

The Structure of Academic Surveying Programs in Nigeria as an Educational Pathway to Land Surveyor Registration

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Abstract

Nigeria as a nation is experiencing a shortage of qualified personnel within the surveying profession. This leads to the disorderliness of land administration in the country today. Hence, there is a need to cushion this problem by providing sufficient qualified personnel and entrants to the profession with appropriate training and education to meet the required professional certification to practice the surveying profession. The purpose of the study is to evaluate the procedure of the academic and the professional pathway of Land surveying and Geoinformatics program and registration. A qualitative research approach was adopted for the study using content analysis. The current structures of the academic programs and the registration and certification process for land surveying practices in Nigeria was reviewed. The content of the paper will guide new entrance into tertiary institutions in career selection and preparation, and undergraduate in procedure to professionalism. Also, education policy maker's and professionals' in the practice of Surveying and Geoinformatics in Nigeria context will be able to inject new innovation in the academic curriculum and the requirements for surveyor's registration.

Keywords: academic, geoinformatics, land surveying, land administration, surveying profession, surveying registration

INTRODUCTION

Surveying is one of the oldest professions known to human. Surveying history goes as far as 1400 BC in ancient Egypt and Babylon during the construction of the great pyramid of Khufu BC in Giza around year 2700 BC. But the surveying profession in recent times is facing hard time in some of the developed and developing countries due to the low level of personnel practicing it. Surveying as a profession according to Webster's Dictionary is "the science of determining the location, form or boundaries of a track of land by measuring the lines and angles in accordance with the principles of geometry and trigonometry". While, a Surveyor is defined by FIG [2004] as "a professional person with the academic qualification and technical expertise to practice the science of measurement, to assemble and assess land and geographic related information, to use that information for the purpose of planning and implementing the efficient administration of the land, the sea and structures thereon, and to instigate the advancement and development of such practices" [NIS, 1997].

In Nigeria, surveying is not as popular among students seeking admission into the universities or Polytechnic as compared to other professional courses such as civil engineering, electrical/electronics engineering, and so on. As referred to in the study of [Simmons, n.d] this as lead to shortage of professional in surveying practice in Australia.

Simmons attests that in order to increase the number of professional in surveying there is a great need to increase the number of graduates with appropriate qualifications requires in academic programmes. Simmons also believed that technological advancement is not just the challenges facing the surveying profession, but also a national dearth of skilled and qualified personnel in the surveying and spatial science professions. He lamented that low numbers of enrolments into surveying programs have affected the viability of those programs.

The formal and informal training of surveying personnel in Nigeria is within the institutions and the workplace. The institutions were majorly responsible for the training of technicians, technologists and full professionals. The full professional training supposed to be focused toward the country need to meet up with the rate of urbanization. Hence, the surveyors are seen to have a paramount function to play with regards to the socioeconomic development of the country. But, in the view of the shortage of surveying graduates and decline in numbers of registered surveyors, the profession will not be able to meet up with its responsibility and competence in service delivery in the built environment [Blanchfield, 2005]. The shortage of land surveyor in the country, if not addressed may culminate into boundaries disorderliness, land litigations, inter-tribal conflict to mention but a few. Based on this, there is a need to research into the structure of the academic

program and the educational pathway to land surveyor registration. In order, to facilitate the enrolment of new student's entrance into the program in tertiary institution's, and encourage professional upgrading among graduates'.

Competency of a Graduate Surveyor and Academic Program Development

It is paramount, for all government recognised institutions of higher learning in Nigeria, to seek accreditation for a program based upon a defined professional and technical core competencies expected of a graduate to attain after completion of a program. The academic curriculum pilot the fundamental development required that is monitored by the government regulating body. The Nigeria Universities Commission (NUC) is in charge of accreditation of programs for universities while the National Board for Technical Education (NBTE) is in charge of the polytechnic / monotechnic and technical colleges. The philosophy of the programme is to produce graduates that are equipped both on theory and practical of surveying and geo-informatics that can face the various challenges in the practice of the profession and in the socioeconomic development of the nation. On completion of the program, the graduate is expected to be equipped in the following core areas [NBTE, 2009]:

1. Land Surveying including Cadastral Surveying, Engineering Surveying, Topographic Surveying and digital mapping techniques.
2. Geodesy including Geometric Geodesy, Physical Geodesy, Satellite Geodesy and Geodetic Astronomy
3. Photogrammetry and remote sensing
4. Hydrographic / Marine/ Coastal Surveying
5. Geographic Information System (GIS) / Land Information System (LIS)
6. Engineering / Exploration
7. Cartography

The curriculum for the B. Tech Degree Programme in Surveying and Geo-informatics consists of the following components:

1. General Studies
2. Foundational Courses
3. Professional Courses
4. Electives Courses
5. Supervised Industrial Work Experience Scheme (SIWES)
6. Survey Camping

The general studies component includes courses in entrepreneurship, social and environmental studies. While the foundation courses include mathematics, physics, computer Science and statistics. Furthermore, the elective courses are courses from humanities such as, principles of psychology, elements of sociology, introduction to political science and principles of economics and accounting,

while the technical courses include: digital terrain modelling and evaluation, institutional and policy issues in geo-information technology and web cartography, principle of geology, introduction to geophysics, transportation planning and management. While the professional courses give the student the theory and practical skills needed to practice surveying and geo-informatics at the professional level.

MATERIAL AND METHODS

The study is a review of the educational pathway to land surveyor registration in Nigeria. A narrative approach was adopted. Pervious literatures were reviewed. Content analysis of the necessary documents that stipulate the educational and professional specification to run surveying and geoinformatics program in institutions of higher learning and the professional registration requirements were carried out. The documents analysed were: the National Board for Technical Education (NBTE), the 2013 Unified Tertiary Matriculation Examination Brochure, the Surveyors Council of Nigeria (SURCON) and the Nigerian Institute of Surveyors (NIS) booklets.

Educational Pathways for Surveyor Registration Requirements

A model of educational structure comprising the technical education, two years National Diploma and two years Higher National Diploma (ND / HND), four or five year bachelor degrees leading to professional and para-professional registration is shown in Figure 1.

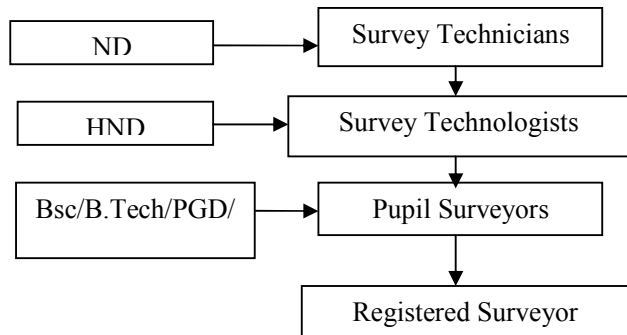


Figure 1: Model of educational pathway to Land Surveyor Registration in Nigeria.

The main purpose of the Surveyor Registration Board in Nigeria named Surveyors Council of Nigeria (SURCON) is to regulate the activities of practicing surveyors, their registration or licensing, and the accreditation of program in institutions of learning running such program. The registration of surveyors generally includes, the pre-qualification and assessment of applicants prior to full registration/licensing of successful applicant's. The Surveyor Registration Board in Nigeria has a

qualification and assessment parameters that includes;

1. Academic qualification;
2. Period of satisfactory training and/ or relevant experience;
3. An examination or project assessment; and/or
4. Interview

From the above, the major assessment parameter used is the academic qualification. This determines the level or cadre in which an applicant's will join the Surveyors Council of Nigeria (SURCON), and later the Nigerian Institution of Surveyors (NIS). The academic qualification for each cadre varies, these determine the various examinations the applicant's will undertake. The educational structure in Nigeria varies based on the program undertaken by the institutions whether in the technical colleges, polytechnics/monotechnic and the universities.

The Polytechnic Educational Pathway

The Polytechnic certified and awarded program in a National Diploma (ND) and Higher National Diploma (HND) Surveying and Geo-informatics. The entry requirements for an applicant for the National Diploma program is SSCE or its equivalents with credit passes in mathematics and physics and any other two subjects from the following statistics, further mathematics, chemistry, technical drawing,

basic surveying, geography, economics, biology, agricultural science and at least a pass in English language at not more than two sitting. But in recent times, some polytechnic compulsory a credit pass in relevant subjects and five credits pass in relevant subjects. The UTME [2013] outline mathematics and physics and any other three subjects from the following subjects: Further mathematics, chemistry, technical drawing/fine art, geography, economics/commerce, biology/agriculture science, english language, basic electricity and least a credit pass in english language is compulsory for entrance to the National Diploma (ND) program.

In Nigeria, there are seventy-nine Polytechnics, these comprises of twenty-two Federal Polytechnics, Thirty-nine State Polytechnics and eighteen Private Polytechnics. Also, there are twenty-one Federal Monotechnics, sixteen State Monotechnics and one Private Monotechnic, a total of thirty-eight Monotechnics in all. The Polytechnics that runs the program of Surveying and Geoinformatic in Nigeria are listed in Table 1. Table 1, shows that sixteen Federal Polytechnics, nine State Polytechnics and two Federal Monotechnics are undertaken the program. All the Polytechnics run the ND program, but few of them are accredited to run the HND program.

Table 1. List of Polytechnics that run Surveying and Geoinformatic

s/n	Abbreviation	Names of Polytechnics
Federal Polytechnics		
1	ARMY	Nigeria Army School Military Engineering, Makurdi
2	AUCHIPOLY	Auchi Polytechnic, Auchi, Edo State
3	FEDPO-ADO	Federal Polytechnic, Ado-Ekiti, Ekiti State
4	FEDPO-BAU	Federal Polytechnic, Bauchi, Bauchi State
5	FEDPO-BID	Federal Polytechnic, Bida, Niger State
6	FEDPO-DAM	Federal Polytechnic, Damaturu, Yobe State
7	FEDPO-EDE	Federal Polytechnic, Ede, Osun State
8	FEDPO-IDA	Federal Polytechnic, Ida, Idah, Kogi State
9	FEDPO-ILA	Federal Polytechnic, Ilaro, Ogun State
10	FEDPOMUB	Federal Polytechnic, Mubi, Adamawa State
11	FEDPO-NEK	Federal Polytechnic, Nekede, Owerri, Imo State
12	FEDPO-OKO	Federal Polytechnic, Oko, Anambra
13	YABATECH	Yaba College of Technology, Lagos State
14	KAD-POLY	Kaduna Polytechnic, Kaduna State
15	WUFPOBK	Waziri Umaru Federal Polytechnic Birnin, Kebbi State
16	NASME	Nigeria Army School of Military Engineering
State Polytechnics		
17	GIWA-POLY	Rufus Giwa Polytechnic, Owo, Ondo State
18	IBD-POLY	The Polytechnic, Ibadan, Oyo State
19	KOGI-POLY	Kogi State Polytechnic, Lokoja, Kogi State
20	KWAPOLY	Kwara State Polytechnic, Ilorin, Kwara State
21	OSUNTECH	Osun State College of Technology, Esa-Oke Osun State
22	RAMAT-POLY	Ramat Polytechnic, Maiduguri, Borno State
23	RIV-POLY	River State Polytechnic, Bori, Rivers State
24	BENPOLY	Benue State Polytechnic, Ugbokolo, Otukpo
25	ABIAPOLY	Abia State Polytechnic, Aba, Abia State
Federal Monotechnics		
26	FCLRT-KURU	Federal College of Land Resources Technology, Kuru, Jos
27	FSS-OYO	Federal School of Surveying, Oyo State

Source: 2013 Unified Tertiary Matriculation Examination Brochure

The polytechnic courses run for four semesters of ND program, and four semesters of HND program. Each Program duration is two years, while each year is made up to two semesters. The courses offered in

both the ND and HND program in the polytechnics are listed in Table 2 and 3.

Table 2: Curriculum for National Diploma in Surveying and Geoinformatics

s/n	Courses	s/n	Courses
1	Basic Principles in Surveying 1& 11	16	Control Surveys
2	Introduction to Photogrammetry&Remote Sensing 1&11	17	Elements of Geo-informatics
3	Basic Principles in Cartography 1&11	18	Database Creation & Use
4	Introduction to Statistics	19	Optics, Waves, Electricity & Magnetism
5	Logic & Linear Algebra	20	Calculus
6	Mechanic & Properties of Matter & Heat	21	Introduction to Sociology
7	Use of English 1	22	Engineering Surveying 1
8	Introduction to Computer	23	Topographical Surveying 1
9	Citizenship Education 1 &11	24	Trigonometry & Analytical Geometry
10	Cadastral Surveying 1,11 & 111	25	Final Project
11	Computer Application 1		
12	Algebra & Elementary Trigonometry		
13	Communication in English 1		
14	Field Astronomy 1 & 11		
15	Surveying Instrument 1		

Source: Fajemirokun and Badejo 2004

After the two semesters in the first year of ND the student's proceed with a four month supervised industrial work experience scheme (SIWES) program and later return for the second year of the ND

program. The completion of the ND program will be preceded by a one year industrial attachment in a recognised organisation relating to the field of specialization of the student.

Table 3: Curriculum for Higher National Diploma in Surveying and Geoinformatics

s/n	Courses	s/n	Courses
1	Advanced Computer Programming	15	Professional Practice
2	Computer Aided Surveying	16	Surveying & Allied Regulations
3	Satellite Geodesy	17	Digital Terrain Modelling
4	Principles of GIS	18	GIS Application
5	Remote Sensing	19	GIS Project Planning & Management
6	Advanced Analytical & Digital Photogrammetry	20	Seminar
7	Advance Hydrograhic Surveying	21	Final Project
8	Advanced Mathematics		
9	Advanced Map Projection & Coordinate System		
10	Geometric Geodesy		
11	Physical Adjustment Computation		
12	Database Design & Creation		
13	GIS Hardware & Software		
14	Advance Digital Mapping		

Source: Fajemirokun and Badejo 2004

The University Educational Pathway

The university certified and awarded bachelor of science and bachelor of Technology degree in Land Surveying or Surveying and Geo-informatics. The entry requirement for an applicant is to write the Unified Tertiary Matriculation Examination (UTME) and attain five SSCE credit passes in English language, mathematics, physics, chemistry and any of fine art, geography or wood work, biology, economics, technical drawing, further mathematics, introduction to building construction, bricklaying/block laying, concreting, wall, floors and ceiling finishing, joinery, carpentry, decorative painting, lining, sign and design, wall hanging, colour mixing/matching and glazing, ceramics, graphics design,

graphic printing, basic electricity. Most of the universities run the surveying program between four to five years.

There are ninety-seven universities in Nigeria, which is comprised of sixteen Federal Universities, three Federal Universities of Agriculture, six Federal Universities of Technology, twenty State University, six State University of Technology, and thirty-eight Private Univeristies. The universities that run the program are stated in Table 4. Six Federal Universities, and four for each of Federal and State Universities of Technology, and three Private Universities offer the program.

Table 4: List of Universities offering Surveying and Geoinformatic

S/N	Abbreviation	Names of Universities
		Federal Universities
1	UNN	University of Nigeria, Nsukka
2	LAGOS	University of Lagos, Lagos
3	UYO	University of Uyo, Uyo
4	UNIZIK	Nnamdi Azikiwe University
5	ABU	Ahmadu Bello University, Zaria
6	OAU	Obafemi Awolowo University, Ile-Ife, Osun State
		Federal University of Technology
7	MINNA	Federal University of Technology, Minna
8	BAUCHI	Abubakar Tafawa Balewa, University, Bauchi
9	YOLA	Federal University of Technology, Yola
10	FUTA	Federal University of Technology, Akure, Ondo State
		State Universities /of Technology
11	UNIOSUN	Osun State University, Osogbo, Osun State
12	ESUTECH	Enugu State University of Science and Technology, Enugu
13	EVAN	Evan Enwerem University, Owerri, Imo State
14	RSUST	River State University of Science and Technology
		Private Universities
15	COVENANT T	Covenant University, Canaanland Ota, Ogun State
16	TANSIAN	Tansain University, Anambra State
17	BELLS	Bells University of Technology, Ota, Ogun State

Source: 2013 Unified Tertiary Matriculation Examination Brochure

The graduation requirements for the universities using the university of Lagos, Akoka as a model example, as stated in [Fajemirokun & Badejo, 2004].

1. University Requirements General Studies (GST, GAS)	12 units
2. Faculty Requirement	54 units
3. Departmental Requirement	126 units
Total	192 units

Courses

The courses, as well as their units (in brackets) are given below according to the levels.

The Pathway to Surveyor Registration

As shown in Figure 1, a graduate of a polytechnic with a National Diploma (ND) in surveying and geoinformatic will join the Surveyor Council of Nigeria (SURCON) as a survey technician, and those with a Higher National Diploma (HND) as surveyor technologist. Graduate with a Bachelor degree (BSc / B. Tech) from universities or with a full professional diploma and postgraduate diploma joins the Surveyors Council of Nigeria as pupil surveyor. Graduate in the survey technician level is generally rare. But many graduates are at the survey technologist cadre due to the number of polytechnic running the program. They have to satisfy the technologist examination requirement for them to

transfer to the pupil surveyor level. The technologist examination courses includes:

1. Land Survey/GIS
2. Mathematics
3. Geodesy/ Geodetic Survey
4. Hydrography
5. Photogrammetry/ Remote Sensing

From the pupil surveyor cadre to the point of registration as a registered surveyor takes a minimum of two year pupilage in a surveyor firm practicing. The candidate's at this level has to undertake an examination. The examination courses comprise:

1. Survey laws, Survey Regulation and Professional Practice
2. Professional Essay
3. Project Defence /Interview

The candidate will thereafter be a registered surveyor when he/she has satisfied all the above requirement [SURCON, 2004]. The Nigerian Institution of Surveyors (NIS) is another controlling body of the practice in Nigeria. A graduate at the level of pupil surveyor can register with NIS as an Associate Member (ANIS). Two years after a candidate has been certified as a registered surveyor by SURCON, the person becomes a Member of the Nigerian Institution of Surveyors (MNIS). Further, after ten years of commitment and participation as MNIS a person can apply for Fellow of the Nigerian Institution of Surveyors (FNIS).

CONCLUSION

The academic structure and the pathway to land surveyor registration in Nigeria have been reviewed in the study. The educational pathway to professional registration differs slightly across international boundaries. In Nigeria, the development of education curriculum has been reviewed periodically to produce professional that can meet the challenges of the 21st century. This action is in accordance to the development in academic platform of the developed economics. The dichotomy issues between the Polytechnic and the University graduate pose a threat to the development of professionalism in Nigeria. It is paramount for government to redefine and create a balance between the two educational establishments. This will allow for easy transit from one cadre to another by the applicant's and encourage professionalism and hence, enhance national economic growth. It's also necessary to research further, to identify various factors that affect land surveyor performance in practice and as an undergraduate.

Table 5: Courses offered in a Surveying and Geoinformatics Department in a University

Year1- 100 Level			
1 st Semester Courses	Units	2 nd Semester Courses	Units
History of Surveying	1	Basic Surveying	1
Pure Mathematics 1	3	Pure Mathematics	2
Applied Mathematics	3	Applied Mathematics	2
Workshop Practice 1	1	Workshop Practice 11	1
Technical Drawing 1	2	Introductory Physics 11	3
Introductory Physics 1	3	Technical Drawing 11	2
Nigerian People & Culture	2	Lab (Physics)	2
Logic & Philosophy	2	History & Philosophy of Science	2
Use of English	1	Use of English 11	2
Year 2- 200 Level			
Basic Surveying 11	3	Engineering Surveying	3
Cartography	3	Introduction Engineering Stat. & Comp.Sys.	3
Engineering Mathematics	3	Introduction to astrophysics	2
Fund.of Electrical Engineering 1	3	Photogrammetry	3
Classical mechanics	2	General African Studies	2
Practical Physics 1	1	Remote Sensing 1	3
Geophysics 1	2	Computer Application in Surveying 1	2
General African Studies	2		
Optics			
Year 3- 300 Level			
Cadastral Surveying	3	Geodetic Surveying	3
Spherical & Field Astronomy	3	Cadastral Surveying	3
Applied Town Planning	2	Geodetic Astronomy	3
Adjustment Comp.	3	Principle of GPS Surveying	3
Hydrographic Surveying 1	3	Computer Appl. In Surveying 11	3
Principles of Geoinformation Sys 1	3	Principle of Geoinformation Sys 11	2
Classical Mechanics 11	2	Digital Mapping 1	2
Elective		Industrial Training	4
Intro. To Swimming 1	1		
Year IV- 400 Level			
Map Projection	3	Industrial Attachment	8
Photogrammetry & Remote Sensing 1	3		
Digital Mapping 11	2		
Engineering Statistics	2		
Numerical Methods in Engineering	3		
Tech. Communication	1		
Plus 5 units of Elective below			
Mining & Underground Survey	3		
Potential Theory & Spherical Harmonics	2		
Special Surveys	3		
Year V- 500 Level			
Adjustment Comp. 11	3	Adjustment Computation 111	3
Survey Laws & Regulations	2	Professional practice & Ethics	3
Engineering Economics	2	Project	3
Project	3	Engineering Law & Management	2
Plus 7 units of electives below:		Plus 9 units of Electives below:	
Special Studies in		Physical Geodesy	3
Digital Remote Sensing	3	Hydrographic Surveying 11	3
Geometric Geodesy	3	Marine Surveying	2
Photogrammetry & Remote Sensing 11	3	Ground Water Hydrology	2
Introduction to Coastal Mapping and Management	2	Special Studies in Analytical & Digital	3
		Photogrammetry	
GIS Tools & Application	3	Satellite Geodesy	3
Surface Water Hydraulics	2	Applied Geophysics	2
Mathematical Geodesy	2	Close- Range Photogrammetry	3

Source: Fajemirokun and Badejo 2004

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