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AN OVERVIEW OF INDUSTRIAL EDUCATION CURRICULUM AT TECHNICAL COLLEGES IN SOUTH AFRICA WITH PROPOSALS FOR MANPOWER DEVELOPMENT THROUGH COURSE OFFERINGS

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Francis Verity Norton

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Major professor

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AN OVERVIEW OF INDUSTRIAL EDUCATION CURRICULUM AT TECHNICAL COLLEGES IN SOUTH AFRICA WITH PROPOSALS FOR MANPOWER DEVELOPMENT THROUGH COURSE OFFERINGS

By

Francis Verity Norton

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ABSTRACT

AN OVERVIEW OF INDUSTRIAL EDUCATION
CURRICULUM AT TECHNICAL COLLEGES IN
SOUTH AFRICA WITH PROPOSALS FOR MANPOWER
DEVELOPMENT THROUGH COURSE OFFERINGS

By

Francis Verity Norton

The purpose of this paper was to identify problems associated with training and education in Technical Colleges in South Africa and to list some of the meaningful steps which could be taken in this area. At the outset, it is necessary to make the point that these are fields in which the ideals of racial integration must be applied with extreme caution. Assimilation of the black labour force will assist in human development and may provide for the manpower needs of South Africa in the area of skilled artisans.

The method used in surveying this problem was an examination of curricula in South Africa and Michigan in the United States of America, a review of pertinent literature and research. A major finding was that courses offered must provide both for the needs of the students and for the needs of industry if manpower development is to be optimal.

ACKNOWLEDGMENT

In appreciation of the generosity of the Rotary Foundation of Rotary International, the patience and understanding of Dr. Richard Gardner and the typing skills of Beverly Ann Klass.

F.V.N.

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Chapter 1

INTRODUCTION

Some educators have advocated speeding up the process to develop South African labour resources, yet the structure of education in the Colleges for Advanced Technical Education and Technical Colleges has left much to be desired in efficient organization in as far as it concerned offering courses pertinent to on-the-job requirements. An improvement in this area could do much to motivate students and result in provision for manpower requirements at artisan level. Provision for the supply of technical educators is also inadequate to meet the future needs of the country, should these recommendations be implemented.

> The Report of the de Villiers Commission 1948 on Technical and Vocational Education used the term technical education in an exclusive sense "to include those forms of vocational education associated with science and technology, the direct purpose of which is to fit the individual for some industrial pursuit or trade."[1]
>
> The Commission offered little criticism of the existing apprentice system; its proposals for a totally new scheme probably implied a rejection of the existing system. The Apprenticeship Act (No. 46 of 1963) was intended to overcome the difficulties which had restricted the control exerted by the State over employer and apprentice.[2]

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[1] Gibson, John L., Critical Study on Technical and Vocational Education, 1968, page 114.

[2] op. cit., page 158.

These quotations refer briefly to the areas of instruction at Technical Colleges in that pupils attending these courses are serving apprenticeships. The courses were intended to supplement knowledge gained through work experience.

Background for this proposal was provided by masters and doctoral theses written by Dr. John L. Gibson, Deputy Principal, Durban Technical College; Education in South Africa written by Drs. Neville and Barbara Robertson, Chamber of Mines and Johannesburg College of Education; and New Perspectives in South African Education by Dr. A. L. Behr, Professor of Education, University of Durban-Westville.

Definition of Terms

Apprentice. A person who is serving an apprenticeship which involves a study of the skills required for artisan status.

Apprenticeship contract. A contract between employer and employee which determines length of service, study requirements and basic wage in order that artisan status receive recognition.

Artisan. A person who has served a recognized apprenticeship and possesses a marketable skill in a trade.

Curriculum. An area of study which deals with all the experiences that are provided for students under the direction of the study institution.

Remission of time. An apprenticeship contract may be shortened from the required 4 or 5 years in recognition of previous experience or success at technical studies.

Technician. A person who has studied at advanced technical levels and operates in the area between engineers and artisans, without having served a recognized apprenticeship.

Termination of apprenticeship contract. This term denotes that the apprentice has either served the required time or has passed the trade test.

Trade Test. A final practical test which determines whether the apprentice has achieved the required proficiency. This test is compulsory at the end of the apprenticeship contract or may be taken voluntarily prior to this, depending on technical achievement.

Chapter II

STATEMENT OF PURPOSE

The purpose of this paper was to identify problems associated with training and education in Technical Colleges, and list some of the meaningful steps which have been and could be taken in this area. At the outset, it is necessary to make the point that these are fields in which the ideals of racial integration must be applied with extreme caution.

> A random merging of peoples with different languages and cultures into one group in order to appease international critics can only give rise to difficulties for those who teach and those who are taught. In education, a plan applicable to all is a worthy objective, but in actual instruction, race sometimes cannot be submerged.[3]

The function of Technical Colleges was to serve those people who were educationally and economically disadvantaged; to give them the opportunity to study while training in a recognized vocational field, so that they may benefit their communities, speed up the industrial development of the country and at the same time qualify them to compete for gainful employment.

Problem Statement

The problem lay basically in the areas of student recruiting, the inabilities of students in some trades to cope with theoretical matter

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[3]Ringrose, H. L., Training and Education, 1978, page 2.

and the relevance of course content to on-the-job requirements. The educational ladder grows ever longer, yet does not adequately serve in depth those who may never climb all of the rungs provided.

In the present circumstances, the education system has failed miserably in providing marketable skills to ethnic minorities. Although the proponents of separate development maintain that it is impossible to reconcile the economic needs of a region with the development of its individual and segregated community components, evidence[4] continues to accumulate which suggests otherwise.

Before critics remind us that there are many Trade and Industrial Training schools provided for Blacks, let it be stressed, that the problem being addressed is in the educational area administered only by Technical Colleges.

> Politically, the system is completely consistent with the ideology of separate development of each of the racial groups in South Africa. In this sense, it is achieving its objectives. Economically, however, a strong case can be made for the thesis that the concept of separate development and the education system which supports it is counter productive to the development of the country.[5]

Another problem associated with organization lay in the provision of separate facilities for the Asian and the Coloured race groups. This problem is highlighted by the number of vacancies in trades assigned to the White group (see Appendix D). Only two of the defects in the apprenticeship system appeared to concern education, namely, the unsuitability of many apprentices for their chosen trades and the lack of responsibility shown by apprentices at technical classes. The

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[4]Robertson, Neville L., Education in South Africa, 1977.

[5]op. cit., page 34.

reasons for this seemed to lie in inadequate assessment of the pupils' ability during recruitment and lack of relativity between course offerings and job requirements.

The system of apprenticeship which developed when craftsmen with versatile skills were important in industry has become outdated in some cases. With the development of assembly line methods, specialized skills have become the real need and these can be acquired in short intensive courses. The length of training is based on what is essential to know and do, rather than on a traditional concept of the time it takes to learn everything associated with a trade or craft.

Many of the 120,000 Blacks who come on to the labour market each year will find unskilled employment in the Homelands. The trained and educated Blacks will supplement the White, Asian and Coloured labour force in urban areas, where large employers in industry have indicated their willingness to promote non-whites into senior administration and managerial positions; for the statutory reservation of certain jobs for certain population groups is gradually disappearing.

> Prompted no doubt by International Labour Organizations, the Trade Unions, in the words of the Minister of Labour, are adopting 'a realistic attitude on the matter in looking not only at their own interests, but also at national interests'.[6]

Options Examined

Before defining the objectives in curriculum improvement, it is essential to define the objectives of vocational education. To the extent that industry in South Africa has much in common with industry in America, the following objectives outlined by Rupert Evans would seem pertinent.

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[6]Ringrose, H. L., Training and Education, 1978, page 4.

Meeting Society's needs for Workers. Apprenticeship attempted to combine the best of family instruction and on-the-job training by having an experienced worker agree to teach the full range of an occupation. At present, almost every skilled technical and professional occupation inducts at least part of its workers through formal school programs offered in high schools, community colleges and universities. Changes in needs for workers occur because once unskilled labour is replaced, it is no longer needed. Agriculture has become one of our most mechanized and efficient industries. Many routine clerical activities have been replaced by electronic hardware. Some experienced workers who are naturally good teachers are recruited to become teachers of vocational education.[7]

Increasing Individual Options. The general curriculum, which many educational philosophers claim offers the greatest number of options to students, really offers the least. Some people have more options than others do; that is to say, they have more opportunities for choice as they go through life. Income beyond the amount required for subsistence generally increases an individual's options as does athletic ability, verbal intelligence, manipulative skill and other prejudice, poor education, social isolation, poor health and recognition of standards of achievement which are unattainable for many.[8]

In addressing this issue, we have both client-centered objectives and organization-centered objectives. To determine the client-centered objectives, it will be necessary to determine those students of each race group who may benefit from programs in vocational education. It was evident that the majority of pupils who did not matriculate were Black (see Table 1).

The Department of Bantu Education (Pretoria 1958) now has direct control of primary, secondary and tertiary education (excluding the three Black universities) for Blacks outside the Homelands. It is organized on a regional basis with directors stationed in Johannesburg

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[7]Evans, Rupert N., Foundations of Vocational Education, 1978, page 9.

[8]op. cit., page 27.

TABLE 1

EDUCATIONAL LEVELS ATTAINED BY THE FOUR PRINCIPAL

ETHNIC GROUPS IN SOUTH AFRICA, 1972-1973

Group	Standard 6[1] (8 years)	Junior Certificate[1] (10 years)	Matriculation[1] (12 years)	First Degree[2]	Advanced Graduate Degrees[2]
Blacks	150 324	27 841	3 393	373	141
Coloureds	12 000[3]	9 344	2 064	123	44
Asians	10 938	8 243	3 001	294	116
Whites	70 000	60 000[1]	38 000[3]	7 683	4 356

(1) 1973 figures
(2) 1972 figures
(3) Figures not available - estimates

Robertson, Neville L., Education in South Africa, U.S.A. 1977, page 15.

for Soweto; Vereeniging for the Southern Transvaal; Pietermaritzburg for Natal, Bloemfontein for the Orange Free State and Cape Town for the Cape Province.

> The Department has set up eight industrial training centers in the main urban residential areas of the country. These centers are an integral part of the junior secondary program of the Department and will offer a wider range of plastics, mechanical and electrical practice, etc.). These courses are not intended to supplant those given at trade or technical schools, but to help the school-leaver in particular to find his feet in an industrial society; they are concerned primarily with orientation rather than with specific skills.[9]

Over 170,000 Black students who have achieved either a standard 6 or junior certificate in the 1972-73 study could benefit from these courses and courses at Technical Colleges.

In order to determine possible improvements in technical courses, it would be helpful to determine the calibre of the students who made use of these facilities. In 1963 W. M. de Waard, Principal of the Durban Technical College, gave some significant aptitude test results obtained from a typical group who would eventually occupy skilled positions. In this test a score of 100 would be obtained by a high school graduate with aptitude in this area.

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[9]South African Yearbook, Education, 1977, page 32.

TABLE 2

APTITUDES OF APPRENTICES UNDER TRAINING FOR SKILLED TRADES

Trade	Number	Mean Score
Turners	83	90.8
Fitters	281	90.1
Sheetmetal Workers	18	88.8
Motor Mechanics	200	85.5
Motor Machinists	17	86.2
Diesel Mechanics	36	87.4
Boiler Makers	25	79.1
Welders	45	76.7
Other Mechanical Trades	9	76.0
Total	714	87.2

> Concern was expressed in the House of Assembly at these figures. Changes were made in 1964 to the Apprenticeship Act to allow remission of time for success at examinations and trade tests. The entrance qualification for some trades has also been set at a higher level - Standard 8. The average intelligence quotient figures have probably not increased since the publication of de Waard's figures.[10]

Insufficient research had been done to accumulate data to support the premise that there was a correlation between the aptitude of students and their success at trade tests. Research by Gibson indicates that there is no correlation between a test of manual skill and success at technical examinations. These factors might be useful in the final determination of course offerings.

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[10]Gibson, John L., Critical Study on Technical and Vocational Education, 1968, page 133.

> Statistics provided by the results of trade tests have not revealed any significant correlation between success at a test of manual skill and proficiency in technical examinations. A greater realization of this factor by employers might conceivably lead to a decision by industry to increase recognition for the provision of intensive in-service training.[11]

To determine the organization-centered objectives, it was necessary to establish present course offerings. Figure 1 shows existing courses on the lower right-hand side and the standard of high school achievement required for acceptance on the lower left-hand side.

A further option exists in that an apprentice may attempt a trade test after a minimum of three years service if he has passed N2 Trade Theory. The difference here lies in the fact that this is a subject and not the entire course. This leads on to a discussion of the courses offered at Technical Colleges. The total range of subjects is outlined (see Appendix A). Of the ninety-two subjects, eighty or more are trade subjects. These form a part of courses offered at different levels.

The levels are indicated by N1, N2, N3 in Figure 1. At each level, the apprentice studies an average of four subjects. These comprise a Trade Theory, Technical Drawing, Applied Science and Mathematics. In order to succeed at any level, the student must pass Trade Theory and any two other subjects.

In order to understand this figure better, it may be convenient at this point to explain the terminology used in the section dealing with apprentices. An apprentice is a male or female who signs a contract to the effect that he or she will work for an employer for a stip-

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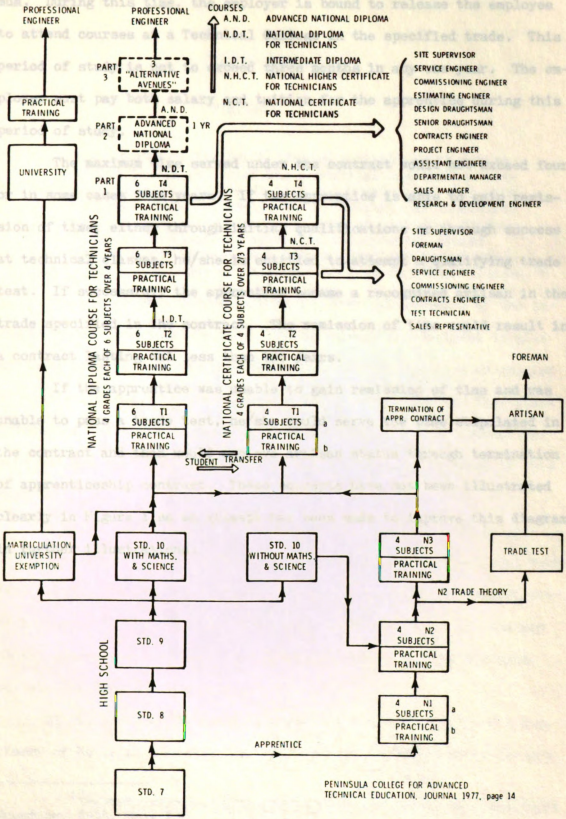
[11] Gibson, John L., A Study of Education for Industry, 1976, page 467.

FIGURE 1

PRESENT COURSE ROUTING IN TECHNICAL EDUCATION



PENINSULA COLLEGE FOR ADVANCED TECHNICAL EDUCATION, JOURNAL 1977, page 14

ulated length of time at a wage equal to or higher than the basic minimum. During this time, the employer is bound to release the employee to attend courses at a Technical College in the specified trade. This period of study is not to exceed three months in any one year. The employer must pay both salary and tuition for the apprentice during this period of study.

The maximum time served under the contract would not exceed four or in some cases five years. If the apprentice is able to gain remission of time, either through initial qualifications or through success at technical classes, he/she is entitled to attempt a qualifying trade test. If successful, the apprentice became a recognized artisan in the trade specified in the contract. The remission of time would result in a contract lasting not less than two years.

If the apprentice was unable to gain remission of time and was unable to pass a trade test, he/she would serve the time stipulated in the contract and then would achieve artisan status through termination of apprenticeship contract. These concepts have not been illustrated clearly in Figure 1 so an attempt has been made to improve this diagram in further illustrations.

Chapter III

FINDINGS

> The defects in the South African apprenticeship system as analyzed in the report of the Industrial Legislation Commission were listed by the de Villiers Commission. The main defects were: workshop equipment in industry was inadequate for training purposes; there was a lack of qualified journeymen to impart knowledge to apprentices; employers lacked interest in their apprentices; many apprentices lacked concentration and a sense of responsibility at technical classes.[12]

There have been recent efforts to cater for students by the introduction of Integrated Courses. These courses are designed to give pupils an overall learning experience where the application of related subjects contributes to the study of Trade Theory. The new flow chart in Technical Education as adapted from the outline in the Journal for Technical and Vocational Education in South Africa is included in this work.

A brief description is necessary, as a comparison may be made with the courses offered in Figure 1. Up to the level of National Technical Certificate part 2 in Figure 2, there is no longer a subject discrimination. The course runs as a unit, but is comprised of relevant subject matter compiled from the courses in Figure 1. The students thus sit for only one examination.

At the level of National Technical Certificate part 3, the Department of National Education has approved the introduction of the fol-

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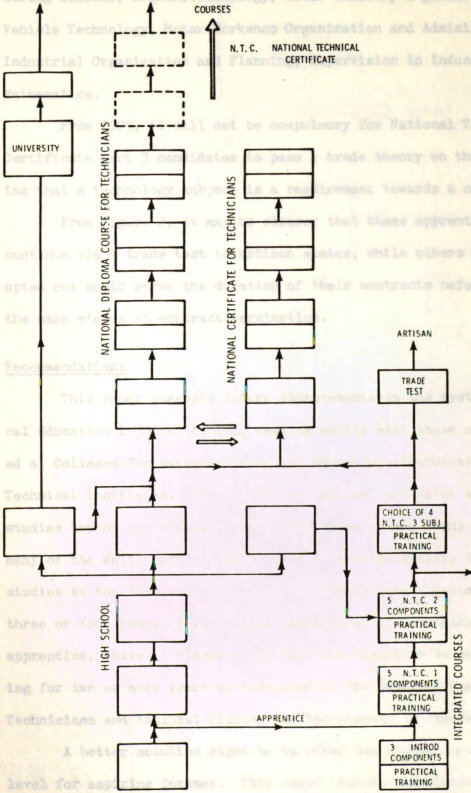
[12]Gibson, John L., Critical Study on Technical and Vocational Education, 1968, page 156.

FIGURE 2

CURRENT CHANGES AT TECHNICAL COLLEGES



SOUTH AFRICAN JOURNAL FOR TECHNICAL AND VOCATIONAL EDUCATION
DECEMBER 1977, PAGE 23

lowing new subjects: Electrotechnology, Engineering Drawing, Engineering Science, Mechanotechnology, Motor Industry Legislation, Motor Vehicle Technology, Motor Workshop Organization and Administration, Industrial Organization and Planning, Supervision in Industry, and Mathematics.

From 1979, it will not be compulsory for National Technical Certificate part 3 candidates to pass a trade theory on the understanding that a technology subject is a requirement towards a certificate.

From Figure 2, it may be clearer that these apprentices would continue via a trade test to artisan status, while others who have opted out would serve the duration of their contracts before achieving the same status at contract termination.

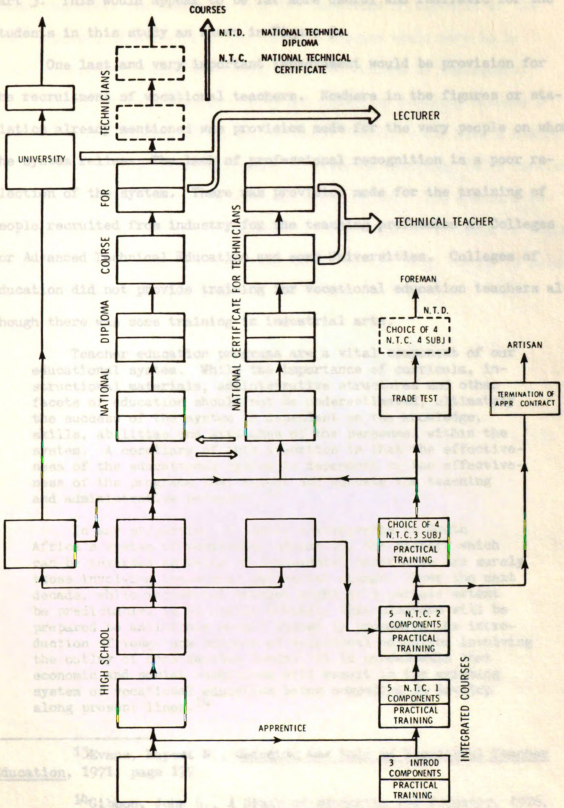
Recommendations

This paper suggests future improvements in the system of Technical Education in South Africa, dealing mainly with those courses offered at Colleges for Advanced Technical Education, Technical Colleges and Technical Institutes. The present design does not cater adequately for studies beyond the artisan level. According to the study of de Waard, many of the White apprentices would not have the ability to pursue studies at the levels envisaged in the Technicians' Diploma. After three or four years of work-study experience, it is unlikely that any apprentice, White or Black, would have the incentive to continue studying for two or more years as indicated by the National Certificate for Technicians and National Diploma for Technicians in Figure 1.

A better solution might be to offer one course above the artisan level for aspiring foremen. This could include experiences in Bookkeeping, Business Economics, Personnel Management, and higher levels of

FIGURE 3

PROPOSED IMPROVEMENT FOR MANPOWER DEVELOPMENT



suitable industrial courses from the new National Technical Certificate part 3. This would appear to be far more useful and realistic for the students in this study as shown in Figure 3.

One last and very important improvement would be provision for the recruitment of vocational teachers. Nowhere in the figures or statistics already mentioned was provision made for the very people on whom the system relies. The lack of professional recognition is a poor reflection of the system. There was provision made for the training of people recruited from industry for the teaching profession at Colleges for Advanced Technical Education and some Universities. Colleges of Education did not provide training for vocational education teachers although there was some training in industrial arts.

> Teacher education programs are a vital component of our educational system. While the importance of curricula, instructional materials, administrative structures and other facets of education should not be underestimated, ultimately the success of the system is dependent on the knowledge, skills, abilities and attitudes of the personnel within the system. A corollary of this assertion is that the effectiveness of the educational system is dependent on the effectiveness of the programs that select and educate the teaching and administrative personnel.[13]

> In any projection of likely developments in South Africa's system of vocational education, the factors which can be regarded as being of fundamental importance are surely those involving industrial and social change. Over the next decade, while industrial changes might to a certain extent be predictable, it is highly unlikely that planners will be prepared to anticipate social change by proposing the introduction of long-term schemes of vocational education involving the outlay of considerable funds. It is conceivable that economic and social conditions will result in the existing system of vocational education being compelled to develop along present lines.[14]

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[13]Evans, Rupert N., Changing the Role of Vocational Teacher Education, 1971, page 177.

[14]Gibson, John L., A Study of Education for Industry, 1976, page 483.

If the employment structure in Appendix C is to be followed, human resources are needed to fill the vacancies in Appendix D. In the interests of economic growth these resources would have to be found elsewhere, should the supply of White workers be inadequate.

If the integration of Whites and Blacks in industry becomes a reality, the resulting social and economic changes could have a remarkable effect on vocational training. In-service training, to be carried out economically, would surely become multi-racial. The eventual acceptance of such industrial integration could lead to a system of state-controlled vocational training which might become large enough to cater for human and industrial needs.

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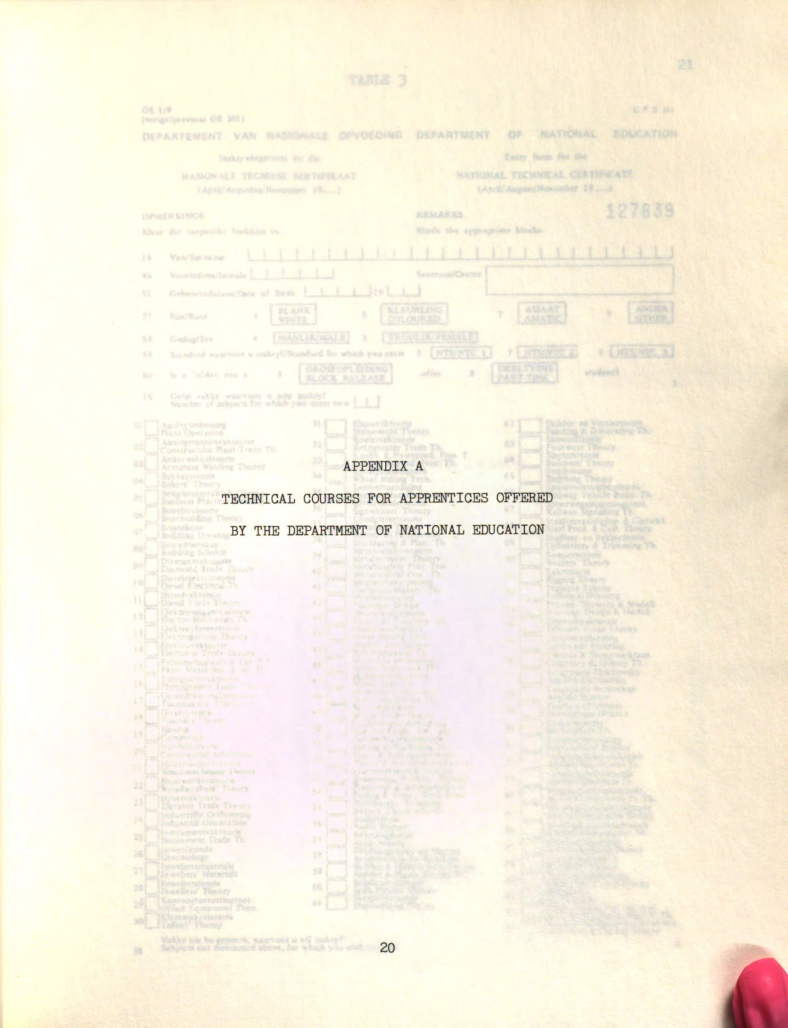

APPENDIX A

TECHNICAL COURSES FOR APPRENTICES OFFERED

BY THE DEPARTMENT OF NATIONAL EDUCATION

TABLE 3

OE 1/9
(vorige/previous OE 301)

GPS (L)

DEPARTEMENT VAN NASIONALE OPVOEDING DEPARTMENT OF NATIONAL EDUCATION

Inskrywingsvorm vir die
NASIONALE TEGNIESE SERTIFIKAAT
(April/Augustus/November 19.....)

Entry form for the
NATIONAL TECHNICAL CERTIFICATE
(April/August/November 19.....)

127839

OPMERKINGS
Kleur die toepaslike blokkies in.

REMARKS
Shade the appropriate blocks.

16 Van/Surname

46 Voorletters/Initials

Sentrum/Centre

51 Geboortedatum/Date of Birth 19

57 Ras/Race 3 BLANK WHITE 5 KLEURLING COLOURED 7 ASIAAT ASIATIC 9 ANDER OTHER

58 Geslag/Sex 4 MANLIK/MALE 5 VROULIK/FEMALE

59 Standerd waarvoor u inskryf/Standard for which you enter 5 NTS/NTC 1 7 NTS/NTC 2 9 NTS/NTC 3

60 Is u 'n/Are you a 5 GROEPOPLEIDING BLOCK RELEASE of/or 8 DEELTYDSE PART-TIME student?

1

16 Getal vakke waarvoor u nou inskryf
Number of subjects for which you enter now

01 Aanlegbediening / Plant Operation
02 Aanlegmasjienvakteorie / Construction Plant Trade Th.
03 Ankerwikkelteorie / Armature Winding Theory
04 Bakkersteorie / Bakers' Theory
05 Besigheidspraktyk (Slagt.) / Business Practice (Butch.)
06 Bootbouteorie / Boatbuilding Theory
07 Boutekene / Building Drawing
08 Bouwetenskap / Building Science
09 Diamantvakteorie / Diamond Trade Theory
10 Dieselelektroteorie / Diesel Electrical Th.
11 Dieselvakteorie / Diesel Trade Theory
12 Elektromeganikateorie / Electro-Mechanics Th.
13 Elektroplateerteorie / Electroplating Theory
14 Elektrovakteorie / Electrical Trade Theory
15 Ferrometaalwals & Fat. P.T. / Ferro Metal Rol. & Sh. Th.
16 Fotografievakteorie / Photography Trade Theory
17 Gereedskapmaakersteorie / Toolmakers' Theory
18 Gieteryteorie / Foundry Theory
19 Handel / Commerce
20 Handelsrekene / Commercial Arithmetic
21 Houtmasjineerteorie / Woodmachining Theory
22 Houtwerkersteorie / Woodworkers' Theory
23 Hysvakteorie / Elevator Trade Theory
24 Industriële Oriëntering / Industrial Orientation
25 Instrumentvakteorie / Instrument Trade Th.
26 Juwelekunde / Gemmology
27 Juweliersmateriale / Jewellers' Materials
28 Juweliersteorie / Jewellers' Theory
29 Kantoortoerustingteor. / Office Equipment Theo.
30 Kleremakersteorie / Tailors' Theory
31 Klipwerkteorie / Stone-work Theory
32 Koelervakteorie / Refrigerator Trade Th.
33 Kooks & Newsprod. Pros. T. / Coke & Byprod. Proc. Th.
34 Koringmaalkegniek / Wheat Milling Tech.
35 Leervervaardiging / Leather Manufacture
36 Letterskildersteorie / Signwriters' Theory
37 Loodgieterssteorie / Plumbers' Theory
38 Messel- en Pleisterteor. / Bricklaying & Plast. Th.
39 Metaalwerkersteorie / Metalworkers' Theory
40 Metallurgiese Pros. Teo. / Metallurgical Proc. Th.
41 Meubelmakersteorie / Furniture Makers' Th.
42 Meubelontwerp / Furniture Design
43 Meubelpolysteorie / Furniture Polishing Th.
44 Patternmakers' Th. / Motorbakwerkteorie
45 Motor Bodywork Th. / Motorelektroteorie
46 Motor Elec. Th. / Motormasjineerteorie
47 Motor Machining Th. / Motorvakteorie
48 Motor Trade Theory / Oorleefingsuitrustingteo.
49 Survival Equip. Facil. Th. / Pas- en Masjineerteorie
50 Fitting & Machining Th. / Plaat- & Boutsaalwerkerst.
51 Platers & Str. Steelworkers T. / Plaatmetaalwerkersteorie
52 Sheetmetal Workers' Theory / Plaatwerk & Boutsaalteorie
53 Plating & Struct. Steel Draw. / Plantkunde (Tuinbou)
54 Botany (Horticulture) / Radioteorie
55 Radio Theory / Rekeningkunde
56 Accountancy / Rekeningkunde vir Slagters
57 Accountancy for Butchers / Rubber & Plastiekmonteerteor.
58 Rubber & Plastic Fitting Th. / Skaalpassersteorie
59 Scale Fitters' Theory / Skeepsbouteorie
60 Shipbuilding Theory / Skilder- en Versierteorie
61 Painting & Decorating Th. / Skoiseltheorie
62 Footwear Theory / Slagtersteorie
63 Butchers' Theory / Smidsteorie
64 Smithing Theory / Spoorvoertuigbouteorie
65 Railway Vehicle Build. Th. / Spoorwegsignaleringteor.
66 Railway Signalling Th. / Staalvervaardiging- & Gietwkt.
67 Steel Prod. & Cast. Theory / Stoffeer- en Bekleeteorie
68 Upholstery & Trimming Th. / Sweisterteorie
69 Welders' Theory / Takelteorie
70 Rigging Theory / Tegniese Tekene
71 Technical Drawing / Tekene, Ontwerp & Modell.
72 Drawing, Design & Modell. / Telekomvakteorie
73 Telecom Trade Theory / Terreinbeplanning
74 Landscape Planning / Timmer & Skrynwerkteor.
75 Carpentry & Joinery Th. / Toegepaste Elektronika
76 Applied Electronics / Toegepaste Wetenskap
77 Applied Science / Tuinbou (Prakties)
78 Horticulture (Pract.) / Tuinbouteorie
79 Horticulture Th. / Tuinbouwetenskap
80 Horticultural Science / Vliegtuigelektronikateor.
81 Aircraft Electronics Th. / Vliegtuigelektroteorie
82 Aircraft Electrical Th. / Vliegtuiginstrumentvakt.
83 Aircraft Instrument Tr. Th. / Vliegtuigmetaalwerkteorie
84 Aircraft Metalwork Theory / Vliegtuigonderhoudsteorie
85 Aircraft Maintenance Th. / Voertuigbouteorie
86 Vehicle Building Theory / Vormgietersteorie
87 Moulders' Theory / Wapenmonteerteorie
88 Armament Fitting Theory / Wiskunde
89 Mathematics / Yster, Staal & Fer. leg. teor.
90 Iron, Steel & Ferro Alloy P. Th. / Ystervervaardiging & Gietwkteor.
91 Iron Prod. & Casting Theory

38 Vakke nie bo genoem, waarvoor u wil inskryf:
Subjects not mentioned above, for which you wish to enter:

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APPENDIX B

ENROLLMENT AT COLLEGES FOR ADVANCED TECHNICAL EDUCATION, TECHNICAL COLLEGES AND OTHER POST-SCHOOL INSTITUTIONS OF THE DEPARTMENT OF NATIONAL EDUCATION

TABLE 4

ENROLLMENT AT COLLEGES FOR ADVANCED TECHNICAL EDUCATION, TECHNICAL COLLEGES AND OTHER POST-SCHOOL INSTITUTIONS OF THE DEPARTMENT OF NATIONAL EDUCATION

1975

	Number of Institutions	Full-time			Part-time			Occasional			Total
		M	F	T	M	F	T	M	F	T	
Colleges for Advanced Technical Education	6	13 795	3 686	17 481	15 362	3 984	19 346	12 684	12 944	25 628	62 455
Departmental Training Colleges and a College of Art	4	224	337	561	–	–	–	269	98	367	928
Technical Colleges	27	13 869	471	14 340	4 600	1 898	6 498	3 116	8 697	11 813	32 651
Technical Institutes	33	1 994	169	2 163	4 062	1 863	5 925	989	3 277	4 266	169
National Trade School for Adults	1	169	–	169	–	–	–	–	–	–	108 557
TOTAL	71	30 051	4 663	34 714	24 024	7 745	31 769	17 058	25 016	42 074	

South African Yearbook, Education, 1977, page 23.

APPENDIX C

MANPOWER AS AT 25 APRIL 1975, ARTISANS

AND APPRENTICES - PRESENT PERSONNEL

TABLE 5

SUMMARY: RESULTS OF MANPOWER SURVEY No. 11 (MANPOWER AS AT 25 APRIL 1975)

ARTISANS AND APPRENTICES (MALES ONLY)

Trades	Present Personnel							
	Artisans				Apprentices			
	Asians	Blacks	Coloureds	Whites	Asians	Blacks	Coloureds	Whites
Metal and Engineering Trades	538	473	3 398	75 324	73	72	982	13 952
Electrical Trades	136	156	253	19 922	77	316	75	7 181
Motor Trades	1 001	511	1 276	24 130	292	465	463	8 356
Building Trades	3 207	2 635	25 425	33 674	650	663	3 338	3 676
Printing Trades	513	415	1 130	6 541	20	–	401	1 457
Furniture Trades	382	396	3 634	1 483	34	3	473	127
Food Trades	321	170	652	5 265	35	97	106	186
Diamond Cutting, Jewellers' and Gold-smiths' Trades	–	–	472	994	–	–	110	226
Hairdressing and Miscellaneous Trades	68	106	586	3 662	–	–	7	293
Total Number of Artisans and Apprentices	6 166	4 862	36 826	170 995	1 181	1 616	5 955	35 454

South African Yearbook, Labour and Industrial Relations, 1977, page 17.

APPENDIX D

MANPOWER AS AT 25 APRIL 2975, ARTISANS

AND APPRENTICES - PERSONNEL VACANCIES

TABLE 6

SUMMARY: RESULTS OF MANPOWER SURVEY No. 11 (MANPOWER AS AT 25 APRIL 1975)

ARTISANS AND APPRENTICES (MALES ONLY)

Personnel Shortage/Vacancies

Trades	Artisans				Apprentices			
	Asians	Blacks	Coloureds	Whites	Asians	Blacks	Coloureds	Whites
Metal and Engineering Trades	1	46	26	3 620	2	2	4	402
Electrical Trades	6	172	7	1 261	2	5	–	59
Motor Trades	7	87	44	1 039	9	27	19	150
Building Trades	8	120	80	1 692	–	60	10	57
Printing Trades	–	–	–	93	–	–	4	9
Furniture Trades	–	–	11	20	–	–	15	9
Food Trades	–	–	–	16	–	1	6	2
Diamond Cutting, Jewellers' and Gold-smiths' Trades	–	–	–	2	–	–	–	1
Hairdressing and Miscellaneous Trades	–	–	–	173	–	–	–	14
Total Number of Artisans and Apprentices	22	425	168	7 916	13	95	58	712

South African Yearbook, Labour and Industrial Relations, 1977, page 18.