The historical development of surveying programmes in higher education in South Africa

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Abstract

Surveying education at South African universities dates back to the early 20th century. The first diploma course in the technical training of surveyors was introduced in 1958 by an institution known as the “Pretoria Technical College”. At Traditional Universities a BSc Degree followed by a MSc and PhD have been offered since the first half of the 20th century.

The promulgation of the Advanced Technical Education Act (No. 40 of 1967), provided for the conversion of six technical colleges into Colleges for Advanced Technical Education. These colleges later became known as technikons, and subsequently as universities of technology, offering a three-year diploma. This course was designed with extensive cooperation of stakeholders in the surveying industry so as to meet their requirements at the workplace.

Currently, universities of technology offer a first qualification in the form of a 3-year National Diploma in surveying, followed by a further year of study towards a B.Tech Degree, also in surveying. Some universities of technology offer further qualifications like the M.Tech and D.Tech Degrees. Traditional universities offer the BSc Degree followed by a MSc and PhD.

Universities of technology have contributed enormously through the training of technicians. Of late the B.Tech Degree offered by the same institutions has resulted in Professional Engineering Surveyors registering with the Council for Professional and Technical Surveyors (PLATO).

Traditional universities have produced land surveying graduates for more than 80 years. The various departments have contributed extensively to research publications and presentations of papers at international conferences. Many of the graduates register with PLATO as Professional Land Surveyors, who have for decades maintained the South African Cadastre.

This paper outlines the historical development of surveying education in South Africa by investigating the range of higher education qualifications that have become available over the years.

Keywords

universities, technikons, colleges, surveying, profession

Introduction

The history of surveying dates back thousands of years and forms of land surveying have been around since ancient man in all major civilisations across the globe. The first examples in the history of surveying date back to the ancient Egyptians during the building of the Great Pyramid at Giza in 2700 BC. There is evidence of the Egyptians using basic geometry to redraw boundary lines when the Nile overflowed its banks. Historical evidence shows that the Roman Empire was the first civilisation to employ an official surveyor within their Empire. They used simple tools to create straight lines and angles.

As new technology and theories have become available, the techniques and methods used in surveying have evolved. Hundreds of years ago surveyors would use all sorts of means for measuring distances – such as using chains with links that have a certain known length. Additionally land surveyors have to measure horizontal angles which in most cases was done using some form of compass.

The early education of surveyors in South Africa

Education of Surveyors in South Africa dates back to 1878 at the Diocesan College, Cape Town, and for the period 1878 to 1886, 31 students passed the course. No records exist for the period 1887 to 1889, but from 1890 to 1899 there were a further 23 passes.

An early record from St. Andrews College in Grahamstown is a photograph, taken at around 1882 showing five survey students. It is possible that there may have been some students prior to 1882, and there is evidence that mathematics was taught in 1878. In 1904 St. Andrews College became Rhodes University College and the survey class of 34 was the
The last students passed the Diploma Course at Rhodes in 1958, after being offered for 55 years. Together with St. Andrews College the period spanned 79 years.

In 1882 Stellenbosch College started offering classes in surveying, but apparently this did not result in a recognised qualification in surveying. In 1887 Stellenbosch College became Victoria College and a two-year diploma course was commenced in 1893. Victoria College became Stellenbosch University in 1918, but no further information on this course after 1920 could be found [2].

The first 4-year BSc class commenced at the University of Cape Town in 1929.

**The establishment of technical education in South Africa**

In January 1956 the first class of survey students studying towards a Diploma in Surveying started at the Pretoria Technical College. The course consisted of three semesters of theoretical training, alternating with three semesters of in-service training. An additional year of in-service training was added resulting in a four-year qualification. The first intake consisted of 13 students, and in 1959 the very first National Diplomas for Technicians in Surveying were awarded to 12 graduates [19].

From 1961 the course was offered on a part-time basis at the Cape Technical College.

The Advanced Technical Education Act (Act 40 of 1967) made provision for the transformation of six technical colleges into Colleges for Advanced Technical Education. Initially five surveying related courses were available:

1. Surveying (Civil engineering)
2. Surveying (Topography)
3. Surveying (Cadastral)
4. Cartographic draughtsperson
5. Hydrographic draughtsperson

The Colleges for Advanced Technical Education subsequently developed into technikons, where the main purpose was to meet the call for well trained technicians. The courses were designed to meet the requirements of industry, the state and local authorities. Graduates needed to be able to apply their knowledge at the workplace, and were therefore trained for a specific occupation [14].

**The Goode Committee**

In January 1974 the Minister of National Education appointed a committee under the chairmanship of Mr. R.C.J. Goode, with the brief to investigate, inter alia, the education and occupational standing of Technicians and Technologists.


Although the Goode Committee did not specifically scrutinise the position of survey technicians, many of the findings and recommendations also applied to them. At the end of 1979 a start was made with the revision of courses in surveying and cartography. Subsequently in-depth discussions on the improvement of the diploma course in surveying took place during 1980 involving the technikons, the private and public sectors.

This resulted in two qualifications, the National Diploma in Surveying and the National Diploma in Cartography. The National Diploma in Surveying consisted of three semesters of theoretical learning at the technikon, alternating with three semesters of in-service training in industry. A National Higher Diploma in Surveying, consisting of a fourth year of study, was also introduced.

During 1984 the Department of National Education approved the introduction of a National Diploma in Technology (Surveying). This diploma consisted of a research project only, without any attendance of lectures [14].

This was the situation until 1992.
Technical education from 1992

In 1988 the Committee of Technikon Principals (CTP) initiated a process to investigate the education and training of engineering technicians, so as to re-structure the then existing surveying and engineering programmes at Technikons.

The CTP appointed a curriculum committee which would be responsible for the planning and carrying out of the course development.

Firstly, an occupational profile for the survey technician was established, specifying the knowledge and skills required by industry for a survey technician who has just qualified.

The main themes for surveying were identified as surveying, engineering surveying, photogrammetry, topographical surveying, cartography and geodetic surveying. This information was presented to members of industry with the request to indicate the themes that were directly associated with their work situation, or whether such a theme would be used as background knowledge.

The process of developing curricula was as is shown in Fig. 1:

![Fig. 1: The process of developing curricula.](image)

At this stage all the themes and major subject areas have been identified in terms of learning content. However, this now had to be organised into a course structure. A profile was compiled containing the theoretical as well as the practical knowledge with which a survey technician had to become proficient. A course was designed which was consistent with those elements, and consisted of an academic component and a relevant in-service training component. The academic component included the basic sciences, technology, management and communication.

The final course for the National Diploma in Surveying was finalised to consist of three years of study, of which the first and third years would be done full-time at a technikon, and the second year would consist of prescribed in-service training with an employer or employers in industry [15].

A degree course at technikons

In 1992 the CTP accepted a policy document in which its position regarding degrees was spelled out. Permission for this had to be obtained from the Advisory Committee for Universities and technikons.
The degree would be a four-year qualification of which the first three years would be the same as for a National Diploma. The focus of the degree would be on technological learning, and it was not intended to compete with the established degrees offered by universities. The degree would be known as a B.Tech Degree [15].

The situation in 2013

In October 2003 the Minister of Education announced that the status of technikons would be changed to universities of technology [12].

Although certain minor adjustments and renewal of learning content have taken place since 1992, the course structure for the National Diploma in Surveying in 2013 is essentially still the same. A characteristic of university of technology approach to education is the close co-operation between the university and industry to ensure that curricula remain market related. Indeed, in most programmes, theoretical studies are supplemented with in-service training to ensure that graduates are equipped not only with essential knowledge but also with relevant practical experience.

Four universities of technology presently offer qualifications in surveying:

The Cape Peninsula University of Technology

- Background
The history of the university goes back to 1920 with the establishment of the then Cape Technical College. In 1962 the Peninsula Technical College was established. The two institutions had their status changed to Colleges for Advanced Technical Education in the late sixties and early seventies respectively, and were then known as the Cape and Peninsula Colleges for Advanced Technical Education.

After the promulgation of the technikons Act in 1976, these colleges could offer tertiary education in selected fields of study. During 1979 both colleges were legally established as technikons: Peninsula Technikon in Bellville and Cape Technikon in Cape Town.

The merger of the two technikons went ahead in January 2005 [12].

- Courses in geomatics
The university offers the National Diploma in Surveying, as well as Bachelors, Masters and Doctoral degrees in Technology: Surveying. It has also introduced a National Diploma in Geographic Information Systems (GIS)

The Durban University of Technology

- Background
The Durban University of Technology was established in 2002, the result of a merger between two much older institutions: the M L Sultan College – later the M L Sultan Technikon – which to begin with had operated exclusively for the substantial Indian population in and around Durban; and the equally racially defined Natal Technical College – later the Natal Technikon – for white students. Both have their roots in the early years of the 20th century.

The merged Durban University of Technology operates on five different campuses in Durban, and two in Pietermaritzburg, offering tuition through its six faculties of Accounting and Informatics; Applied Sciences; Arts and Design; Engineering and the Built Environment; Health Sciences; and Management Sciences [12].

- Courses in surveying
The university offers the National Diploma in Surveying, as well as Bachelors, Masters and Doctoral degrees in Technology: Surveying.

The Tshwane University of Technology

- Background
This institution was established in January 2004 through the merger of three former technikons: Technikon Northern Gauteng, Technikon North-West and Technikon Pretoria. Accordingly, the Tshwane University of Technology has campuses in the most northerly four of South Africa’s nine provinces. In Limpopo, the campus is situated in the
provincial capital Polokwane. In Mpumalanga, there’s a campus in Nelspruit and another in eMalahleni (previously Witbank); and in North-West a campus serves the sprawling peri-urban area called Ga-Rankuwa. Two campuses provide technical education to the northern parts of the densely populated Gauteng province, both in the Tshwane Metro, one in Soshanguve and the other, the main campus, in Pretoria.

Seven faculties – Engineering and the Built Environment; Science; Humanities; Management Sciences; Information and Communication Technology; Arts; and Economics and Finance – provide ample choice for students interested in career-focused tertiary education [12].

- Courses in surveying

The university offers the National Diploma in Surveying, as well as Bachelors, Masters and Doctoral degrees in Technology: Surveying.

**The Mangosuthu University of Technology**

- Background

This university has its origins in the semi-independent homeland of KwaZulu. The then Chief Minister, Mangosuthu Buthelezi, wanted to establish a higher education institution close to Durban to provide young people from disadvantaged backgrounds with the opportunity to further their education beyond secondary school level. In 1979, supported by an Anglo American Chairman’s Fund grant, the institution came into being as a technikon with an initial enrolment of 15 students. Today, 30 years later, more than 10 000 students are studying at the university, which is based in the Umlazi Township some 25 km south of the centre of Durban.

Academic activity is divided between three faculties: Engineering and the Built Environment; Natural Sciences; and Management Sciences. The university has also established a language centre to improve students’ competencies in English and communication, both verbal and written.

Community outreach is also a priority. Since its inception in the early 1990s, the university’s Department of Community Outreach has done important work in bridging the gap between formal and non-formal education – particularly for disadvantaged groups. The department trains youth workers in a variety of fields, including community research techniques [12].

- Courses in surveying

The university offers the National Diploma in Surveying and is well known for its Pre-tech Bridging programme in Engineering.

**Traditional university education**

The role of the traditional university is to anticipate the future and the needs of society of the future and to train its undergraduates with an eye on the demands which may be made on them in the future. It is also the responsibility of the university to give the undergraduate as broad a base as possible in his/her undergraduate course. This is fundamental to the whole philosophy of education. The traditional universities in South Africa which offer degrees in surveying have adhered to this principle and have resisted the temptation to train surveyors for one branch of surveying only to the exclusion of all other branches. The university also has a responsibility towards its graduates and to the society in which it operates that if the demand in that society is for expertise in a particular branch of surveying then emphasis must be given to that branch but not to the exclusion of all else [8].

Programmes in surveying at all traditional universities include the BSc, MSc and PhD degrees.

**The University of Cape Town**

- Background

The oldest university in South Africa, UCT was founded in 1829 as the South African College – a school for boys that also provided some tertiary education. Women were admitted to the college after 1887. UCT was formally established as a university in 1918.

The university moved to its spectacular Groote Schuur campus on Rhodes’ Estate on the slopes of Devil’s Peak in 1928. This campus is still home to most of UCT’s academic functions.
Additional campuses are in Observatory (home to the Faculty of Health Sciences), Gardens (the Hiddingh Campus for fine art and drama studies) and the Waterfront (the Graduate School of Business) [12].

- **Courses in surveying**

UCT was given independence by an act on parliament in 1918, and the first 4-year BSc degree in surveying commenced at the university in 1929. The School of Architecture and the Department of Urban and Regional Planning amalgamated to form the School of Architecture and Planning in 1985. In mid-2002 the Department of Geomatics came into the fold, and the new School of Architecture, Planning and Geomatics was formed in the Faculty of Engineering & the Built Environment [16]. Qualifications other than surveying include postgraduate courses in Geographic Information Systems (GIS) [1].

**The University of KwaZulu-Natal**

- **Background**

The 2004 merger that created this university brought together two major higher education institutions that had operated throughout the apartheid era on the Natal coast.

The older of the two original universities, the University of Natal, was founded in Pietermaritzburg in 1910 as the Natal University College. After World War I, a campus was established in Durban. Further additions followed: a Faculty of Agriculture in Pietermaritzburg in 1946; and a Medical School (for Africans, Indians and coloureds only) in Durban in 1947. The Natal University College was granted independent university status in 1949.

The other institution, ultimately known as the University of Durban-Westville, was essentially an apartheid institution, reserved for the use of Indian students only. It began as a University College on Salisbury Island in Durban Bay in the early 1960s. Student numbers grew rapidly and in 1971 full university status was granted, and the following year the new university moved into its modern Westville campus [12].

The merged University of KwaZulu-Natal has four colleges: Agriculture, Engineering and Science; Humanities; Law and Management Studies; and Health Sciences [18].

- **Courses in surveying**

In 1947 Harry Biesheuvel (later to become Professor Harry Biesheuvel) was appointed Senior Lecturer in Land Surveying and given the formidable task of establishing a Department of Land Surveying [11].

The department was established in 1948 and in addition to the full range of qualifications in Surveying, also awarded Diplomas in Town Planning and Photogrammetry [7]. The Department also offered a coursework Master's programme in Land Management, leading to an MSc in Land Surveying.

**The University of the Witwatersrand**

- **Background**

The origins of Wits lie in the South African School of Mines, which was established in Kimberley in 1896 and transferred to Johannesburg as the Transvaal Technical Institute in 1904, becoming the Transvaal University College in 1906 and renamed the South African School of Mines and Technology four years later. Other departments were added as Johannesburg grew and in 1920 the name was changed to the University College, Johannesburg. Full university status was granted in 1922, incorporating the College as the University of the Witwatersrand, with effect March 1st.

In 1923, the university gradually vacated its premises in Eloff Street to move to the first completed teaching buildings at Milner Park. Today, with five faculties (Commerce, Law & Management; Engineering & the Built Environment; Health Science; Humanities; Science) and 33 schools, Wits offers its students approximately 3000 courses [12].

- **Courses in surveying**

The first students doing the BSc Degree in Land Surveying at the University of the Witwatersrand registered in 1929 [10].

There were three surveying graduates in 1989, one who followed the land surveying option and two who followed the mine surveying option. The degree in Land Surveying was then discontinued and what remained of the department had been merged with the Department of Mining Engineering [4].
The University of Fort Hare

- **Background**

Fort Hare came into existence in 1916 and is the oldest historically black university in South Africa. Throughout its existence, Fort Hare produced graduates from as far north as Kenya, Uganda and Nigeria.

The university has four faculties: Humanities and Social Sciences; Management and Commerce; Education; and Law. It also houses an Institute of Social and Economic Research and a Leadership Institute financed by a locally based private-sector company [12].

- **Courses in surveying**

Ministerial approval for the establishment of a Department of Land Surveying at the University of Fort Hare was acquired at the beginning of 1966. A senior lecturer was appointed as Head of the Department in February 1966, with the responsibility of establishing a University course in Land Surveying [5].

The University of South Africa (UNISA) was approached with a view to its acting as an examining body for a four year BSc Land Surveying degree within the Faculty of Science on similar lines to those existing at other universities in South Africa at the time. A committee was subsequently nominated by UNISA to design a suitable course and to draw up syllabi. In 1969 the first students registered for the course [5].

During the mid-1980s the department closed.

The University of Pretoria

- **Background**

The University of Pretoria has its origins in the establishment of the Pretoria Centre of the Transvaal University College in 1908. The college opened its doors as an English language institution housed in Kya Rosa, a four-bedroom residential property in the centre of Pretoria. TUC started off with four professors and three lecturers and 32 enrolled students. Courses were presented in Dutch and other Modern Languages, English Language and Literature, Classics (which included Philosophy, Latin and Hebrew), as well as Natural Sciences.

On 10 October 1930, an act of Parliament – championed by General Jan Smuts – gave rise to the name TUC becoming the University of Pretoria. At the time the university had more than 900 students, making it the largest tertiary institution in the country at the time [17].

Today, the academic activity of this large institution (an Act of parliament changed its name to the University of Pretoria in 1930) is divided into the following faculties: Economic and Management Sciences; Education; Engineering, Built Environment and Information Technology; Health Sciences; Humanities; Law; Natural and Agricultural Sciences; Theology; Veterinary Science; and to this list must be added the university’s postgraduate Gordon Institute of Business Science [12].

- **Courses in surveying**

In 1989 the Committee of University Principals (CUP) concluded that the existence in South Africa of three university departments of surveying and mapping exceeded the needs of the survey profession. In 1995 the closure of the department was announced [6].

The present situation

University of Technology education has contributed extensively to the development process of the country.

In the field of surveying, which requires technicians to collect and analyse field data for effective decision making, the universities of technology have contributed enormously through the training of technicians. Of late the B. Tech Degree offered by the same institutions has resulted in Professional Engineering Surveyors of the highest quality registering with the Council for Professional and Technical Surveyors (PLATO).

Traditional universities have produced land surveying graduates for more than 80 years. The courses offered and that are still being offered compare with the best in the world, and the various departments have contributed extensively to research publications and presentations of papers at international conferences. Many of the graduates register with
PLATO as Professional Land Surveyors, who have for decades maintained the South African Cadastre, which is an official record of the location and boundaries of land.

References


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