

ENGINEERING EDUCATION IN THE POLYTECHNIC SECTOR: ITS ROLES IN NATIONAL DEVELOPMENT

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Abstract

Engineering has assumed the paramount avenue through which technology is being practised. The attention given to engineering education by any country therefore, has a lot to say about the technological status of that nation. Nigeria is one of those countries that operate Polytechnic Education with a view to producing technologists who are well groomed in engineering, and who can readily deliver the services required of them to enhance national development. This paper takes a look at engineering education in Nigerian polytechnics, though pointing out some prevailing shortcomings in the system, highlights the potentials it possesses which promise to be the hope for national development if well harnessed by the relevant stake holders. It presents some of the engineering roles the polytechnic sector has to perform to move this nation technologically forward.

Keywords: Engineering; Polytechnic; Education; National Development

Introduction

Every nation aspires to develop. **National development**, which is now synonymous with technological advancement, cannot be attained by any nation except by a dedicated practice of engineering. Except for geniuses, engineering is practised by those who are trained in the field hence, the need for serious participation in engineering education scheme by any nation aspiring to develop. Nigeria saw this reality when she introduced the polytechnic system to help boost technical education generally.

According to the National Policy on Education (2004) the **polytechnic** is one of those institutions meant to operate technical education. The policy describes technical and vocational education as a comprehensive term referring to them as those aspects of educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life.

Engineering education, which can be referred to as the highest level of

technical education, has been simply defined as "the study of the art of directing the great sources of power in nature for the use and convenience of humans" (Barker, 1997). Because it seeks to bring things into being, engineering requires the creative imagination to innovate useful applications of natural phenomena. The polytechnic system therefore, having a similar vision, provides a prepared ground for the operation of engineering education in a way that it would yield satisfactory results.

This paper sees the polytechnic system as having a good prospect for national development, a supportive framework already existing to enable her achieve the goal through engineering education but a very poor implementation of the accompanying policies since its inception. Nevertheless, it raises the nation's hope when it recollects some components of this framework, presenting them as added advantage to the polytechnic system and calls on the appropriate quarters to capitalize on these factors by properly harnessing the potentials of the polytechnic system so as to enable the nation achieve the goal that was at the back of the mind on conception of the idea.

The Role of Education in Nigerian Polity

Education

Education is a process of teaching, training and learning especially in schools or colleges, to improve knowledge and develop skills (Hornby, 2010). It has been discovered to be the bedrock for the development of any nation. This view is shared by some prominent personalities in Nigeria viz.

- Igweonu and Chuku (2003) quote Azikiwe as saying that education is an avenue for spiritual balance, social regeneration, mental emancipation and economic determinism.
- Fafunwa (1974) is particular about Technical/Vocational Education and thus asserts that its exploitation holds the brightest prospect for national advancement.
- President Umaru Musa Yar'Adua believes that education is one of those factors necessary for national development hence, his inclusion of **provision of qualitative and functional education** as one of the items in his seven-point agenda.

It is education that has brought great nations like U. S. A. and Japan to the comfortable level of development they find themselves today hence; it should not be toyed with by any nation aspiring to develop. The state of Nigerian education today, on the other hand, can best be described as unfortunate. Government has allowed several evils to befall this all-important sector through unstable policies. Education policy of the country is characterized by instability and sometimes, lack of focus. One aspect of this carelessness is reflected in the budgetary allocation to the sector as can be seen in the table below for 2007 to 2009.

Table 1. National Budgetary Allocation to Education in Nigeria - as percentage of the national budget (Adapted from the website of Federal Ministry of Finance, 2008).

Year	National Budget (N' 000,000,000,000)	Allocation to Education (N' 000,000,000)	Percentage (%)
2007	2.3	188	8
2008	2.647	317.64	12
2009	2.8	420	15

It is not even as if the story was palatable for education in previous years. This could be seen in the table below, which shows the budgetary allocation in percentage of the total national budget for a period of nine years.

Table 2. National Budgetary Allocation to Education in Nigeria - as percentage of the national budget (Adapted from Ezeh, G. C., 2003).

Year	Percentage (%)
1992	2.7
1993	7.0
1994	10.3
1995	11.5
1996	10.8
1997	11.6
1998	10.27
1999	9.6
2000	8.0

According to Galadima (2001), nations that realize the importance of education, spend 20% or more, of their Gross National Product (GNP) on education alone. This is not the case with Nigeria. Again, the level of funding on education in Nigeria represents less than 2% of the Gross Domestic Product (GDP) as against 15% of GDP recommended by the United Nations, or less than 26% of the national budget as recommended by UNESCO (Mumah and Yakubu, 2000).

Education therefore, can be said to occupy but an insignificant place in Nigerian polity, hence the poor rate of development of the country.

Engineering Education in Nigeria Today

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Engineering Education in Nigeria Today

The poor attention of government to education has affected engineering education adversely. Technical education generally is capital intensive. Barker (1997) has it that engineering involves people, money, materials, machines and energy. The government of Japan, for instance, spends a disproportionate share of its budget on education – not just any education but largely science-based, technological and business education (Gladima, 2001). But coming to Nigeria, what we rather see is an education system without any sense of direction and focus, more especially as it concerns science, technical and engineering education. According to Tongpak and Habila (1998), there are more arts-based graduates in Nigeria today than scientists. Worse still, they continued, among the existing science-based graduates are more of those who are experts in theory and dunces in practical; and yet we want to make the technological leap forward. The problem of having fewer science-based graduates than arts-based graduates can be traced from the fact that we do not have enough science teachers in our secondary schools; yet among the existing ones only few of them are qualified. The target set by the National University Commission (NUC) of 60% of total number of candidates for enrollment into universities for science and science-related

courses has never been made, while the 40% for arts and social sciences often shoots up (Tongpak and Habila, 1998). Simple observation shows that the engineering laboratories and workshops of many higher institutions are ill equipped. Worse still, the existing equipment have either gone bad or obsolete. The same is the case with libraries, where there are not enough books and the existing ones are outdated.

Many tertiary institutions nowadays seldom send their engineering and technical staff on refresher courses, conferences, workshops, seminars, etc. Furthermore, some higher institutions are not yet hooked on to the Internet. It should be noted that the saying that “no man is an island”, is highly applicable to engineering hence, the need for collaborative effort. Engineering is a dynamic field of study. There is therefore, the need for easy and consistent access to current information on the various fields that make it up, and this calls for the hooking on of all the tertiary institutions to Internet.

Sometime in 2003, the issue of Nigerian University Network (NUNET) and Nigerian Polytechnic Network (NIPONET) was on the news. This was about linking universities with computer network (for NUNET) and polytechnics (for NIPONET). Right now, there seem to be silence over the project as if it is not a good venture. The importance of this project cannot be over-emphasized, because through the network, one can access the database of another function of objectivity and dedication in the pursuit of set goals.

institution for information; and information is a very important ingredient to development. If at all this project would still be carried out, the delay is already unbecoming for a nation seeking development. Nigeria should learn good lessons from a country like Japan which, in 1965 its graduate engineers were less than those of Britain; but by 1978, it was hiring out ten times as many graduate engineers as Britain, which perhaps reflects the result of its successful industrialization (Onogu, Jatau and Sambo, 2000). This is a If at all this project would still be carried out, the delay is already unbecoming for a nation seeking development. Nigeria should learn good lessons from a country like Japan which, in 1965 its graduate engineers were less than those of Britain; but by 1978, it was hiring out ten times as many graduate engineers as Britain, which perhaps reflects the result of its successful industrialization (Onogu, Jatau and Sambo, 2000). This is a

The Technologist Misconstrued

Technologists are erroneously looked at as lower-class teachers when compared with their Lecturer colleagues. This is discouraging on the part of the Technologists. It should be noted that these are the people who impart the much needed practical knowledge to the students, and you cannot talk about engineering without talking about practical know-how. The university system even worsens the matter by not regarding them as academic staff simply because of their qualification

which is HND. This paper calls on stakeholders in the education sector to make amends in this regard if we hope to grow technologically.

The Nigerian Polytechnic in Perspective

According to Galadima (2001), polytechnic education was not originally intended to belong to the tertiary tier of education. He says that it was conceived by the French, and perfected by the Russians to be education and training aimed at discouraging elitism and geared towards the practical preparation of its recipients to fulfill prescribed norms of the economy which the traditional academic institutions do not address. The aim was to evolve an educational system based on work and training (Korel, as cited by Galadima, 2001). It was later reformed in China and this led to its being regarded as university level institution specializing in engineering and technology, and providing in-service training and continuous education (Price, as cited by Galadima 2001). The polytechnic system as we operate it in Nigeria has its origin in Britain, which was the colonial master of Nigeria. Initially, the system was focused but as time went on it started losing its focus owing to reasons ranging from working out avenues to generate fund internally (an atmosphere created by the government), to trying to erase the unwanted inequality created between the system and the university. This has led to the accreditation of a lot of arts-based courses as well as remedial programmes (Tongpak and Habila, 1998).

Furthermore, Mumah (1998) observes that many of the Lecturers (performing the training) in polytechnics are not trained in the areas of technological improvement and maintenance since they are products of universities. This in turn affects the orientation of the products of the polytechnics. The aim is to produce Technologists and Technicians. But the result of all these is that the performance of the products from the polytechnics is deficient not because they have not been trained but because the focus of their training has changed. Mumah and Yakubu (2000) further argue that the rigid structures under which the polytechnic sector in Nigeria has been operating since introduction has been identified as a contributing factor to its seeming poor performance. Such rigidity, they added, has affected its evolution process to the extent that staff from this sector are considered, along with their students, inferior to their counterparts in other sectors, even if they are products of the same university. It should be noted that the objectives of the Polytechnic, under normal circumstances, appear to be more directed to meeting the national goal of technological growth. To buttress this point, the relevance of polytechnic education as compared to other forms can be seen in the few following areas:

Relevance of Polytechnic Curriculum

Development of skills is very imperative at this stage of our technological development and this happens to be one of the objectives of the polytechnic system of education. Ogunbadejo, as cited by Suleman (1998) supports this claim by describing the polytechnic curriculum as having an emphasis on practical appreciation of problems. The polytechnics, moreover, were established with a deliberate policy of enhancing technological emancipation by skilled technicians who would

handle tools of technology. A high content of practical in the curriculum was therefore introduced. It is unlike the curricula of other tertiary institutions, which Ogunbadejo, in Suleman (1998) described as being 'too theory-based' and asserts that theoretical orientation cannot lead to technological development. Therefore polytechnic system, now seen to have the most practically inclined curriculum, can best be described as being most relevant to engineering, technology and hence, national development.

Industrial Experience

The three or four-month Students' Industrial Work Experience Scheme (SIWES), added to the one-year Industrial Training (IT) programme provides polytechnic students with the opportunity of gaining much industrial knowledge and hence, improving their skills while still in school. This can help the graduates to be self-reliant thereby contributing to national development.

Furthermore, according to National Policy on Education (2004), the Polytechnics, being technically inclined, are required to give training and impart the necessary skills for the production of technicians, technologists and other skilled personnel (e.g. roadside craftsmen) who shall be enterprising and self-reliant. This objective practically gears the trainees towards national development.

Manpower Production

The kind of manpower needed for the adaptation of technology is the middle level cadre; and this happens to be the polytechnic graduates' cadre. This cadre constitutes the principal actors involved in the real practical demonstration of the acquired knowledge. Akande, as cited by Suleman (1998) states that about seven technicians are needed to work with one engineer. The polytechnic education therefore becomes very relevant in producing the right cadre of manpower in the right quantity needed,

and with adequate proficiency. It is worthy of note that without technicians, the high level manpower produced by the universities cannot work effectively because it is the technicians who are concerned with the actual production work, control of machines and other production materials (e.g. the liquid level of a chemical) and maintenance of machines in events of breakdown. In the higher institutions, it is the technologists who are in charge of practical classes – the very avenue for the demonstration of all that the students have been learning theoretically in the class.

It is therefore not palatable for such a set of important persons to be graduated half-baked. They should be adequately informed because any attempt, whether consciously or unconsciously, to deprive them of any relevant knowledge, is capable of hampering on the developmental process of the nation. Effort should also be geared towards producing them in greater numbers than those of the high level manpower, seeing their ratio in the field as one engineer to seven technicians.

Recommendations

- Government should step up budgetary allocation to the education sector.
- Government should consciously fund technical education considerably, more than other aspects of education.
- Government should encourage science-based and technical teachers at all levels with special incentives,

while ensuring that they are actually well groomed theoretically and practically.

- Bribery and corruption should be entirely stamped out of Nigeria's education system to guarantee the authenticity of certificates issued by Nigerian schools.
- Polytechnics should be allowed to produce its training manpower needs. This is only achievable if polytechnics in the country are allowed to run programmes leading to the award of higher degrees in engineering with the focus chiefly on improvement of technology. In this way, graduates from the polytechnic sector will be highly motivated since they can aspire to the highest level in their professions
- Priority attention should be directed to technologists in engineering departments in the area of training on modern trends in their fields, providing them with modern engineering books, tools, equipment, etc and payment of a handsome incentive as hazard allowance because of the hazardous nature of their job and the relevance of their job to national development. Government should stop relegating them to the background.
- Engineering syllabuses should be restructured at least every five years, to take care of the argument by Okoye (1998), that the half life of an engineer is about five years, meaning that after five years, new developments in the field render former ones obsolete.

Conclusion

The rapid growth in the number of polytechnics from three, by the time Nigeria became politically independent in 1960, to sixty presently, is perhaps enough indication of how important the role of polytechnics is in our national development. However, government should ensure that this is not just a mere proliferation of institutions. The focus should always be maintained - promotion of practical engineering education. This paper believes that if Nigeria conscientiously implements the following recommendations, in the near future, she would join other developed countries of the world to export technology and control the world economy.

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