

The Trend of Engineering Education in Nigerian Tertiary Institutions of Learning towards Achieving Technological Development.

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Abstract

The quality of engineering graduates from universities and polytechnics in Nigeria has been the major concern by the industries over the years. The current trend in engineering education in Nigeria has created a disparity between the quality of training received by the graduates vis-à-vis the employers expectations in the businesses and industries in the country despite its enormous resources. This paper looked at the current trend of engineering education in terms of curriculum, teachers, students, funding, facilities, industrial collaboration as well as teaching methods with the view of suggesting the way forward.

Keywords: Engineering Education, curriculum, teaching

1.1 Introduction:

The origin of engineering education can be traced from two different distinct roots. First is the trade apprenticeship education where the trainees of the local trade program studied to advance their practical and theoretical knowledge of their various trades. The second root can be traced through the college or university that recognizes natural science which serves as a key point for specialization to an application in engineering (Booth, 2004). Late George King (InMaillardet, 2004) described engineering as 'a three legged stool' that relies on science, mathematics and techné. He referred the word techné as the creative abilities that distinguish an engineer from scientist; to design, to make, to conceive and to actually bring to fruition. It is important to recognize that engineering is more than to simply understands the rudiments of science; it is basically a vocational subject which depends on the sound understanding of scientific principles as well as appropriate mathematics facility, the modeling language and vital communication. In an effort to keep America's knowledge and technology driven economy, it categorizes engineering education as an important national resource. The current technological innovations in the world came as a result of the trained personnel in the field of engineering and technology (Adegbuyi and Uhomoibhi, 2008). The future of any nation does not only depend on its enormous natural resources possessed but the specialized engineering skills, competence and the ability of its populace to harness and utilize the resources. Engineering is the bedrock to economic, social and technological development of any nation because of its connection to all aspect of human activity (Kofoworola, 2003).

The quality of engineering graduates from universities and polytechnics in Nigeria has been the major concern by the industries over the years. The industries mostly complaint of inadequate skills required especially in the current cutting edge technology, having low practical know-how and lack of confidence. Going by the quality of training acquired by the graduates of tertiary institutions in Nigeria in the area of engineering education, most of them are engaged into several re-training by the industries in order to build their skills for the fact that they are considered to be un-employed at the first intake level. The technological and industrial development of any nation depends on its ability to develop its citizens towards human resources especially in the area of science and engineering. Due to poor infrastructural facilities bedeviling Nigerian tertiary institutions, coupled with the number of graduates from different institutions of higher learning that failed to transform the economic fortune of the country towards industrialization, the nation is far from experiencing technological advancements and economic growth (Olorunfemi and Ashaolu, 2008). Ajimotokan et.al (2010) attributed the obstacle to national development and growth to lack of viable engineering education and training. The condition in Nigeria can be described as poor due to inability of our leaders to make provisions that are necessary for national development since after the independence, according to Dike (2005), valuable changes that could bring positive changes in terms of improving the living standards of the citizens, brings about employment opportunity, poverty reduction and many other things are the quest for national development.

1.2 Overview of Nigeria and its Economy

Nigeria is the most populous Black nation in the World and it is a single largest entity in West Africa with the population of over 140 million people based on the 2006 census. It has occupied about 923,768 square kilometers and is a member of common wealth countries and also a member of the Organization of Petroleum Exporting Countries (OPEC). The country exports over 2.5 million barrel of crude oil per day which becomes the dominant economy of the nation and provides about 90% of its foreign exchange earnings. The manufacturing aspect of the economy was at its peak after the independence in 1960 with lots of industries for the manufacturing of goods and services which contributed up to about 3.9% to 10% of GDP from 1960 to 1981 and since then, the country has been witnessing a very low declination by dropping to about 2.57% in 2006 due to lack of electricity, water and other ingredients of services (Chinedu et-al, 2010 and CIA World fact book, 2012). Therefore it is imperative for the policy makers in Nigeria to have a re-think of the demographic nature of the country coupled with the population explosion so as plan ahead for a better future by providing a sound education and industrial labor force (Adetona, 2010).

1.3 Higher Education Regulatory Bodies

The regulatory bodies in charge of educational sectors at tertiary levels in Nigeria constitute the National Universities Commission (NUC), the National Board for Technical Education (NBTE) and the National Commission for Colleges of Education (NCCE). These are the main organs of the Federal Ministry of Education that ensures the proper management of the entire universities, Polytechnics, monotchnics as well as Colleges of Education. The bodies are responsible for planning, organizing, managing, funding, monitoring and supervision of activities and

development of the tertiary institutions in the country in order to ensure an effective and efficient control of higher education in the nation (Fagbulu et al, 2005).

Summary of 2009/2010 Accreditation Results

Year of Accreditation	No. of Programs	Accreditation Status		
		Full	Interim	Denied
July/August, 2009 (Affiliated Institutions)	185	37(20%)	37(76.2%)	7(3.8%)
December, 2009	117	59(50.4%)	45(38.5%)	12(10%)
June, 2010	408	174(42.2%)	202(49.8%)	32(7.8%)

Source: National Universities Commission, 2010.

From the accreditation exercise conducted in 2009 to 2010, a total of forty-eight engineering programs were accredited with 30(62.5%) having full accreditation, 17(35.4%) got interim accreditation and 1(2%) was denied accreditation. This clearly portrays the quality of engineering education in Nigeria having looking at the statistics with 35.4% of the programs having interim status and 1(2%) denied, this signifies that there are a lot of efforts that need to be done by the universities based on the criteria used for the exercise.

1.4 Challenges of Engineering Education in Nigeria

The Nigerian tertiary institutions are faced with enormous challenges in terms of general conduct of engineering education programs which failed to equip students with the necessary skills to cope with the challenges of world of work and the modern day society. The challenges faced are discussed as follows:

1.4.1 Engineering Education Curriculum

The effectiveness of a program starts with effective and adequate curriculum design that will guide and equip the students with the skills needed in their respective areas of specialization. The curriculum of engineering education is described as obsolete and needs to be thoroughly reviewed from time to time by the body concerned in order to meet with the world standard and allow Nigerian graduate to compete globally. The curriculum should be able to create space to accommodate certain aspects of engineering applications that are prevalent in our environment today. The high level of re-training of graduates of engineering education by the industries signals the evidence of the curriculum inadequacies. Therefore, for engineering education to

fully support economic growth, there should be provisions for the change of tools that is used in solving the problem as the problem is equally changing from time to time. This implies that engineering education curriculum should be flexible in nature, examined frequently and modified in order to accommodate certain societal needs (Kofoworola, 2003 and Onwuka, 2009).

1.2.2 Engineering Education Students in Nigeria

Adedokun (2011) lamented that, it is quite embarrassing to discover that there are some graduates of such professional fields who never experience to handle or touched tool throughout their program and maintained that if all engineering awarding institutions in Nigeria were to be holistically audited in terms of equipment, many graduates will have their certificates rejected or recalled. Atsumbe and Saba (2008) postulated that students of engineering education in Nigeria should be exposed to the current edge technology machines during their programs for them to be able to develop emotional stability and self confidence in their respective places of work, this opportunity should be given to them during their students' industrial work experience scheme (SIWES) by allowing them with free access to handle machines in the industries.

1.4.3 Facilities for the teaching of Engineering Education in Nigeria

The dilapidation of laboratories and equipment in the Nigerian tertiary institutions has been a major concern to all stakeholders in engineering education. Most of the tertiary institutions laboratories and equipment were the old ones provided since the inception of the institutions for decades and hence they are completely obsolete for the current training of our graduates. The quantity of the facilities is grossly inadequate, and for those institutions that have laboratories are facing an acute shortage of supplies of consumables and equipment (Owolabi & Rafiu, 2010).

1.4.4 University-Industrial linkages

Engineering education is characterized as a different type of education compared to traditional science education, management, psychology, medicine, arts etc (Silveira, M.A, 2006 in Ye and Lu, 2011). Since great importance is attached to the development of creativity of students by engineering education, then there is a great significance attached to practical education in which for this reason, conducting engineering education in conjunction with industries is also of great importance for the training of engineering students (Ye and Lu, 2011).

Universities in developing world play a very important role towards economy and the industry in a number of ways as assessed by the American National Academy of Engineering. Collaboration between academia and industry is a vital instrument for development which came through different ways such as faculties, hiring of students by the industries, graduates; exchange of researchers temporarily; consultancies; academic and industry, engineers and scientist joint research, grants and contracts offered by the industries to academia, conferences, seminars, publications etc. in some cases, the stakeholders of industries are made advisory board in a number of universities and is increasingly seen as an effort in promoting science and technology, but such arrangements between universities and industries are completely absent in the Nigerian education system (Onwuka, 2009).

1.4.5 Funding of Education in Nigeria

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The quality of output from the tertiary institutions depends solely on proper funding of the sector by the bodies concerned for the provision of teaching, learning and research facilities. The indication on how a country gives priority to its education at all levels depends on the overall budget to education in relation to the overall resources allocation. The expenditure on education involves the total spending on academic institutions and other supporting educational services.

Funding in Nigeria involves all the three tiers of government namely; Federal, state and local government. This also includes capital and recurrent expenditure to education sector along with Educational Trust Fund (ETF) as well as scholarship award by the federal, state and local governments. The figure below shows the Federal Ministry of Education Budget from 2006-2010.

Proportion of Budgetary Releases to Federal Ministry of Education (FME) in term of National Budget 2006-2010.

Year	National Budget	Capital Released to FME	Recurrent Released to FME	Total Released to FME	% Allocation of FME to National Budget
2006	1,899,987,467	33,214,311,336	129,915,875,356	163,130,186,692	8.59
2007	2,309,233,949,983	47,103,779,521	140,625,995,408	187,729,774,929	8.13
2008	2,647,492,865,643	52,328,688,792	168,649,142,600	220,977,831,392	8.35
2009	2,649,543,000,000	42,005,096,425	184,671,793,236	226,676,889,661	8.56
2010	4,427,184,596,534	38,569,636,552	196,272,854,914	234,842,491,466	5.30
Total	13,933,442,334,627	213,221,512,626	820,135,661,514	1,033,357,174,140	7.42

Source: Digest of Education Statistics, 2006-2010.

Comparing the total amount releases of capital and recurrent budget of Federal Ministry of Education with that of the total National budget for the past five years (2006-2010), it could be observed that education had never received up to 10 percent. The highest released by the Federal Government was 8.59 percent in 2006 and it eventually came down to 5.3 percent in 2010. However, Akintoye (2008) stressed that, for the past decades, Nigeria has been underfunding the education sector by declining the percentage of GDP to education and non-compliance with UNESCO recommendations of at least 26% of National budget to be allocated to education, this has tremendously affected the entire educational system of the country in terms of quality and quantity.

1.4.6 Engineering Education Teachers in Nigeria

Adedokun (2011) and Shu'ara (2010) reported that academic staff of tertiary institutions is bedeviled with low number of senior lecturers with PhD qualification which is seriously affecting engineering education in the country. The current situation is quite unhealthy for Nigerian tertiary institutions where majority of the academic staff belong to the junior cadre of Assistant lecturers, lecturers I, lecturers II who happened to be learning the ropes, these groups of lecturers usually have master's degree with no much experience in research and most of them belong to the engineering faculties. The minority numbers of Professors are getting close to retirement age and the gap that was created between the lower lecturers and the higher ranks

created a vacuum that is difficult to fill in, and there are also some Professors in engineering that are based abroad for greener pastures and refused to come back because of the poor remunerations. Owolabi and Rafiu(2010) described the lopsided attitude among the members of engineering professions by showing lack of professional commitment due to the poor leadership of the professional bodies which do not take the welfare and the condition of service of its members so seriously. This has generated a lot of setbacks in the area of engineering education in Nigeria.

1.4.7 Teaching methods

The teaching methods adopted by the academic staff of tertiary institutions in Nigeria are most frequently demonstration, students centred or lecture method. The situation is partly due to the difficulties to run experiments and run some tests required for the teaching and learning because of the absence of materials and equipment for practical training. This made the teaching and research in engineering education very difficult which resulted in producing ill-prepared and insufficient graduates that are required for national development(Owolabi and Rafiu, 2010). The current teaching method been practiced by the lecturers of tertiary institutions in Nigeria where the teacher is at the center and acts as a source of embodiment of knowledge is phasing out nowadays with the advent of ICT which has made knowledge easily accessible in the current globalization. Here the teacher is no longer the manipulator who knows it all but serves as a guide while the students take to themselves whatever they could be able to take from the global reach (Onwuka, 2009).

1.5 Conclusion

Engineering education is indeed one of the strongest pillars of economic growth and national development of any nation. The current trend in engineering education in Nigeria has created a disparity between the quality of training received by the graduates vis-à-vis the employers expectations in the businesses and industries in the country despite its enormous resources. This paper looked at the current trend of engineering education in terms of curriculum, teachers, students, funding, facilities, industrial collaboration as well as teaching methods with the view of suggesting the way forward. It is obvious to note that the curriculum of engineering education needs a to be reviewed in order to have a well-trained graduate that can compete with their counterparts globally, this could be done through university-industrial linkage that will give exposure to the students, reforming the teaching and learning methods through different methods that will make the students creative, focused and exposing them to different problems and challenges. However, adequate provision of funds, creation of national skills centers, up to-date equipment and facilities as well as the welfare of teachers is also paramount towards achieving quality engineering education and national development in Nigeria.

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