changing needs of the work place, commerce and industry.

Lack of private sector engagement in curriculum planning and design hampers the efficient practical and theoretical training of students and renders technical college-based training ineffective, irrelevant and unattractive to the employer.

c] **The problems created by offering courses not in line with the needs of business and industry and the effect it has on students/colleges**

Evidence from Table 46 [Section 4.10.1.10] shows that there is lack of collaboration between colleges and employers regarding planning, training and curriculum development. When employers are involved in the curriculum construction, colleges receive many benefits, including:

- access to information about new jobs;
- useful insights into local employer perspectives on aggregate labour market trends; and
- knowledge of specific job requirements of local employers before developing a formal curriculum; and
- ensuring that training will meet their requirements.

Noticeable from this study is that the employers are not involved in the curriculum development, showing that technical college-based training is not relevant and in line with the needs of the private sector. The reason for this could be linked to the fact that a number of companies/firms in this country have their own training centres and do not rely heavily on students trained by technical colleges. The ensuing result must be that, if colleges do not work in collaboration with the private sector in terms of curriculum planning and design, it stands to reason that these colleges will produce students who will be redundant, ineffective and unemployable. Collaboration between colleges and the private sector in terms of curriculum planning, design, implementation and monitoring is a viable way to ensure that irrelevant elements are excluded from curricula and necessary elements are present and given the appropriate emphasis.

7.2.3 LACK OF EXCHANGE SYSTEM

a] The significance of an exchange system

It was stated in Chapter 2 that, for technical college-based training to be effective, there must be a well defined exchange system of lecturers [see Section 2.2]. Unesco [1978: 28] argue that technical and vocational teachers in the educational institutions must have updated knowledge and be aware of the applicability of new technologies to teaching. This puts technical institutions under increasing pressure to ensure that an exchange system of lecturers with technicians in industry is implimented in order to update and upgrade their knowledge and skills. The idea of an exchange system between colleges and industrial enterprises is further endorsed by Smith [1988: 76] who sees the private sector as providers of experience and expertise to lecturers.

Scientific and technological progress makes training programmes [including teaching methods] in technical and vocational education obsolete at an ever-increasing pace. To overcome this problem technical college based training requires increased co-operation between college sector and enterprises in industry [see 2.3.1]. The reason for a teacher exchange programme is to raise the standards of technical education to meet the growing demands for a higher level of knowledge in Information Technology, Science and Mathematics and to learn from the experience of the technicians and engineers from the private sector.

b] Relevant research evidence of this constraint

Findings concerning this category suggest that there is a limited teacher exchange programme between colleges and the private sector. The fact that 50 % and 25 % of the respondents from ex-KwaZulu and ex-Natal respectively confirm that there is NO exchange system in place is testimony to this [see Table 46 and Section 4.1.10.15]. However, this apparent lack of an exchange system between colleges and the private sector shows that technical college-based training is unable to meet the changing labour market needs. Naturally, this has negative implications for technical and vocational education in terms of both curriculum content and teaching methods.

c] Problems created by lack of exchange system between colleges and private sector and its effect on the colleges

As already indicated, college lecturers from KwaZulu Natal colleges do not have an exchange system of lecturers with technicians from industry. This raises a question regarding college lecturers, i.e. How can college lecturers train engineering students without engaging support or assistance of the technicians or engineers from the private sector? It is doubtful whether a lecturer without exposure to up-to-date experience, knowledge and skills from industry can effectively produce marketable and competent students after training. The lack of an exchange system between colleges and the private sector affects the quality of teaching, learning and practical training of students, the result of which is that students who train at these institutions are unable to get employment and become redundant. Many of those who happen to get employment after training, do not have up-to-date skills and they are required to undergo further training before being able to contribute to the labour force.

7.2.4 CONCLUSION

This section of the study has demonstrated that technical college-based training in KwaZulu Natal technical colleges is problematic because:

- is not in line with the needs of the private sector;
- lacks partnership and support from industry; and
- does not have an exchange system of lecturers.

7.3 CRITERION TWO: ADEQUATELY EQUIPPED WORKSHOPS

7.3.1 LACK OF EQUIPMENT IN WORKSHOPS

a] The significance of equipment in workshops

In Chapter 2 the principle of adequately equipped workshops was discussed. The research findings of Unesco [1979], Unesco [1990], Gates et. al. [1963], Gagne [1985], Kruger and Muller [1988], Vrey [1979], Gunter [1982], Esland [1990] and Bartel [1976] include ideas which reflect the need for college workshops to be adequately equipped. Unesco [1979] indicates that machines and equipment used in workshops at technical colleges should be geared to the level and training of the users [see Section 2.3]. Unesco [1990] elaborate on the argument that technical education requires an adequate infrastructure, facilities, equipment and specialised teaching staff to meet the needs of students and industry.

Gagne [1985] indicates that, for the use of equipment to be didactically justifiable, it must promote the problem-solving ability of the students [see Section 2.3.1]. Technical college students need to develop an ability to solve problems and the specifics of creativity and resourcefulness and that can only be learnt through the use of equipment, tools and heavy machinery [see Section 2.3.1].

Jones and Jones [1981], Van der Stoep and Louw [1990], Kruger and Muller [1988], Very [1979], Cawood and Gibbon [1981], Avenant [1990], Bourd [1988], Curzon [1985], Avernath [1990], Gunter [1982] and Richard and Rogers [1986] agree that the use of learner participation and discovery as methods of presentation of Motor and Electrical trade courses is likely to be didactically most effective [see Section 2.3.1]. This situation demands that workshops for the practical training of students be adequately equipped so that students will be able to participate in the learning and training process [see Section 2.3.1]. Without active student involvement in the didactic situation, no effective learning and practical training can successfully take place. There can be no doubt that adequately equipped workshops are essential for students to be actively involved in learning [see Section 2.3.1].

b] <u>Relevant research evidence of this constraint</u>

i] ***Motor Mechanics Workshop equipment***

The figures of Table 55 reveal that:

College 03: [ex-Natal] had 52 of 55 items of equipment
College 10: [ex-Natal] had 52 of 55 items of equipment
College 09: [ex-KwaZulu] had 38 of 55 items of equipment
College 22: [ex-KwaZulu] had 32 of 55 items of equipment
College 16: [ex-DET] had 53 of 55 items of equipment
College 21: [ex-DET] had 54 of 55 items of equipment
College 01: [ex-HOD] had 52 of 55 items of equipment
College 12: [ex-HOD] had 46 of 55 items of equipment
College 07: [ex-HOR] had 39 of 55 items of equipment.

Evident from Table 55 [and also from the above information] is that colleges 16 and 21 [ex-DET] and college 1 [ex-HOD] are the best equipped colleges in the sample [see 7.1.2]. In direct contrast to this, Table 55 reveals that colleges 9 and 22 [ex-KwaZulu] and 7 [ex-HOR] are the worst equipped colleges in the sample [7.1.3]. This Table 55 further reveals that ex-KwaZulu and ex-HOR departments do not have diesel or petrol running engines [items 33 and 34], distributor testers [item 13], lubrication system [item 25], tyre changing machines [item 44]), valve grinder machines [item 48] or computers [item 8] in their workshops [see Section 7.1.4]. This could suggest why ex-KwaZulu and ex-HOR have serious problems when it comes to the practical training of students. What is obvious from Table 55 is that ex-KwaZulu and ex-HOR colleges do not have adequate equipment for the effective practical training of students compared with ex-DET, ex-Natal and ex-HOD colleges .

ii] ***Electrical Trade Workshop Equipment and Consummables***

Evidence emanating from Table 56 shows that:

- colleges 3 and 10 [ex-Natal] had 55 and 52 of 62 items of equipment respectively;
- colleges 9 and 22 [ex-KwaZulu] had 41 and 33 of 62 items of equipment respectively;
- colleges 16 and 21 [ex-DET] had 54 and 56 of 62 items of equipment respectively;
- colleges 1 and 12 [ex-HOD] had 56 and 62 items of equipment respectively; and
- college 7 [ex-HOR] had 38 of 62 items of equipment [see Section 7.2.1].

Noticeable from Table 55 [and from the above data] is that colleges 21 [ex-DET], 1 [ex-HOR] and 3 [ex-Natal] are the best equipped colleges in the sample [see Section 7.2.2] when compared with colleges 9 and 22 [ex-KwaZulu], as well as college 7 [ex-HOR] [see Section 7.2.3]. Findings in this category suggest that ex-KwaZulu and ex-HOR colleges are the worst equipped colleges in the sample [see 7.2.3]. This therefore has implications on the practical training of engineering students.

It is noticeable from Table 56 that ex-KwaZulu and ex-HOR colleges do not have:

- ballpein hammers [item 1]
- computers in the workshops [item 9]
- conduit dies [item 10]
- carpenters brace [item 12]
- dividers [item 14]
- drill press [item 17]
- dust pole tester [item 18] [see Section 7.2.3].

An explanation for this situation could be the fact that ex-KwaZulu colleges were underfunded and ex-HOR did not have workshops for the practical training of students. These findings therefore suggest that ex-KwaZulu and ex-HOR colleges are inadequately equipped and this has a negative impact on the quality of training.

c] **Problems created by inadequately equipped workshops and their effects on the students and colleges**

The private sector requires students to be efficiently trained in order to obtain employment. To meet the demands for skilled technical manpower, technical colleges need to have all the necessary tools, equipment and machinery in their workshops for effective practical training of engineering students. The role of technical education is to provide students with training programmes geared towards new patterns of employment, skills and knowledge. If technical training is to offer appropriate, up-to-date and relevant practical training to students, technical colleges must be adequately equipped.

What is most disturbing from Tables 55 and 56 is that ex-KwaZulu and ex-HOR colleges are under equipped when compared with ex-DET, ex-HOD and ex-Natal colleges. Evident from Table 46 is that 75% of the respondents from ex-KwaZulu, compared with 25 % from ex-Natal colleges, expressed the view that there was a lack of machinery and equipment for practical training [see Section 4.10.1.1]. This seems to confirm that ex-KwaZulu colleges are inadequately equipped [see Table 47 and Section 4.11.3].

Bot [1991: 17] is of the opinion that very few students are able to secure employment after training because of lack of practical training. In KwaZulu Natal it was found that many school-leavers who received post-school technical training remain unemployed and that only 30 % of technical trainees manage to secure full-time employment. A partial explanation for this is that technical training in colleges concentrates on theory and does not provide adequate practical experience [see Section 5.3].

It was found by Bot [1991: 17] that there was very little training equipment for certain race groups, particularly Blacks, and that, as a result, employers either do not employ those groups or are forced to send trainees away for further training. The current study shows that the situation has not been inproved. The state pays a substantial amount of money subsidising engineering students who, many of whom do not get employment afterwards because they lack the necessary skills. This is a waste of government money.

7.3.2 IRRELEVANT AND OUTDATED EQUIPMENT AS WELL AS THE LACK OF MAINTENANCE PROGRAMMES

a] The significance of equipment being up-to-date

The updating of equipment and heavy machinery is necessary if it to enable technical institutions to remain in line with the requirements of industry [see Section 2.3.3]. To overcome this problem, a well defined maintenance programme needs to be designed which will assist in ensuring that equipment and heavy machinery in workshops is updated and maintained so that they remain relevant to the course needs as well as to the needs of industry. Esland [1990: 243] states that a high degree of employer co-ordination and involvement are needed to make this system work [see 2.3.3]. Unesco [1990: 17] confirms that many countries struggle to maintain, replace, upgrade, update and look after equipment needed for training. This study has shown that many technical colleges in KwaZulu Natal have equipment that is irrelevant and outdated.

b] Relevant research data of constraints

i] *Relevance of workshop equipment*

Evidence emerging from the quantitative results reveal that respondents from all ex-departments were more positive about the relevance of equipment, than about any other question related to equipment - although the grand average of 3,3 still falls in the "neither satisfied nor dissatisfied" category [see Section 5.5.2 and Table 50].

When looking at the averages of the various ex-departments, the two ex-departments in which principals were most satisfied were those from ex-Natal and ex-DET colleges, whereas the principals who came closest to describe their equipment as irrelevant were from ex-KwaZulu colleges [average 2,8 - see Section 5.5.2].

ii] *Outdated equipment*

The quantitative results reveal that principals from three colleges [18,75 %] were very dissatisfied, four [12,5 %] were rather dissatisfied and four were neither satisfied nor dissatisfied, in contrast with five [31,25 %] principals who felt fairly satisfied with the updating programme [see Section 5.5.3 and Table 51]. Data in this category reveals that only principals from ex-DET [4] were fairly satisfied, compared with ex-Natal [3] and ex-HOR [3]. The principals of ex-KwaZulu colleges [2] and ex-HOD [2,3] were most dissatisfied [see Section 5.5.3]. What is apparent is that principals from ex-KwaZulu are effectively dissatisfied with the manner in which equipment is updated in their institutions compared with principals from other colleges [ex-DET, ex-Natal, ex-HOD and ex-HOR - see Table 51 and Section

5.5.3].

iii] ***Maintenance of equipment***

According to the quantitative findings, of the seventeen principals who responded to the question about maintenence programmes, approximately 41 % were satisfied with the maintenance programme at colleges as against 35 % who were dissatisfied [see Table 54 and Section 5.5.6]. According to the figures in Table 54, ex-Natal and ex-DET colleges were "fairly satisfied" with their maintenance programme as opposed to ex-KwaZulu, ex-HOR and ex-HOD who expressed dissatisfaction concerning their existing maintenance programmes [see 5.5.6].

c] <u>Problems caused by the use of outdated and irrelevant equipment as well as the lack of maintenance programmes and the effects thereof</u>

Since technical education is the link between the formal system of education and the world of work, it needs to keep abreast with the changes caused by rapid technological progress. The main task of technical colleges is that of imparting sound and relatively stable basic knowledge which reflects the latest scientific and technological discoveries. As a result, technical colleges need to be equipped with relevant and modern equipment and also have access to maintenance programmes which will encompass the maintenance of equipment.

This section of the study reveals [see Sections 5.5.2, 5.5.3, 5.5.6 and also Tables 50, 51 and 54] that ex-KwaZulu and ex-HOR colleges do not have sufficient training equipment according to the requirements of their students. The equipment which does exist in the ex-KwaZulu and ex-HOR college appears to be outdated and colleges are unable to replace equipment which has become obsolete, with the result that technical college lecturers are unable to prepare their students to cope with the requirements of the private sector. A tragic consequence is that many students with high expectations are unemployable.

The National Integrated Training and Education Project [NITE, 1996: 50] conducted a survey on the degree to which South African Technical Colleges are equipped. The results of the study indicated that there was a wide gulf between the skills training being provided at the institutions and those required by the world of work. There was also clear evidence that teaching practices and the majority of training equipment in the technical areas were outdated and inadequate [NITE, 1996: 1]. Generally, technical training fails to address the business skills required for the formal and non-formal markets [NITE, 1996: 2] as existing equipment is inadequate and does not represent the latest technology.

Therefore, students are being trained with old or obsolete technology which is not representative or competitive in most organisations by whom they can be employed.

NITE [1996: 50] found that

> the equipment being used in the South African Technical Colleges is outdated and of little educational value in terms of importing the skills required to enable qualified manpower to be effective in morden industrial environment. In the technical college sector alone over 60 % of the institutions reported having equipment 10 years old or more. IN addition some 30 % of the institutes have equipment that is either in a poor state or beyond repair. Some 60 % of the technical colleges having no laborating or workshops facilities allowing experimental and practical work to be carried out. In some fundamental subjects such as Engineering Science this figure is a high as 80 % [NITE, 1996: 50].

The information provided by NITE is relevant to KwaZulu Natal colleges and confirms that, if colleges do not update their equipment tools and machinery, it will be difficult for them to produce competent and marketable students. According to NITE, the training programmes offered by technical colleges in KwaZulu Natal and in South Africa are not yet demand-led programmes which have the ability to respond immediately to the changing needs of commerce and industry.

7.3.3 INADEQUATE FUNDING FOR PURCHASING EQUIPMENT AND THE LACK OF A POLICY GOVERNING PROCUREMENT OF EQUIPMENT

a] The significance of a sound funding policy

It was stated in Chapter 2 [see Section 2.3.3] that technical institutions are facing a number of problems, including the inability to replace equipment which becomes obsolete within the context of technological advances. This study [see Section 2.3, 2.3.1 and 2.3.2] leads to the belief that technical education requires a more supportive infrastructure, tools, equipment and heavy machinery if it seeks to meet the needs of students and industry than that which is presently in place.

Bartel [1976: ??] asserts that [see Section 2.3.4] equipment changes as technology changes and also as the individuals' needs change, yet, such circumstances *require continual revision and updating of content and equipment and this tends to be costly* [see Section 2.3.4]. An ideal solution would be that the state distribute finances equally to all technical colleges, have a well defined policy governing the procurement of equipment and ensure that efficient funding of technical colleges leads to effective and meaningful training [see Section 2.3.4].

b] **Relevant research data of this constraint**

i] ***Lack of Funding Policy***

The empirical findings from Table 52 suggests that the principals of colleges are dissatisfied with the allocated budget for replacing equipment, tools, machinery and for maintenance of buildings [see 5.5.4] - of the seventeen principals who responded to this question, 47 % were dissatisfied with the budget allocation compared with 35 % who were satisfied [see Section 5.5.4].

Qualitative results indicate that 50 % of the respondents from ex-KwaZulu colleges express dissatisfaction regarding the manner in which the state allocates the budget to colleges [see Section 4.10.1.4 and Table 46]. Ex-Natal colleges [25 % - see Table 46] do not appear to be experiencing financial constraints to the same degree as with the ex-HOD [25 %] and ex-DET [25 %] colleges.

This situation makes it easier for ex-Natal, ex-DET and ex-HOD colleges to budget for the purchasing and updating of equipment and they are, therefore, in a better position to offer more effective learning and training for their students than the other colleges.

c] **Problems caused by inadequate funding of technical colleges**

The situation reflected in Table 47 reveals that the majority of the respondents [75 %] from ex-KwaZulu colleges, compared with ex-Natal colleges [50 %], felt that the Department of Education needs to increase the budget for purchasing equipment, tools and heavy machinery and for maintaining buildings [see Section 4.11.2.1]. Ex-KwaZulu colleges are apparently unable to update training equipment, maintain buildings or provide for staff development programmes. Because ex-KwaZulu colleges fall short of the other colleges in this regard, the implication is that they will not be able to:

- upgrade training ability and capacity;
- maintain and update equipment, tools and machinery; and
- purchase suitable and current training equipment and machinery to meet the demands of industry and the curriculum.

The end result is that ex-KwaZulu colleges produce students who are not yet adequately trained and who remain unemployable by industry.

7.3.4 CONCLUSION

This research concerning training eqipment has shown that there is a wide gulf between the skills training being provided at the technical colleges and those required by the world of work. Evident from this section of the study is that the teaching practices and the majority of training equipment in KwaZulu Natal technical colleges are outdated and inadequate.

7.4 CRITERION THREE: EFFECTIVE EVALUATION

a] The significance of evaluation

In Chapter 2 the theory discussed to support the principle of evaluation, confirm that evaluation is a process that allows one to determine how well students, teachers and schools have performed [see Section 2.5]. *According to Bossert [1980: 195], evaluation is a more complex concept than merely* examining, testing and measurement. In measurement procedure quantity emphasized while in evaluation quality as well as quantity are the focus [see Section 2.4.2].

7.4.1 ENGINEERING COURSES MOSTLY AFFECTED BY CONSTRAINTS

The findings from Table 36 revealed that ex-KwaZulu colleges have a low pass rate [67,5 %] in Motor *Trade Theory compared with other* ex-Departments [see Section 3.2.1.1. a]]. Also evident from this Table is the fact that 40,1 % of the students from ex-Natal colleges did not write examinations [see Table 12 and Section 3.2.1.2 a]]. This information implies that Motor Trade Theory is one of the engineering courses mostly affected by constraints.

Furthermore, the evidence obtained from Table 37 shows that ex-HOD colleges have a lower pass rate [66,4 %] when compared with other ex-Departments [see Table 31 and Section 3.2.1.5 b]].

Figures in this table reveal that ex-KwaZulu [56,9 %] and ex-HOD [67,2 %] colleges have the lowest pass rates in Engineering Science compared with the other ex-Departments.

It is shown that Engineering Drawing is severely affected by the constraints discussed in Table 39 [also see Table 21 and Section 3.2.1.3 d]], but that Engineering Mathematics seem to be the most affected course. Table 40 shows that ex-KwaZulu [56,3 %] ex-HOD [50,8 %] and ex-DET [56,9 %] had a pass rate below the average of 62 %, suggesting that colleges experience serious problems with Mathematics [see Table 40].

7.4.3 COLLEGES MOSTLY AFFECTED BY CONSTRAINTS

The findings in Table 36 reveal that ex-KwaZulu colleges had the lowest pass rate [67,5 %] in Motor Trade Theory compared with ex-Natal [96,5 %], ex-HOD [89,1 %], ex-DET [86,6 %] and ex-HOR [80 %], meaning that ex-KwaZulu colleges are experiencing more serious problems in this area than the other ex-Departments. Such a situation is exacerbated by the facts in the same table which point out that ex-KwaZulu also had the lowest pass rate [56,9 %] in Engineering Science.

Predictably, Table 39 exposes that ex-DET colleges have the lowest pass rate of 32,7 % in Engineering Drawing. Evident from Table 40 is that the majority of students in technical colleges perform poorly in Mathematics and the most affected colleges are ex-KwaZulu [pass rate 56,3 %], ex-HOD [pass rate 50,8%], and ex-DET [pass rate 56,9 %].

7.4.4 EX-DEPARTMENTS MOST AFFECTED BY CONSTRAINTS

According to Table 36, ex-KwaZulu Department of Education appears to more deeply affected by constraints related to Motor Trade Theory than the others. Following the trend diplayed through analysis of the tables, it is seen that the ex-KwaZulu Department is most affected by constraint related to Engineering Science [see Table 38].

Noticeable from Table 39 is the fact that ex-DET has the lowest pass rate (32,7 %) in Engineering Drawing than the other ex-Departments.

Table 40 confirms that ex-HOD, ex-KwaZulu and ex-DET departments are most affected by constraints related to Engineering Mathematics.

7.4.5 PROBLEMS CAUSED BY HIGH FAILURE RATES AND THE EFFECT THEY HAVE ON STUDENTS

Examinations assess the overall efficiency of teaching and learning and also measure the attainment of objectives and they are regarded as the most reliable evaluation procedures and standards in education.

The average failure rates of:

32,5 % for Motor Trade Theory [ex-KwaZulu] [see Table 36]
43,1 % for Engineering Science [ex-KwaZulu] [see Table 38]
36,5 % for Engineering Drawing [ex-KwaZulu] [see Table 39]
43,7 % for Engineering Mathematics [ex-KwaZulu] [see Table 39]
33,6 % for Electrical Trade Theory [ex-HOD] [see Table 37]
32,8 % for Engineering Science [ex-HOD] [see Table 38]
67,3 % *for Engineering Drawing [ex-HOD] [see Table 39]*
34,2 % for Engineering Mathematics [ex-Natal) (see Table 40]
49,2 % for Engineering Mathematics [ex-HOD] [see Table 40]; and
43,1 % for Engineering Mathematics [ex-DET] [see Table 40]

are extreme, especially when considering the large subsidies these colleges received. This study has revealed that most of the students who enroll for engineering courses/studies either do not pass or else they do not complete their studies, thus they waste a lot of government money on pointless study. This *situation surely indirectly affects the economy of the country as a large number of students are unable* to join the workforce at which their studies were aimed. The failure rates in the different technical colleges, and in ex-KwaZulu in particular [see list above], can only be interpreted as being too high and influencing factors include poor teaching, the high rate of absenteeism from the side of students and the weak Science and Mathematics background of the students.

What worsens the situation is the fact that many students who enrol for Engineering courses do not sit an examination. This is evident from Table 36 where 40 % of students [ex-Natal] who enrolled did not sit for an examination, compared with 4,6 % [ex-KwaZulu], 8 % [ex-HOD] and 3,2 % [ex-DET]. This means that there are very few successful Engineering students who are qualified to join the market.

7.5 CRITERION FOUR: TRANSFER OF KNOWLEDGE

a] The significance of transfer of knowledge

The chief purpose of theoretical and practical training at technical colleges is to lead each student to develop technical skills relevant to the needs of commerce and industry. A didactically justifiable paradigm for practical training should thus be one which would allow all students to achieve meaningful didactic transfer from theory to practice [see Chapter 2, Section 2.5.1]. Transfer was described transfer as the influence of knowledge mastered by the learner in one situation and applied in another situation. Teaching must be aimed at the transfer of knowledge. The possibility of transfer determines the teaching method and the selection of material with a view to application. Transfer, therefore does not take place automatically and the lecturers at technical colleges have grave responsibility to train and teach in such a way that students' knowledge will be functional in new situations [see Chapter 2, Section 2.5].

I have also argued earlier that transfer is connected to teaching methods and methods of study which suggests that the teacher should assist the student to become personally involved in the act of learning [see Section 2.5]. This situation demands that college workshops and laboratories for the practical training of students be adequately equipped for students to be able to relate theory to practice and to be able to apply their knowledge in the world of work.

b] <u>Research evidence and problems related to this constraint</u>

The following trends have been identified regarding this criterion:

- Lack of Science and Mathematics backgrounds
- English language as a constraint
- Absenteeism among the students
- *College-based practical training.*

i] ***Lack of Science and Mathematics***

It can be seen from Table 40 that the majority of Engineering students from technical colleges perform poorly in Mathematics as reflected by the figures of ex-KwaZulu [56,3 %], ex-HOD [50,8 %] and ex-DET[(56,9 %].

Also noticeable from Table 38 is that ex-KwaZulu college [56,9%] students do not perform as well in Science as the other ex-Departments. What needs to be mentioned here is that Engineering studies/courses depend mainly on a good understanding and knowledge of Science and Mathematics. For NTC 1-6 Engineering students to be able to pass and complete a course, she/he must have a sbstantial understanding of these subjects. What becomes apparent here is that students in the ex-KwaZulu, ex-DET, and ex-HOD colleges [see Tables 36 - 40] lack this in their qualifications, suggesting that there are deep-seated problems regarding the application of theory to practice during technical college-based training.

ii] ***English language as a constraint***

Evidence emanating from the qualitative results show that students experience problems when English is used as a medium of instruction at technical colleges as Table 46 and Section 4.10.1.6 indicate that 75 % [ex-Natal], 50 % [ex-HOD], 25 % [ex-KwaZulu] and 25 % [ex-DET] of the respondents reported problems. The difficulty that students have in expressing themselves in English is exacerbated by the fact that they often cannot understand or interpret examination questions and they are also unable to communicate and this situation prevents them from transferring or applying theory to practice.

iii] ***Absenteeism among the students***

The empirical findings reveal that a large number [100 %] ex-Natal, [25 %] ex-KwaZulu, [50 %] ex-DET and [25 %] ex-HOD, of respondents stated that students absent themselves from lecturers [see Table 46 and Section 4.10.1.5]. Meaningful transfer of knowledge from theory to practice can only occur if students attend classes regularly and are able to learn effectively.

iv] ***College based-practical training***

The quantitative results of this study show that the ex-KwaZulu and ex-HOR colleges are the worst equipped colleges in the sample compared with ex-Natal, ex-DET and ex-HOD colleges [see Section 7.1.2]. If technical colleges are inadequately equipped, college-based training is unlikely to be able to develop marketable skills in students. The use of equipment in a didactic situation enables students to transfer knowledge from one situation to another. For this, they need to become familiar with various kinds of equipment. The problem is that ex-KwaZulu and ex-HOR colleges are inadequately equipped and therefore unable to provide all students with the knowledge or practical skills required for future employment. Many students cannot link practical training to theory.

7.6 CRITERION FIVE: QUALIFIED LECTURERS

a] The significance of poorly qualified lecturers

The view adopted in this study is that adequately qualified, experienced, motivated and skilled lecturing staff are essential for technical college-based training. Teachers involved in any aspect of technical and vocational education should possess the personal, ethical, professional and teaching qualities essential for the accomplishment of their work [see Section 2.6]. Their professional preparation should include learning to use special teaching methods appropriate to the field of technical and vocational education, training in the use of modern teaching media and aids, and training in how to create and produce appropriate teaching materials of special importance for teaching technical students effectively [see 2.6.1]. The need for in-service training of teachers, the regular updating of teacher knowledge and the induction of newly appointed lecturers is a non-negotialbe aspect of training [see Section 2.6.2.1. In similar fashion, the recruitment of high quality lecturers is of paramount importance since the quality of the training offered at technical colleges is, to a large extent, determined by the calibre of the lecturers who conduct the training.

Earlier in this study it was pointed out that developing countries have a particularshortage of adequately trained manpower because of low incentives in education. This situation leads to staff discontent and to the loss of academic staff to industry [see Section 2.7.2.1 v]]. Detrimental factors of this nature, however, do not detract from the principle that, for technical education to be effective it must have adequately qualified lecturers, effective recruitment programmes, well defined induction programmes and motivated lecturing staff. This area of the research has shown that that the quality of technical education depends largely upon the teachers as they are in the unique position to contribute to the goals of binding humanism and technology as they possess knowledge required by students for future application in the world of work.

b] <u>Relevant reseach evidence and problems related to this constraint</u>

The empirical part of this study provided some proof that there are various weaknesses in the present system which obstruct the steady provision of high quality lecturers in the technical colleges of KwaZulu Natal.

i] ***Underqualified Lecturers***

Table 42 reveal that 46 % of the lecturers from ex-Natal possess only technical qualifications and not professional/teaching certificates, while 55,9 % of the lecturers from ex-KwaZulu colleges hold only technical qualifications without any professional certificate. It can therefore be deduced that ex-KwaZulu colleges have the highest percentage of lecturers who only have technical qualifications [55,9 %] compared with ex-Natal [46 %], HOD [15,7 %], DET [38,8 %] and HOR [35,2%].

Also evident from Table 42 is that ex-Natal colleges have the highest percentage [60,2 %] of lecturers who are both technically and professionally qualified compared with ex-KwaZulu [42,3%] and ex-DET [22,7 %]. A possible explanation for this could be that white lecturers, who are doubly qualified, are reluctant to take employment in the township or black residential areas because of the lack of safety. Data in Table 42 further shows that ex-HOD and HOR colleges have 62,7 % and 80 % respectively of lecturers who are technically and professionally qualified. The lack of doubly-qualified lecturers at ex-KwaZulu and ex-DET colleges obviously affects the quality of training.

Evident from Table 47 is that the majority of respondents [100 % - ex-KwaZulu, 50 % - ex-Natal, 50 % - ex-DET and 25 % - ex-HOD] indicated that qualifications of lecturers need improvement. College lecturers qualify to become teachers by completing a National N Diploma [Technical] and a teacher diploma/ certificate or a degree course [see Section 4.1.1]. They are therefore qualified to teach and supervise students projects/tasks. The main problem here is that ex-KwaZulu colleges have teachers who have only technical qualifications and not professional certificates [see Table 42]. When these lecturers are given employment by ex-KwaZulu colleges they are expected to teach and supervise students' projects in the workshop, yet there is no training that these lecturers go through in order for them to acquire particular skills in teaching and supervision of students' work.

ii] ***Lecturers Resignations***

Staff resignation appears to be a general problem experienced by all colleges which, during the pass three years, have experienced the following resignations [see Table 44]:

- ex-Natal 13
- ex-HOD 16
- ex-DET 12
- ex-HOR 03
- ex-KZ 33.

This study shows that colleges which have mostly white staff [ex-Natal and ex-DET] lose less teachers than colleges with historically non-white staff. The reasons given by lecturers for *resigning their posts at colleges are:*

a] The department of education's failure to pay satisfactory salaries to adequately qualified lecturers; and

b] Lack of support programmes for lecturers.

This finding is one reason why ex-KwaZulu fail to achieve good results [see Tables 36 - 40]. Ex-KwaZulu colleges have the highest rate of lecturers who resigned their posts.

iii] ***Ineffective Recruitment***

Question 6 [Table 43] shows that ex-Natal colleges [average 3,8] do not experience difficulty in recruiting suitable staff who are both technically and professionally qualified compared with ex-KwaZulu colleges, where a weak average of 1,6 is found. The low average of satisfaction with the recruitment programmes in ex-KwaZulu colleges can be explained by the fact that these colleges are situated in the black residential areas where the safety of the lecturers cannot be guaranteed. Both ex-HOD and HOR colleges produced an average of 2 in their recruitment success [see Table 43], meaning that they also both have a problem with recruitment [see Section 4.6].

If colleges do not have effective recruitment programmes, it stands to reason that the effective teaching and practical training of studnets will be hampered.

iv] ***Lack of in-service training programmes***

Findings regarding this category suggests that ex-Natal [average 3,2] and ex-DET [average 3,5] colleges [see Table 43 [Question 7] and Section 4.7] have well defined in-service training programmes for teachers. This includes the development of the capacity for teachers, upgrading of qualification and management training. Not yet satisfied with the in-service training programmes at their colleges are ex-KwaZulu, ex-HOD, ex-HOR [averages 1,6; 2 and 2 respectively - see Table 43, Question 7].

Technical and vocational lecturers need to maintain up-to-date knowledge of their subject content and possess the necessary skills to teach successfully. Knowledge is often best obtained through staff development and in-service training programmes. Noticeable from this research was that ex-Natal and ex-DET colleges have well defined in-service training education programmes. These programmes include periodic review and updating of knowledge and skills. The vital role of this element is revealed by the fact that ex-Natal and ex-DET colleges also have very good examination results. This is largely due to the fact that ex-Natal and ex-DET colleges are more capable of conducting development programmes for their lecturers and management staff when compared with ex-KwaZulu where in-service training programmes for lecturers and management staff is very unsatisfactory.

This information confirms the compounding reasons for the high failure rate in the ex-KwaZulu colleges [see Tables 36 - 40].

v] ***Inadequate Induction of Lecturers***

Evidence emanating from Table 45 show that ex-KwaZulu colleges have the weakest induction programmes of all the ex-Departments [see Section 4.9.1]. This table indicates that 100 % of the respondents from ex-Natal colleges are of the opinion that the induction of lecturers is conducted by Heads of Department whilst only 25 % of the lecturers from ex-KwaZulu colleges share this opinion.

What Table 45 suggests is that there is a gap of 75 % between ex-Natal and ex-KwaZulu colleges concerning the induction of a new lecturers which is extremely wide and cause for concern as it shows that one reason why ex-KwaZulu colleges do not perform at a satisfactory level is the absence of an effective induction programme.

Newly appointed lecturers need orientation with regard to the syllabus, workshop and laboratory efficiency, teaching methods, testing programmes, control of tools, equipment, heavy machinery, leave conditions, college policies and other conditions of service.

Yet, this study proves that ex-KwaZulu colleges do not expose their newly appointed lecturers to the training facilities of the college. One obvious reason for this is that most of ex-KwaZulu colleges had been understaffed or operating without a Head of Department or Deputy Principal. It could also be that ex-KwaZulu colleges regarded orientation of newly appointed lecturers as less important. This situation has had a negative effect on the colleges' general performance. Ex-KwaZulu colleges cannot perform at a satisfactory level due to lack of induction programms.

vi] ***Lack of Motivation from Lecturers***

Table 46 provides data which shows that 100 % and 25 % of the respondents from ex-KwaZulu and ex-DET respectively, reported that they are demotivated and do not have strength to teach [see Section 4.10.1.8]. Factors which might contribute to this problem are:

- Student absenteeism [see Section 4.10.1.5];
- Student demotivation [see Section 4.10.1.6];
- Language problems [see Section 4.10.1.6];
- Low teacher salaries [see Table 44];
- No support for staff-development and in-service training programmes [see Table 43 and Section 4.10.1.9];
- Outdated and irrelevant curricula [see Section 4.10.1.10];
- Inadequate financial support from the Department of Education [see Sections 4.10.1.2 and 4.10.1.4];
- Lack of policy governing the procurement of equipment [ex-KwaZulu] [see Section 4.10.1.11];
- Lack of working relationships between colleges [see Section 4.10.1.13];
- Student inability to cope with Science and Mathematics courses [see Section 4.1.10.4]; and
- Lack of placement programmes for students [Table 47].

Lack of motivation of college lecturers from ex-KwaZulu and ex-DET colleges is provided in Table 46 [see Section 4.10.1.8] and lecturers report that they are severely demotivated and cannot teach . In the light of all these demoralising realites it is clear that the department of education in KwaZulu Natal has failed to create an environment which motivates and uplifts lecturers in all the technical colleges of the province.effectively. The main reason for this situation is the fact that the Department is unable to create an environment which will allow teaching and learning to take place [see Section 4.10.1.8].

c] **Problems caused by having inadequately qualified lecturers, their resignations, ineffective recruitment, lack of induction and in-service training programmes and lack of motivation**

In contrast with this situation, ex-KwaZulu colleges have inadequately qualified lecturers [see Table 42] and the weakest induction and in-service training programmes and this has had a negative effect on the examination results of these colleges [see Tables 36 - 40].

7.7 CONCLUSION

This chapter has demonstrate the problematic nature of technical college based training in KwaZulu

Natal and has highlighted shortcomings to partnerships between colleges and industry, workshop equipoment, examination results, the transfer of knowledge from theory to practice and properly qualified lecturers.

These shortcomings cannot merely be treated as a list of abstract findings of an academic research study. On the contrary, the constraints identified in this thesis are practical problems which need to be addressed quite urgently because they retard not only the students' progress, but progress in South Africa as a whole. Technical developments provide all people in the country with the necessities of life - food, clothes, houses, medicine, etc. Technical developments enhance the life of every person in some way - with luxuries such as radios, transport, television, parks, furniture, books and telephones. To ensure that these development continue to take place, it is imperative that technical knowledge and skills be transferred to the younger generation in highly effective ways. A steady improvement in the quality of education in technical colleges is, therefore, important - not only for the students and lecturers in technical colleges, but to every one of us living in the country. Only through technical knowledge can South Africans generate industrial and economic developments which raise the standard of living. Only through high quality technical education can this goal be reached.

CHAPTER 8

RECOMMENDATIONS, RECENT TRENDS AND CONCLUSIONS

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CHAPTER 8

RECOMMENDATIONS, RECENT TRENDS AND CONCLUSIONS.

8.1 INTRODUCTION

The following research problems were outlined in Chapter 1:

a] Which constraints affect the quality of teaching and training at technical colleges in KwaZulu Natal?

b] Which guidelines can be proposed to improve the quality of teaching at technical colleges in KwaZulu Natal? [See Section 1.4].

From the findings discussed in Chapter 7, it is evident that the study succeeded in identifying a number of constraints which seem to affect the technical college-based training in KwaZulu Natal. Chapter 7 demonstrated that the current arrangements regarding technical college-based training are such that THE teaching and practical training of Engineering students is not effective. The first research problem was therefore answered in Chapter 7.

This section attempts to answer the second section of the problem, i.e. the extent to which current technical college-based training can be improved, hence the recommendations which follow. The recommendations outlined below emanate from the findings of this study, based on the wealth of data produced by this investigation.

For purposes of coherence and systematisation, recommendations will take the following pattern:

- Recommendations related to students.
- Recommendations related to lecturing staff.
- Recommendations related to facilities and equipment and

- Recommendations related to the Department of Education.

It is important to indicate that after the recommendations have been made the writer will discuss the latest developments in technical education and the implications of recent trends for the existing technical colleges. The latest developments in technical education are the result of the recent introduction of the Green Paper for Further Education and Training as well as the National Strategy for Further Education and Training by the National Education Department. The researcher will discuss the implications of these developments in thi section. The recommendations below relate only to constraints identified in this study.

8.2 RECOMMENDATIONS RELATED TO STUDENTS

8.2.1 COLLEGES SHOULD HAVE BRIDGING COURSES FOR STUDENTS WHOSE SUBJECTS SELECTION AT SCHOOL DID NOT INCLUDE SCIENCE AND MATHEMATICS

This study prooves that there is a high failure rate of students in Mathematics and Science subjects. It is therefore recommended that students whose subject selection at school level did not include Science and Mathematics should be given bridging courses in preparation for their enrolment or entry into Electrical and Mechanical Engineering courses. If students are given bridging courses at their entry level it is anticipated that they would be more likely to perform better when starting their NTC 1 Engineering programme. It is therefore recommended that each college should have bridging courses which will include Mathematics, Science and Engineering Drawing for students who have not yet covered these subject at secondary level.

8.2.2 ENGLISH LANGUAGE AND OTHER NON-TECHNICAL SKILLS SHOULD BE INCORPORATED INTO THE PROGRAMME OF ENGINEERING STUDENTS

This study showed that the most important language required for communication in technical situations is English. There is growing concern from the side of lecturers that African students are unable to express themselves in English and that they fail to understand instructions and questions during examination times.

In order to cope with the nature and size of demand for language training it is recommended that language laboratories be established as a component of resource centres to facilitate English language learning as this approach has proved to be very successful at Technikons and Universities. Such a language laboratory would not only help black students but will benefit students of other racial groups for whom English is not a first language.

It is further recommended that technical colleges need to place more emphasis on helping learners to acquire non-technical skills. The most effective approach would be to incorporate the required non-technical skills into the engineering curriculum or by means of work preparation programmes before placement so that students do not view work issues as entirely separate from their academic education. The programmes should be specifically aimed at assisting students to anticipate the norms, values and behavioral expectations which these skills require in the work environment.

The Student Counsellors and staff involved with student development should, through extra-curricular programmes, encourage the development of identified skills including communication, reading, listening, creative thinking and problem-solving, organisational effectiveness and leadership, information management and work related dispositions and attitudes skills. Lastly, students should be encouraged to participate in student societies as these could play a role in developing some of the required non-technical skills.

8.2.3 COLLEGES SHOULD HAVE STUDENT SUPPORT SERVICES

At present, student support services at technical colleges in KwaZulu-Natal are virtually non-existent and a dramatic change in this direction is required if we are to work in the interest of students. It is recommended that each college should have adequately qualified counsellors to cater for the needs of the students. Services to students should include the following:

- Assistance for students through providing personal counselling, career counselling, financial assistance, transition from school to colleges, part-time employment opportunities, study skills, handling stress, absenteeism, progression routes and additional skills in respect of physical disability and/or sensory impairment and in the selection of subjects,
- Appointment of personal tutors [see Section 8.2.6 below] and
- Assessing of students progress.

The service should be provided during office hours and in the language that would be understood by the student. The service should be monitored and evaluated by the college staff by means of survey and feedback. Volunteers from the community and other specialist agencies could assist the college counsellors.

8.2.4 STUDENTS WITH SPECIAL EDUCATIONAL NEEDS SHOULD BE CATERED FOR.

Currently, students with special needs are not catered for at technical colleges and it is recommended that this be rectified by ensuring that the infrastructure exists for the incorporation of such students. Volunteers could assist technical college personnel in the provision of tuition for these students or qualified staff could be appointed.

8.2.5 COLLEGES SHOULD DEVELOP RECRUITMENT AND INDUCTION PROGRAMME FOR NEW STUDENTS

Senior secondary school pupils from the surrounding areas should be afforded an opportunity to sample college life by spending between three to five days at technical colleges in classes of their choice. A school consortium link could be developed to facilitate this initiative and guide students in their career choices. It is recommended that all technical colleges should develop their own comprehensive induction for new students incorporating the following aspects:

- course aims and objectives
- examination and assessment procedure
- time table and schemes of work
- recommended books and equipment
- health and safety
- support services available
- college code of conduct
- college amenities
- administration procedures
- Students Representative Council's information
- transport routes
- available loans and bursaries
- placement programmes and
- staff structures.

8.2.6 STUDENTS SHOULD BE ALLOCATED PERSONAL TUTORS OR MENTORS

It is recommended that every student at a technical college should be allocated a personal tutor who would help him/her with diverse problems. Personal tutors should meet with students at least once a fortnight and should be available to motivate students, give advice, guidance and encouragement. The tutor or mentor would be responsible for the student's induction, records of achievement, helping in the development of personal and social skills and in assisting in decision making. Action plans will have to be developed for the year and the tutor will guide the student in compiling a personal portfolio, building on his/her strengths and helping the student to overcome weaknesses. Mentor lecturers/teachers should have the following characteristics:

- they should be skilled in the supervision of instruction and practical training of students;
- they should have skills in observing and interpreting student behaviour;
- they should be conversant with college programmes, including didactic theory.

8.2.7 TRACKING OF STUDENTS AFTER LEAVING THE COLLEGE

The tracking of students after leaving the college is very important in order to establish the viability of certain courses and the efficacy of the training by the institution. Statistics emanating from such a study could provide direction in respect of courses to be offered in terms of the manpower needs of the country. The Green Paper on Labour [1988] also regards such an exercise as vital in the strategic planning of all Further Education and Training institutions.

8.3 RECOMMENDATIONS RELATED TO LECTURING STAFF

8.3.1 COLLEGES SHOULD IMPROVE CONDITIONS OF SERVICE FOR LECTURERS

Staff resignation appears to be a general problem experienced by all colleges and this situation affects the quality of teaching and training at technical colleges. In view of the great demands made on technical college staff, it is recommended that a separate contract be devised which should include the conditions of service, hours of attendance, in-service training programmes and other obligations.

Considering that these educators offer pre-tertiary as well as tertiary tuition, a more attractive salary and incentive package should be negotiated. This would serve as motivation to retain experienced members of staff and to attract staff from commerce and industry to join the Further Education and Training sector.

8.3.2 EFFECTIVE INDUCTION PROGRAMME FOR LECTURERS

The study has revealed that not all colleges have well defined induction programmes for newly appointed lecturers. It is recommended that all colleges should develop their own comprehensive induction programmes for newly appointed lecturers incorporating the following:

- colleges'structures including college management
- emergency procedures and information

- campus matters including students' committees
- college policies
- code of conduct for lecturers and students
- administration procedures
- finance
- communications
- college services
- staff development
- teaching time tables
- involvement in different developments
- number of classrooms, workshops for practical training of students, number of laboratories, libraries and equipment available.
- health and safety.
- support services available
- teaching Aids [Audio-Visual]
- how and where to get stationery and textbooks
- resource Centres
- personnel matters including leave and salaries
- examinations and assessment procedures and
- stock-control procedures.

In this way, teaching and practical training of students at technical colleges could be more effective.

8.3.3 CONSENSUS BY TECHNICAL COLLEGE LECTURERS REGARDING EFFECTIVE TEACHING AND PRACTICAL TRAINING STRATEGIES

It is recommended that each college should have an in-service training team attached to it which would create conditions for lecturers to reach consensus as to what constitutes effective teaching and high quality practical training. This means that college lecturers should work as a team rather than working in isolation or in competition. When lecturers evaluate students' practical projects or tasks, there would be common understanding between lecturers and students as to what constitutes high quality projects/tasks.

The Competency-Based-Modular Training system discussed in Chapter 5 [see Section 5.2] could have some relevance here because college lecturers would have agree upon competencies which an Engineering student should demonstrate during practical training in the workshop situation. Before students go to the workshop for practical training, the following issues regarding competencies should have been clarified:

- How are the competencies to be built into NTC1 to NTC 6 Engineering programmes ?
- What criteria can be formulated to assess these competencies ?
- To what extent have these competencies been negotiated by interested parties e.g. college lecturers, students and local companies/industries ?
- How should individual competencies been acquired?

8.3.4 SHORT-TERM SECONDMENT AND STAFF EXCHANGES BETWEEN INDUSTRY AND TECHNICAL COLLEGES IS NECESSARY

A basic condition for success would be the forging of links between technical colleges and industry. It is recommended that employers actively define and design new curricula, monitor institutional management, organise student placement and arrange for industry personnel to be seconded to technical colleges and for academic staff to have industry experience in order to contribute to the alignment of education to the country's needs and to the changing structure of the labour market.

Short-term secondments and staff exchanges between industry and technical education institutions can provide familiarisation training opportunities for staff to assist with training schemes. Staff, on the other hand, should view their training opportunities in terms of the colleges' requirements and not their own. The focus in education and training should be on a broad-based education which reduces the time spent on specific skills training. Teaching across disciplines, however, does pose several problems in that lecturers are usually trained to specialise in one field instead of relating their work to other fields. This problem needs to be discussed at ministerial level and clear guidance should be given to technical college staff regarding ways in which disciplines should be integrated.

The exchange programme outlined above would serve a useful purpose regarding the practical training of students. At the same time, such an arrangement would be beneficial to the professional and technical development of both lecturers and technicians from industry. It would be possible to counteract problems which emanate from a lack of partnership as discussed under 7.2.2 [c] because the technical college curricula would be contextualised.

A programme should be introduced to ensure that both lecturers and technicians from the private sector would develop a more positive attitude towards each other. This would hopefully enhance the technical college-based training programme and change the attitudes of students towards technical college-based training.

The exchange of staff between colleges and industry presupposes that a technical college would have a permanent working relationship with local companies in its vicinity. Involvement or participation of industries would create an environment for colleges to decide how best to meet local goals or the needs of industries whilst at the same time holding them responsible for student placement.

8.3.5 COLLEGE LECTURERS MUST BE ADEQUATELY QUALIFIED

This study has revealed that quite a number of college lecturers are inadequately qualified [see Chapter 4]. Table 42 revealed that 46% of the lecturers from ex-Natal possess only technical qualifications and not teaching certificates, while 55% of the lecturers from ex-KwaZulu colleges hold only technical qualifications without any professional certificates [see Section 7.6. [a] [i]]. From the explanation above, it can be concluded that a great majority of college lecturers do not have professional certificates which is disturbing in that teaching involves a certain degree of teaching skills without which it would be impossible for even an experienced teacher to get along.

It is recommended that the lecturers who do not have teaching certificates be given a special programme, either by a Technikon or University which will enable them to obtain the necessary qualifications. This programme must be designed specifically for lecturers who do not have professional certificates and must be subsidised by the state. This will assist colleges in improving their performance and will benefit both the and the state.

8.3.6 LECTURERS AT TECHNICAL COLLEGES MUST HAVE INDUSTRY EXPERIENCE

Llecturers with both professional certificates and industry or work experience should be recruited. When these lecturers teach theory they would be able to link it to practice through demonstration lessons. When lecturers evaluate students' practical work in the colleges' workshops, they would not only be informed by theory, but by previous work experience which would provide important background knowledge.

8.3.7 COLLEGES SHOULD HAVE STAFF DEVELOPMENT COMPONENTS

It is recommended that each college should have a staff development committee to conduct needs assessment - i.e. to assess in which areas the lecturers need training. Staff development further entails the development of the capacity for lecturing, updating of qualifications, management training, organisation of workshops and seminars, industrial placement, lecturer-technician exchange mentorship schemes and staff appraisal.

An analysis of training needs could assist in the development of a routine and relevant development programme which should be regularly assessed and reviewed. Targets and standards need to be set and staff should be encouraged to help identify and meet their job-related developmental needs. The services of consultants who would train lecturers in project management, leadership roles, workshop management and the evaluation of instruction should be solicited.

It is further recommended that college lecturers be provided with training in areas of advanced technology with the focus on learning processes and teaching strategies because much of what people learn comes from how they learn.

8.4 RECOMMENDATIONS RELATED TO FACILITIES AND EQUIPMENT LACK OF EQUIPMENT IN COLLEGES'WORKSHOPS

This study has revealed that there is a severe lack of suitable training equipment and didactic aids to facilitate such education and training. Therefore, Engineering students are being trained with old or obsolete technology equipment which is not representative of the most competitive organisations.

It is thus recommended that the supply of relevant and up-to-date Egineering and other technological training tools, equipment and heavy machinery should be accepted as top priority. The following three recommendations are suggested regarding facilities and equipment.

8.4.1 THE DEPARTMENT OF EDUCATION SHOULD PURCHASE TOOLS, EQUIPMENT AND HEAVY MACHINERY FOR COLLEGES

The responsibility of the state is to see to it that technical colleges are equipped with up-to-date tools and equipment and to ensure that these facilities are kept clean, updated and well maintained. It is therefore recommended that the Department of Education should purchase tools, equipment and heavy machinery for inadequately equipped institutions.

8.4.2 CLUSTERING OF COLLEGES

Clustering and merging of technical institutions should be considered where this is practical and viable. This system works on the basis that those colleges within a certain radius share human, physical and other resources in providing training to students. The high cost of capital equipment and tools seem also to suggest that specialist provision needs to be consolidated to fewer sites. There should be a system of specialisation in certain areas of provision that would eliminate the multiplicity of resources. It should also neutralise the problem of under-and over-provision of equipment and facilities. Such clustering would possibly address the serious problem of unavailability of equipment and allow the sharing of scarce resources.

8.4.3 FORMATION OF PARTNERSHIP WITH PRIVATE SECTOR

By adopting the private sector partnership approach, technical colleges would be in close contact with employers throughout the planning and implementation of training . Not only will this yield short-term benefits in the quality of specific programmes, but it will provide an opportunity for building longer term relationships that will continue even after the specific programme is completed. The role that the private sector plays includes:

- donating cash and materials
- donating training space, tools, equipment and heavy machinery
- providing access to company facilities and
- assisting in job placements.

It is therefore recommended that a strong partnership between employers and technical colleges be formed. This partnership will allow engineering students to -

- obtain experience with more up-to-date equipment than may be available at technical colleges
- learn about employer standards of punctuality and worksite behaviour
- deal with some of their anxiety about entering the work force in a comparatively non-threatening setting.

8.5 RECOMMENDATIONS RELATED TO THE DEPARTMENT OF EDUCATION

8.5.1 ENTREPRENEURSHIP SHOULD BE TAUGHT AT TECHNICAL COLLEGES COMPONENT IN ALL TECHNICAL COLLEGES

This study has exposed that the majority of courses offered at the various technical institutions are geared towards preparing students and trainees for employment in the formal labour market. These courses assume that, on completion of their training, students will find employment within organised industry and commerce. Few technical colleges have a business or entrepreneurial orientation as an integral aspect of their programme. The educational system does not encourage students to pursue the establishment of their own small business concerns as a career option. In view of the limited employment opportunities within the formal sector, this is deemed to be a serious weakness of the education and training system.

The majority of training institutions do not run their production and manufacturing programmes in order to attract existing entrepreneurs to enrol for such courses as most courses are of a full-time nature and there is a lack of courses which are offered after hours for which many employed "potential entrepreneurs" are unable to enrol. The duration of many programmes, geared mostly towards the training of people at craft level, is not appropriate for latent entrepreneurs.

The few institutions which do offer short duration courses have the unemployed and disadvantaged sections of society as target groups and the level of training is not very high because of the lack of formal education on the part of the students. As such, these courses are often not suitable for entrepreneurs, in the technical field who need to develop very good skills but on a much narrower skill band or field than those covered by general courses.

It is therefore recommended that :

a] the Departments of Education and Labour consider incorporating an entrepreneurial component in all technical and craft programmes offered at technical colleges.

b] technical colleges offer short courses of high level and standard to existing entrepreneurs on a part-time basis.

8.5.2 THERE SHOULD BE A WELL DEFINED POLICY GOVERNING THE PROCUREMENT OF EQUIPMENT

The study revealed that the policy governing the procurement of equipment within the Education Department is non-existant. That is why certain colleges within ex-KwaZulu Education Department for instance, are better equipped than the others. It is therefore recommended that a well defined policy governing the procurement of equipment be established. This will enable all technical colleges to be treated equally and fairly.

8.5.3 THE DEPARTMENT OF EDUCATION SHOULD INTRODUCE A NEW FUNDING POLICY BASED ON REDRESS

The research has shown that state funding seems the most problematic area in some technical colleges, especially those from disadvantaged ex-Departments. Principals of technical colleges confirmed that their stated programmes of education cannot be entirely fulfilled as a result of the funding shortage. The difference in financing between state-aided [largely previous white colleges] and state colleges is vast..

Current funding for state-aided and state colleges is based on the full-time equivalent [FTEs] formula and is calculated on the basis of the number of successful learners and the number of subjects taken over a period of time.

It is recommended that a new funding system, based upon redress, weighting of certain programmes [such as a bursary scheme] and own revenue generation initiatives, be applied. The new funding approach at technical and vocational institutions should be based on such principles as equity, development, efficiency, effectiveness, financial sustainability and shared costs [made possible through intelligent partnership] [NCHE, 1996:117].

It is further recommended that various stakeholders [from industry, financial institutions and the departments of trade, industry and labour] collaborate in setting up financial aid programmes to assist graduates from technical colleges in starting their own businesses.

The Department of Labour, in its input towards a Green Paper - "A New integrated Human Resource Development strategy for South Africa" - [28 August 1996:79], favours the idea of a National Training Fund where a payroll levy of between 1% to 1,5% is suggested. Vocational and technical institutions could also benefit from this fund should it be implemented effectively. Both the private and public sectors could invest in bursary schemes for learner development in technical and vocational sectors.

Direct income generation projects should be embarked upon, for example, the sale of consultancy and training services which will release the wealth of experience and talent available at technical colleges. The development of small business units on campus grounds or other suitable venues, could also be a source of extra revenue.

8.5.4 TRAINING OFFERED BY TECHNICAL COLLEGES MUST BE IN LINE WITH NEEDS OF INDUSTRY

In order to keep education and training relevant and ensure that students produced by these institutions are marketable, the department of education must be able to involve industry and the department of labour when designing college curricula. Structures for proper market analysis need to be set in place. This could comprise of a partnership between the department of education and labour together with industry.

The creation of courses that teach the basics of creative and analytical thinking, link different disciplines and use the community as a base for hands-on projects would help in the development t of career pathways which incorporate skills specific training into the teaching of all aspects of industry. Programmes offered should provide students with opportunities for basic research and presentation skills, the development of hand and mind abilities and encourage both independent and group thinking.

8.6 DISCUSSION OF RECENT TRENDS

8.6.1 THE KEY IMPLICATIONS OF THE NEW FRAMEWORK AND NATIONAL STRATEGY FOR FET ON TECHNICAL AND VOCATIONAL EDUCATION

The Green Paper on Further Education and Training [1998], as well as the National Strategy for Further Education and Training [1999-2001] specifically aim to improve and upgrade the education and training quality and ability of the technical colleges and other selected provider institutions in the critical fields of engineering, business and technological training. This will largely contribute towards meeting the objective of increasing the professional status of technical colleges. As part of the project, modern and high technology equipment will be provided and principals will be brought up to date with modern institutional management techniques. Educators will be trained and upgraded in the use of equipment and course material and it is anticipated that these efforts will make a large contribution to improving the image of colleges and to bridge the perceived gap which presently exists.

The project further has a point of departure which is the introduction of new, modern, updated and technological training equipment and machinery into the education training institution, thus establishing the training ability and capacity at technical colleges to offer such new skills required to compete effectively in the global economy. It should be noted that this study has confirmed that existing equipment in many of the technical colleges is very old and outdated and cannot develop relevant and essential skills needed in the workplace.

Training equipment and other diagnostic aids to be provided in terms of the project will substantially improve the theoretical and contextual understanding of students, focus on generic skills development and will provide the opportunity for practical exposure and demonstration within the college, thus enhancing a transfer of learning and skills from the classroom/workshop to the workplace.

The new framework for FET, as outlined in the Green Paper on Further Educationand Training [1998], has profound implications for the system, particularly with regards to curriculum, funding, governance, institutional and staff development and implementation. These areas are briefly discussed below.

8.6.1.1 A NEW CURRICULUM AND QUALIFICATIONS FRAMEWORK: RESPONSIVE LINKAGES BETWEEN FET, HIGHER EDUCATION (HE) AND WORK

A new curriculum and qualifications framework is based on an integrated approach to education and training and is programme-driven. The new learning programmes are underpinned by the twelve critical and developmental outcomes defined by the South African Qualification Authority [SAQA] in 1996. These aim to encourage problem-solving skills, critical and creative thinking, working in teams, communicating effectively, making use of Science and Technology and responsible citizenship [Green Paper, 1998: 27].

The new qualification structure will be based on a flexible combination of fundamental, core and elective learning components. The aim is to develop qualifications that have sufficient breadth [through the development of high levels of mathematical and communicative literacy] and depth [via the offering of a much wider range of core and elective credits] to equip learners to function more effectively in the work context, in HE, and as lifelong learners [Green Paper, 1998: 27].

The new programme encourages partnerships between FET institutions, including technical colleges, private sector organisations and other goverment departments and agencies which seek to experiment with and pilot innovative approaches to the new qualifications structure for FET. The National Strategy for Further Education and Training [1999-2001] undertakes the larger task of redesigning and integrating existing instructional offerings in Senior Secondary Schools and technical colleges. At present, these subjects and instructional offering are offered separately, so perpetuating the divide between general formative education and career preparation [Green Paper 1998: 27].

8.6.1.2 PROGRAMME-BASED FUNDING

Key principles of the proposed funding framework, which for the time being is limited to FET colleges including technical colleges, include the following:

a] enabling provincial departments to fulfill their constitutional obligation to make further education progressively available and accessible,

b] making use of management information systems as a basis for arriving at strategic decisions regarding funding of particular programmes and institutions, c] *providing for individual and institutional redress,*

d] maximising all available resources through cost-sharing, and income generation by providers.

e] basing funding on learning programmes,

f] *ensuring funding coherence*, so that the same level of funding applies to the same programme wherever it is ,

g] incorporating a perfomance-linked element in funding,

h] emphasizing the demand-side rather than the supply-side in funding, and

I] *providing for stability public funding* [Green Paper, 1998:28].

The new funding approach will have three main components - ilt will include formula funding for recurrent costs, based on full-time equivalent students in approved programmes leading to qualifications or parts thereof *earmarked funding for specific national policy objectives, and user* fees ralated to the ability to pay [Green Paper 1998:28].

8.6.1.3 A NEW GOVERNANCE STRUCTURE, LEGISLATION AND INSTITUTIONAL STAFF DEVELOPMENT

The new governance framework will be developed in accordance with provisions of the National Education Policy Act [Act 27 of 1996] and through the passage of a new Further Education and Training Act. These actions will introduce three important changes:

a] the establishment of a National Board for FET (NBFET),

b] the establishment of Provincial Boards for FET, and

c] the recognition of two types of FET colleges, viz, public and private.

The National FET Act will specify the terms and conditions under which publicly - funded colleges can move progressively towards the assumption of greater governance and management responsibility. In sum the new governance model will require of the FET system a greater degree of strategic planning, coherence and sense of purpose than has been the case previously [Green Paper, 1998: 30].

The implementation of these challenges will require significant leadership capacity, management information systems, and strategic planning. The Department of Education will aid the development of these capabilities through the establishment of Task Teams on Management Capacity Development and Management Information Systems [Green Paper, 1998: 30].

8.6.1.4 INSTITUTIONAL AND STAFF DEVELOPMENT

The introduction of a new FET system with new strategic planning and programme-based funding process, requires responsive and well-managed high quality institutions. For this reason the Green Paper [1998] accepts that institutional and staff development are integral to the establishment of a co-ordinated system.

8.6.2 A NATIONAL STRATEGY FOR IMPLEMENTATION OF FET PROGRAMME 1999-2001

The National Strategy for Further Education and Training [1999-2001] sets out a multilevel programme of action for the next three years, as well as action plans for the immediate year, 1999. It provides a national framework for the implementation of FET policy and outlines areas of collaboration with key stakeholders in line with the new policy and legislation,[Education White Paper 4 and the Further Education and Training Act , 1998].

A significant characteristic of the strategy is a shift from annual profiling activities to taking a medium view of FET development through effective multilevel planning and co-ordination. Education White Paper 4 sets out a broad and long-term national framework and programme for the transformation of FET and identifies four central features that support the new system. These take the form of new approaches in governance, programmes and qualifications, quality assurance and funding and constitute the basic logic of this planning document.

The new FET policy envisages that the provision of education and training at multilevel sites of delivery, in the workplace and in multi-campus institutions is going to transform FET provision into new forms and modes of delivery. To support this critical direction, high-level information management, system co-ordination and quality promotion will play an increasingly crucial role in the delivery of education and training programmes of great importance is the introduction of quality management practices at national, provincial and institutional level [National Strategy for Further Education and Training 1999-2000 1:5].

The key priorities include-

- The creation and staffing of FET units in National and provincial departments of education.
- The establishment of the National Board for Further Education and Training [NBFET] and provincial boards for advising the Minister.
- The development of criteria for the declaration of FET institutions
- The development of National policy on learning programmes and qualifications, assessment and guidelines for learning support materials.
- The development of strategy for improving learner participation and achievement, particularly in Mathematics, Science, Technology and Engineering.
- The development of national guidelines for programme-based funding.
- The development of strategy for the provision of relevant youth programmes and necessary learner support services.
- The establishment of an FET Quality Authority and the development of quality assurance framework.
- The development of norms, standards and procedures for the registration of private FET institution.
- The conduct of research and the design of an Emis for FET .
- The development of human resources at national and provincial departments of

education and at institutions.

- The briefing of the public on learner performance in technical colleges.
- *The review of the implications for schools and technical colleges of their incorporation* into the FET system and
- The development of national policy on learning programmes and qualifications for educators {Ibid 1999: 2001].

In the three year period to 2001, the Department will focus on four strategic objectives in areas of organisation, development, learning and teaching, FET resourcing and developing a system for co-ordinated planning, monitoring, evaluation and reporting.

The medium-term strategy is based on the following Strategic objectives that will have a bearing on FET transformation and development in the next ten years:

Strategic objective 1: *Organisational Development.*

To establish and strengthen governing structures, initiate institutional reorganisation build the Culture of Learning, Teaching and Service [COLTS] and undertake human resource capacity building that is outcomes specific [Ibid 1999-2001:7].

Strategic objective 2: Learning and Teaching

To set up appropriate national structures for managing the introduction of responsive learning programmes and qualifications, assessment, flexible modes of learning, effective learner support and articulation to the needs of communities, Higher Education and the workplace.

Strategic objective 3: Resourcing FET:

To put in place a new funding administration and position the Department to steer the transformation of FET through multiple funding instruments, including student financial aid and, earmarked fund and programmed based funding.

Strategic objective 4: Planning, Monitoring and Evaluation.

To set up a national Education Management Information System [EMIS] for FET to determine national targets, monitor performance, assure quality and support the Ministry's obligation to account to Parliament [Ibid 1999-2001:7].

Each strategic objective is linked to activities over three years to achieve logic and build sequence. The strategy is a product of joint planning between the National and provincial departments of education and has resulted in plan of action that has far-reaching implications for technical colleges and all levels of FET provision.

8.6.3 POTENTIAL BENEFITS OF THE GREEN PAPER [1998] AND NATIONAL STRATEGY FOR FURTHER EDUCATION AND TRAINING 1999-2001

The Green Paper on Further Education and Training [1998] as well as the National strategy for Further Education and Training [1999-2001] provide the following benefits:

a] Benefits to technical colleges and other FET institutions

- opportunities to develop programmes which meet a wider range of learner needs and preferred learner style,
- provision for credit transfer between colleges and institutions of Higher learning,
- opportunities to expand the range of programmes in response to industry training needs,
- access to more learners through the recognition of prior learning,
- ongoing professional development,
- ensure that institutions are well led and managed,

- build links between colleges an industry,
- set a new Standard of excellence,
- manage themselves as autonomous, accountable and efficient institutions.
- commit themselves to quality assurance and
- enjoy parity of esteem with other educational and training institutions.

b] Benefits to learners are as follows:

- access to national qualifications where previously there were none,
- greater choice and flexibility in what, where, and how to learn,
- standards and qualifications that are nationally portable between providers, occupations and employers.
- recognition of prior learning,
- greater transparency in the standards and qualifications being acquired,
- increased opportunities to continually build on credit towards national qualifications, and
- increased opportunities to get employment and to secure skills.

c] Benefits to State are as follows:

- monitor performance, disseminate information and raise awareness,
- greater transparency in the outcomes of the education and training,
- a means for comparing overseas qualifications with South African ones,
- an accurate profile of the learners, and labour force.
- transformed middle management,
- incentives for disadvantaged colleges to improve,
- increased participation of black and female students,
- Team-Based-Management Development, and
- succeeded in college restructuring, formation of partnerships and linkages, formation of governance and effective funding programme for both colleges and students.

8.6.4 INTERNATIONAL COMPARISON

Many countries are facing similar problems to those which South Africa is striving to overcome, albeit in a different context from South Africa, particularly in the need for a "qualified flexible and competent world-class workforce" [Heron, 1994]. A major contributory factor in all of these situations is an apparent education and training crisis. Corney [1995] claims that ....
"what is wrong with education and training systems all over the world is that they were designed in a previous age for previous needs." In an effort to address this, many countries have begun their own transformation processes and have introduced national strategies for training and new frameworks of qualifications.

For this reason South Africans were able to consider international examples when deciding on an appropriate strategy and framework [National Qualifications Framework - NQF]. The National strategy and framework as they stand currently draw largely on the Australian, Canadian, New Zealand and the British systems [Wits EPU, 1996]. While the international experience is useful as a learning tool, implementors must however be cautious and avoid transferring such systems in their entirety to South Africa [Wits EPU, 1996]. Implimentors must also ensure that they fully analyse the disadvantages and the contexts of the systems.

Samson and Vally [1996] express disappointment at the apparent lack of interest in the international experience. In Canada, for example, competency-based training has resulted in an erosion of workers' know-how, which has been fragmented into discrete chunks" [Samson and Vally, 1996 a : 13]. They continue by saying that fragmentation of tasks has been an issue used in the past by employees to resist employers and pressurise them to initiate improvements in working conditions. It is only when considering the international experiences holistically that South African can attempt to avoid similar difficulties.

In Britain, the introduction of the National Vocational Qualification framework in the mid - 1980s called attention to the vocational or work based training needs of the individual and attempted to afford training qualifications the equivalent status of educational qualifications [Ashman, 1995)]. The framework has failed to achieve the latter and Ashman [1995] believes that individuals without an academic background are still regarded as "second class citizens". The British system has also had limited acceptance by organisations and only a minority of organisations are "buying into the system" [Johnsons, Pers. Comm, 1996]. This poor reception is due in part to the development of National Vocational Qualifications in isolation from the context of the workplace, for which they are ultimately designed [Phillips, 1997 a]. This places enormous pressure on the ability of the South African strategies and framework to a] elevate the status of training in the country, and b] encourage all technical colleges and other FET institutions become involved in and committed to the process.

By considering these few international scenarios some potential problems with strategies and the NQF have been raised. Clearly there are also South African criticisms and misgivings about the new FET system and these will be discussed below.

8.6.5 CRITICISMS AND POTENTIAL DRAWBACKS

The major problem regarding the national strategy on Further Education and Training is the issue of the time frame. The National strategy for FET put forward a medium-term strategy for the translation of the new FET policy into prioritized activity and carefully considered results for the initial three years. This strategy also sets out a programme of action for the following three years, as well as action plans for the immediate year, 1999.

In his article on NVQ, Heron [1994] discusses how the British system seems to be beginning to make excellent progress after eight years of gradual transformation. The time frame has allowed for the smoothing over of some of the problems mentioned on section 8.6.4. South African intentions seem to indicate a much shorter period for effective implementation and do not dispel fears of unrealistic assessments of the resources and infrastructure necessary for effective, widespread implementation.

The second problem that the framework will face is that of participation of stakeholders at the implementation stage. The basic assumption is that all stakeholders will participate in all areas of the implementation of the national strategy without delay or suspicion. The participation may not be automatic, especially as technical colleges have not yet been merged.

A further concern of Heron [1994:] is the issue of funding of the FET programme. It is not clear as to how much is budgetted for the implementation, and monitoring of the FET programme. The national strategy document indicates that technical colleges will be converted into FET institutions and be expected to:

- adopt a client-centred approach,
- provide better value for money,
- offer a range of programmes.
- operate "Open Door " policies,
- manage themselves as autonomous, accountable and efficient institutions,
- commit themselves to quality,
- train students for work, and
- respond to industry and communities.

It is also not clear as to how much each institution will'be allocated with and when that money will be given to them or what criteria will be used when allocating those funds to institutions. The national strategy further indicates that each province should have a strategic plan and capacity, build strong institutions and ensure that those institutions are well led and managed. A concern here is the fact that no auditing of human and physical resources have been made by provincial department to establish whether these institutions have capacity to convert their colleges into FET institutions or not. A further concern is the fact that no management development programme and as training needs analysis have been made for the effective management of these colleges.

Criticism has also been raised around the difficulty of "identifying equivalent outcome for education in the classroom and training in the workplace". This difficulty exists because of the fundamental differences between learning a specific work-based skill, through a modular outcomes-based approach , and developing a broad understanding of art, social sciences and the humanities in a classroom [Wits EPU, 1996].

It is noted that clearly divided competencies and outcomes are contradictory to the holistic development of the individual aimed for in the integration process. This may result in the individuals having highly specialised skills in their jobs but not being able to easily transfer these to other situations and this would seriously limit mobility, another underlying principle of the framework [Wits EPU, 1996].

It is important to indicate that these criticisms should not be ignored as they may prove to be stumbling locks to the successful implementation of the of the Green Paper [1998], the national strategy for Further Education and Training [1999-2001] and the NQF.

8.7 CONCLUSION

On the whole, the Green Paper [1998], the National Stratergy on Further Education and Training and the NFQ have been positively received by the stakeholders who view them as a means of addressing the education crisis, particularly at technical colleges and those related to industry Yet. Despite this positive reception, there remain many reservations regarding cost, time and funding factors which affect implimentation. A consideration is that FET is not a once-off transformation programme of transformation, but one which will require ongoing attention and adaption for increased relevance.

The National Stratergy [1999 - 2001] and the Green Paper [1998] are offering a means to attain standardisation and improved relevance of the current system. The ideal degree of participation [as discussed in 8.6.4] has not yet been achieved due to the reality that some stakeholders do not understand what is required, whilst others are trying to adjust. Naturally, there is also the obstacle of inadequate funding which impedes the purchasing of necessary equipment for effective training of students.

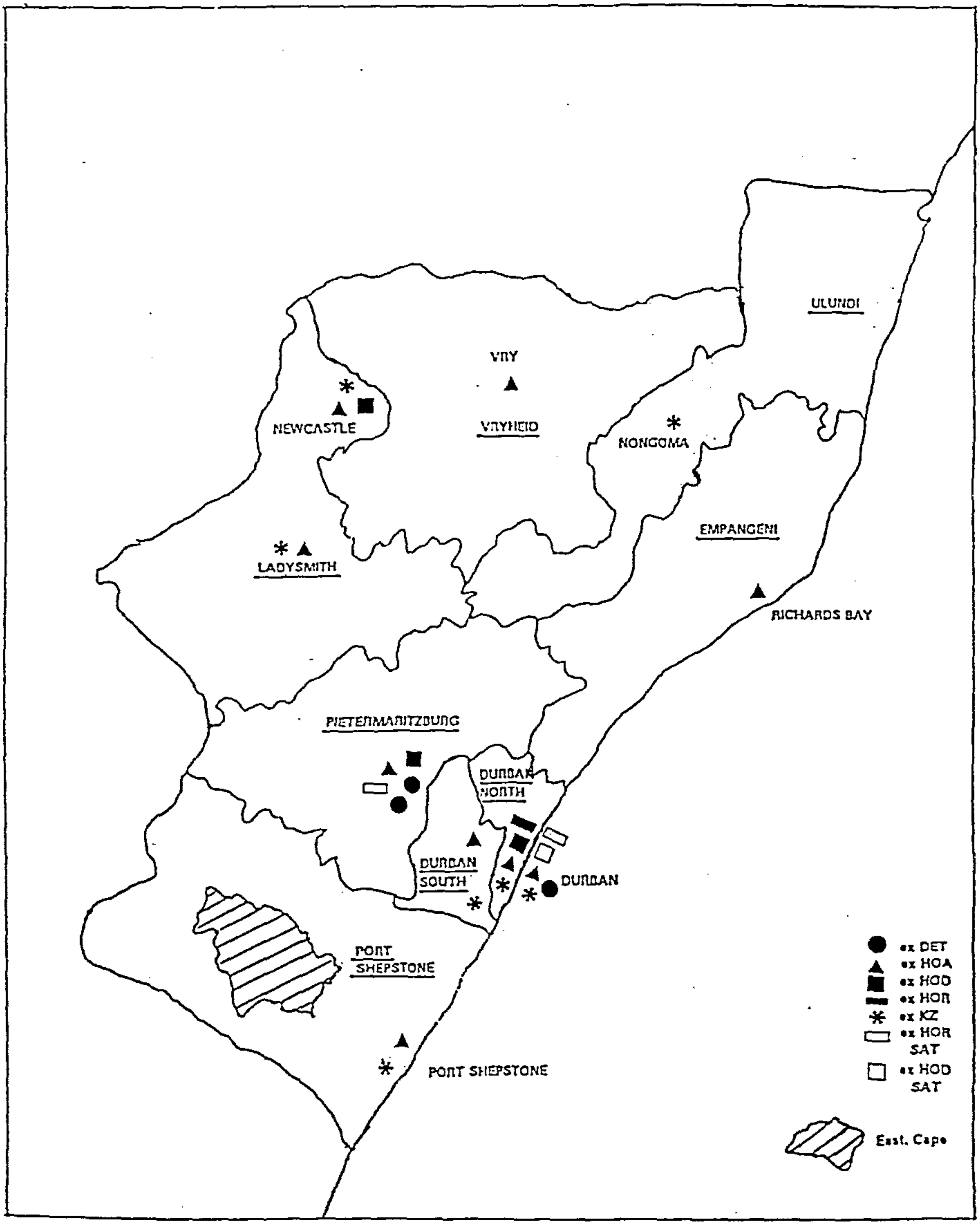
At present, South Africa is unable to provide the skills necessary to effetively meet the needs of the expanding domestic and international markets. Within the context of the global view, competition and productivity is dependent upon relevant technological advancement, a superior quality of productivity, value service and well developed skills. If any country is to succeed in developing a growing and competative economy, there is a dire need for the human resources to motivate this process towards a meaningful future and, with this in mind, there can be no hesitation in needing to impliment the National Stratergy for Further Education and Training, the FET programme, the NQF and the Human Resource Development programmes.

Technical and vocational education both directly contribute to economic growth through their impact on productivity, through support and by being catalysts for the introduction of new technology, product and process innovation and improved customer services.

This project specifically aims to improve and upgrade the training at technical colleges and will contribute towards the objective of increasing the professional status of technical and vocational education. Technical colleges and the principals need to be provided with modern and equipment of a standard so as to ensure that quality training can be provided.

PROCINCE OF KWAZULU-NATAL

LOCATION OF TECHNICAL COLLEGES



QUESTIONNAIRE NO _____

QUESTIONNAIRE FOR PRINCIPALS OF KWAZULU-NATAL TECHNICAL COLLEGE

NAME OF COLLEGE ....

NAME OF PRINCIPAL (Please write in block letters) ....

PART 1

QUESTION 1

Engineering studies N1, T/1, 1995 results

Please supply me with your Examination Results (1996) in Trimester 1 for students studying for NI in Engineering Science/Mathematics/Drawing as well as Motor and Electrical Trade Theories.

COURSES	LEVELS	ENROLMENT	NUMBER WHICH WROTE	NUMBER FAILED	NUMBER PASSED
Motor Trade Theory	N1				
Electrical Trade Theory	N1				
Engineering Science	N1				
Engineering Drawing	N1				
Engineering Mathematics	N1				

PART 2

Recruitment, Staffing and Upgrading Of Teachers:

QUESTION 2

In relation to course objectives, how do you generally feel about the qualifications and experience of your staff?

VERY UNSATISFIED	RATHER UNSATISFIED	NEITHER SATISFIED NOR UNSATISFIED	FAIRLY SATISFIED	VERY SATISFIED
1	2	3	4	5

QUESTION 3

Qualifications of Lecturers: NO.

(i)	How many teachers with technical qualifications only?	
(ii)	How many teachers with professional certificates only?	
(iii	How many teachers with both technical and professional qualifications?	
(iv)	Other (Explain)	
(v)	Total number of teachers	

QUESTION 4

Are there any staff members who are moving to industry or other jobs because of better pay or benefits? Approximately how many of your teachers moved to jobs in the private sector because of better pay or benefits during the past three years? (Please tick relevant number)

1	2	3	4	5	6	7	8	9 and more

QUESTION 5

How satisfactory is the staff development plan in your college?

NON-EXISTENT	UNSATISFACTORY	SATISFACTORY	GOOD	EXCELLENT
1	2	3	4	5

QUESTION 6

How difficult do you find it to recruit an adequate number of professionally qualified staff\lecturers with industry experience?

VERY DIFFICULT	FAIRLY DIFFICULT	SOMETIMES DIFFICULT	FAIRLY EASY	VERY EASY
1	2	3	4	5

QUESTION 7

How satisfactory are the arrangements for in-service teacher training at your college

VERY UNSATISFACTORY	RATHER UNSATISFACTORY	NEITHER SATISFACTORY NOR UNSATISFACTORY	SATISFACTORY	VERY SATISFACTOR
1	2	3	4	5

PART 3

Provision and utilization of teaching equipment in your college

QUESTION 8

How comprehensive is the range of workshop equipment?

VERY UNSATISFACTORY	RATHER UNSATISFACTORY	NEITHER SATISFACTORY NOR UNSATISFACTORY	FAIRLY SATISFACTORY	VERY SATISFACTORY
1	2	3	4	5

QUESTION 9

How relevant is the equipment to course needs?

VERY UNSATISFACTORY	RATHER UNSATISACTORY	NEITHER SATISFACTORY NOR UNSATISFACTORY	FAIRLY SATISFACTORY	VERY SATISFACTORY
1	2	3	4	5

QUESTION 10

How satisfactory is the equipment in terms of being up to date?

VERY UNSATISFACTORY	RATHER UNSATISFACTORY	NEITHER SATISFACTORY NOR UNSATISFACTORY	FAIRLY SATISFACTORY	VERY SATISFACTORY
1	2	3	4	5

QUESTION 11

How satisfactory are the provisions in annual budgets for replacing tools and equipment?

VERY UNSATISACTORY	RATHER UNSATISFACTORY	NEITHER SATISFACTORY NOR UNSATISFACTORY	FAIRLY SATISFACTORY	VERY SATISFACTORY
1	2	3	4	5

QUESTION 12

How satisfactory are the availability of materials including consumables and their use in the workshops?

VERY UNSATISFACTORY	RATHER UNSATISFACTORY	NEITHER SATISFACTORY NOR UNSATISFACTORY	FAIRLY SATISFACTORY	VERY SATISFACTORY
1	2	3	4	5

QUESTION 13

How satisfactory is the maintenance programme in your college?

VERY UNSATISFACTORY	RATHER UNSATISFACTORY	NEITHER SATISFACTORY NOR UNSATISFACTORY	FAIRLY SATISFACTORY	VERY SATISFACTORY
1	2	3	4	5

PART 4

Improving the training offered at your college:

QUESTION 14

Which of the following measures would, in your opinion, most improve the training offered to students in your institution? Please write number 1 next to the most important measure, number 2 next to the second most important measure, etc. according to the rank order of importance.

(a)	Improve equipment	
(b)	Improve training materials	
(c)	Upgrade lecturers	
(d)	Improve the selection process for incoming students	
(e)	Establish closer relations with employers and industry	
(f)	Improve the system of requisitioning material from department	
(g)	Increase the number of professionally and technically qualified staff	
(h)	Improve buildings	
(i)	Other (Explain).	

QUESTION 15

Which major problems do you experience in your institution that you would like to bring to my attention?
Please write in the space provided.

____

____

____

____

____

Thank you for completing the questionnaire. We know you are a busy person and appreciate the time and effort you spent.

SIGNATURE OF PRINCIPAL: ....

APPENDIX B

QUESTIONNAIRE FOR INTERVIEWS

NAME OF COLLEGE : ....
NAME OF EDUCATOR : ....

QUESTION 1

Explain how the college orientates newly appointed lecturers, without teaching of qualifications, who are recruited directly from industry

....
....
....
....
....

QUESTION 2

Explain how the college admits NTC I students in Engineering studies department

....
....
....
....
....
....

QUESTION 3

What do you dislike most about teaching and training that takes place at your college and in your lecturer.

....
....
....
....
....
....

QUESTION 4

Suggest hour training offered at your technical college can be improved.

....
....
....
....

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