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ENGINEERING EDUCATION (EE): A VERITABLE TOOL FOR JOB CREATION AND SUSTAINABLE DEVELOPMENT IN NIGERIA

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ABSTRACT

This paper examined Engineering Education as a tool for self – reliance, job-creation and sustainable development. The development of any nation lies on its economic vibrancy and this is true particularly for developing countries like Nigeria, who is battling with chronic factors like unemployment and underemployment, which have kept them in the perpetual bondage of economic frustration. Engineering Education as an instrument of poverty eradication is multidisciplinary and pragmatic field of study, aimed at equipping the individuals with requisite skills which will enhance their relevance, independence and functionality in the society. Hence, Engineering Education plays a vital role in the economic recovery and sustainable development of society. This paper identified some of the challenges to successful implementation of engineering education such as inadequate funding, poor infrastructure and brain drain. The paper concluded by emphasizing the need for full implementation of engineering education policies in Nigeria as a key factor in enhancing engineering innovations which could lead to the improvement in technical and vocational education. Finally, it is recommended that in both secondary and tertiary institutions, emphasis must be placed on practical aspect of engineering education with relevant tools and materials in a well equipped workshop. Engineering students should be encouraged and motivated through the award scholarships and internship to enable them apply theories into practical problems.

KEYWORDS: *Engineering Education, Economic Recovery, Innovations, Self-Reliance, Sustainable Development*

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INTRODUCTION

Engineering education is a program for the training of individual in a formal environment for the acquisition of occupational skills under the supervision of an expert or engineer. The term Engineering Education (EE) refers to those aspects of the educational process that deals with study of technologies and sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life [1]. Engineering education recorded its greatest achievements, which were reported as widespread development and distribution of electricity, clean water, automobiles, antibiotics, telecommunications and computers to mention a few. Despite these achievements, engineering education is faced with challenges that engineers need to solve to improve livelihoods around the world [2]. Proposed solutions to these challenges include developing Engineering Education (EE) programs that will focus on training graduates with the technical, social, political and ethical leadership skills appropriate to address these challenges. Since the first EE programs were launched the understanding of how people learn has significantly improved, more effective teaching tools have been developed and Industrial technology has changed very

significantly. In order to prepare engineering graduates for the global challenges, educators must review both the content and the delivery of program material. Unfortunately, few engineering schools in Nigeria have made major updates to their programs over the past few decades [3]. Engineering education challenges are issues for the entire world, they are more acute for the Africa and Asia, the continent with a good number of developing countries. The establishment of National Business and Technical Education Board (NABTEB) and a resultant coherent national policy for engineering education is expected to be a key driver of Nigeria's economic growth. It is believed that the establishment of NABTEB will equip the middle manpower with necessary skills and supply the nation with capable workforce and increase access of people to money making ventures so as to banish hunger and poverty in the country. Nigeria global competitiveness depends on ability of our technical and engineering education system to adapt and innovate. The curriculum of a subject with practical content is generally organized into an average of 70% for theoretical classes and 30% for practical.[4] noted that one of the issues confronting the design of appropriate curriculum for engineering education is preparing students for the shift from analogue to digital paradigm in technology practice. However, some problems inherent in curricular include:

1. They are based on foreign model
2. There is usually a shortage of highly competent indigenous teaching and supporting staff with sufficiently wide practical experience of technology
3. The curricular are adjudged to be too academic and over-loaded with intellectual content in pure science and mathematics at the expense of basic engineering and technology.
4. The teaching approach follows the conventional method of transforming knowledge across through the lecturer reading out to student, who would then take down notes. Hence, Nigeria need to prepare to take the lead for the very highest engineering education and training standards that would enable her engineers not only performs creditably in the profession but also keeps abreast with the advancing technology [5]. Therefore, this paper discussed challenges confronting engineering education as a tool for job-creation and sustainable development and possible suggestions were made for ways forward.

Objectives of Teaching Engineering Education Programs in Schools

According to the National Policy on Education NPE (2010): the objectives of teaching engineering education include:

- To promote the technical knowledge and vocational skills necessary for agriculture, industrial, automobile, commerce and economic development
- To train and impact the necessary skills leading to the production of Technicians, Technologist and Engineers who will be enterprising and self-reliant.
- To produce skilled and technical manpower necessary to restore, revitalize, energize, and sustain the national economy and substantially reduce unemployment
- Raise and sustain a generation of job creators rather than job seekers
- Reform the content of Vocational and Technical Education to make it more responsive to the socio-economic needs of Nigeria
- To provide services as means of national defense against poverty brought about by lack of job skills.

The effectiveness of Engineering Education (EE) can be assessed by focusing on the extent to which the above objectives are achieved. Also, the achievement of these objectives has a direct bearing on our technological development as a nation leading to the actualization of vision 2025 in Nigeria; therefore, emphasis must be placed on skill acquisition for self –reliant and job creation.

Challenges Confronting Engineering Education (EE) Development in Nigeria

Regrettably, Engineering Education is faced with many problems which make reproductive Engineering Education hardly achievable and thereby making it difficult to achieve these objectives: Some of these challenges are:

- Dearth of qualified and competent teaching personnel
- Poor funding
- Lack of training facilities
- Lack of institutionalized framework in the administration of empowerment programmes
- Gender inequality and stereotyping to certain technical and vocational based courses
- Ignorance
- Absence of healthy spirit of competition.

According to a report [6], it is evident that very little has changed in the engineering industry since the inception of the first engineering school in Nigeria. The minerals extracted, mining being the major manufacturing factor, are still exported as raw materials with very little value addition being made in terms of processing into intermediate and finished engineering products by Nigeria Engineers[7]. Engineering products such as mining and construction equipment are imported for various industries as opposed to local manufacture from local raw materials. Most foreign investors would prefer to bring in their own state-of-the-art equipment and facilities and this suppresses the young engineer's innovation and creativity in providing engineering solutions. Instead, most engineers are pushed to the "maintenance inclination" rather than the "design perspective". In addition, the other reasons why Nigerian engineering graduates end up being maintenance engineers could be because:

- Design and analysis training is weak; and
- There appears to be an over concentration on just the technical aspects and very little on other factors such as innovation and entrepreneurial elements that are important for developing new and creative ways for value addition. If Nigeria were to develop their own EE model for the region devised through collaborative and creative efforts with potential end users, then training based on this model would ensure that graduates are employable both in the local and regional labour markets. In addition, the graduates would be relevant to both the urban and rural areas; providing intellectual solutions to problems. The concept would result in both national and personal development well-adjusted to conform to the realism of the Nigeria environment and society. Therefore, the Nigeria context needs to reflect a balance of the local, regional and global current trends in EE. Also while engineering schools copied a training model from Europe many decades ago, many other models have since come into the market that may best meet the Nigeria needs. On the other hand, EE in Nigeria cannot turn a blind eye to the on-going technological advancements. Therefore, the involvement of the generation of people born during the

1980s and early 1990s is quite critical to developing meaningful strategies for the future. This forward looking and dynamic model of EE could be encouraged through youth participation to exploit their high mental potential and freedom [8]. Graduates from this type of approach to EE would therefore successfully compete at international levels and exhibiting an innovative capability to generate and evaluate new ideas and make well-informed decisions to adapt to prevailing and future situations. Considering that Nigeria engineering graduates need skills that can be applied, there is need to benchmark against EE globally and regionally.

This would require EE educators to have an effective interaction with engineers from other parts of world. There is need to prepare an engineering workforce relevant to the current engineering challenges in Nigeria. To ensure an informed approach to building strategies for EE for the current trends in engineering practice in Nigeria.

Benefits of Engineering Education

The contribution of engineering education is enormous. [9] Identified some of the contributions of engineering education to include the following:

Youth Empowerment: Through engineering education the youth are sensitized, mobilized and motivated to acquire skills for paid employment and self reliance. Effective acquisition of vocational and technical skills will inculcate entrepreneurial skills that would help the individual to be self- reliant.

Consumer Education: Engineering education develops in the individual rational consumer and socio-economic competences. It therefore equips the individuals to be intelligent consumers of goods and services. Consumer education promotes better understanding of business, and product in our socio-economic life

Manpower Development: Engineering education provides highly trained and skilled workers for different levels and sectors of the economy. Hence, engineering education must aim at producing students with saleable and employable skills. Engineering education provides training and empowerment in the necessary skills leading to the production of craftsman, technicians and other skill personnel who will assist in developing the economy. It also engenders human capital development that enhances empowerment of peoples and strengthening of economic prosperity of the society.

Desirable Changes in Nigeria Engineering Education for Job-Creation

In view of the importance of engineering education in nation building and several contributions from different authors, Therefore, this paper identified some of the desirable changes for enhancing lifelong engineering education in Nigeria.

Expansion of Facilities: Government is aware that only limited facilities exist for the technical teacher education. A conscious effort to expand the facilities for the training of technical teachers should be made particularly since the new structure proposed for secondary school education will require many more teachers.

In recruiting teachers for technical education institutions, the industrial experience of candidates should be given the highest premium. In addition, government should make in- serve training mandatory for serving teacher, and industrial attachment should be recognized as necessary for updating the competence of technical and vocational teachers.

At the very early phases of the education for an appreciation of the role of technology in society, elementary technology should be introduced into the school curriculum as early as possible. Pupils will be exposed to using their hands in making, repairing and assembling things.

Government should take steps to improve the immediate and long term prospects of technicians in relation to graduates of other profession with respect to their status and remunerations. This would boost their morale and motivate secondary school graduates to study engineering education.

Science and technology should be taught in an integrated manner in the schools to promote appreciation by student and the practical implications of basic ideas.

In view of the limited opportunities for practical on-course experience, government should take steps to ensure that training programs of technicians incorporates a service unit based on existing facilities which will operate as training and commercial unit where such an arrangement is not in existence.

Government should make it mandatory for contractors to engage where possible the service of student of technical and vocational institutions to give them the required practical experience.

Equipment and other facilities in technical institution should be utilized also for evening classes and for adult and non-formal education for instance, in establishing training programs for groups of traders and roadside mechanics

As regards proper guidance to courses, technical colleges should be required to identify occupational groups and utilize them in disseminating information on courses and new techniques relevant to their trades.

Both the present and future needs of the country should be considered in making curriculum changes in technical and vocational education. In addition government should intensify efforts to introduce skill-forming technical vocational courses into secondary school curriculum.

Education supervision should be enhanced: In supporting this view, [10] stated that supervision is responsible for maintaining discipline as well as facilitating change from outdated patterns of work to modern techniques. Finally, the paper provided some future directions or opportunities for EE in Nigeria to acquire rapidly the much needed modern technology there is an urgent need for a radical approach in the development of engineering education systems in Nigeria. This is important because Engineering education is crucial as it enables future engineers to fully assume that leading role in serving as engines of innovation whose developments will benefit the people of Nigeria.

CONCLUSIONS

In this paper, we have studied various techniques of harmonic reduction developed by various researchers. The techniques are studied on the basis of implementation feasibility, operations methods and performance in harmonic reduction. By studying these techniques, we can conclude that the passive techniques are responsible to reduce harmonics efficiently, but overall losses on overcoming harmonics reduce system efficiency. Active harmonic filters are capable of reducing harmonics without affecting system efficiency, but the implementation cost is so high. Hybrid systems, which are a combination of passive and active harmonic filtering systems are reliable and robust in terms of performance, implementation cost and complexity is also low.

RECOMMENDATIONS

In view of the aforementioned challenges, the author wishes to make the following recommendations:

1. Federal Government, state governments, and privately own institutions offering engineering education should always make enough budgetary allocation for the procurement and maintenance of infrastructural facilities and equipment.

2. Government should encourage student to enroll into engineering education institutions by awarding scholarships to such students.
3. Existing trade centers school should be recognized as special vocational technical schools for proper distribution of junior secondary school graduates. This will go a long way to boost the morale of prospective engineering education students and erase the negative view people have for engineering education as education for never-do-wells in our society.
4. Adequate facilities, equipment, tools and machines should be provided by government at all levels of the educational system to ensure realization of set objectives of engineering education.
5. Regular in-service course including seminars and workshops should be mounted for teachers of technical subjects in our technical education institutions: this is necessary since such in-service course seminars and workshops would upgrade their knowledge, skill and competencies.
6. School administrators should be given the necessary orientation towards the importance of engineering education so that they will support the programs in their entire ramifications

Accreditation of engineering education should be carried out on regular basis in universities to check dwindling situation.

REFERENCES

1. *Danko A. I (2016), The Role of Engineering Education in National Development Entrepreneurship Education for Vocational and Technical Students (2nd Edition) Abuja Benchmark Publishers Ltd.Ch.3, pp 23-27*
2. *Hamukoma, P. M. (2011). Survey and Analysis of Demand for and Supply of Skilled Workers in the Nigerian Mining Industry, in Jobs & Prosperity: Building Nigeria's Competitiveness (JPC), World Bank*
3. *Royal Academy of Engineers (2012), Engineers for Africa, Identifying Engineering Capacity Needs in Sub-Saharan Africa.*
4. *Davidson, C. I. (2010). Preparing Future Engineers for Challenges of the 21st Century Sustainable Engineering, Vol. 18, pp. 698-701.*
5. *Erinne, J. N. (2015). Engineering Education for 21st Century Africa: The Chemical Engineering and Nigerian Perspectives, the Nigeria Institution of Mechanical Engineering Annual Symposium.*
6. *Cilliers, J. B. (2011). African Futures 2050, the Next Forty Years, John Wiley and Sons, New York, Pp 350-365.*
7. *Juma, C.O. (2015) "Unleash the Power of Universities", New African Magazine. [Available Online] http://newafricanmagazine.com/calestous-juma-unleash-the-power-of-universities, [accessed on July 21, 2019].*
8. *Ogorodova, L. M., (2012). Engineering Education and Engineering in Russia: Problems and Solutions. Journal Association for Engineering Educations of Russia, pp.16-21*
9. *Nigeria Society of Engineers (2014): The Universe of Engineering. A Nigeria Perspective*
10. *University of Nigeria (2015): Report on the Survey of the Needs for Graduate Engineers in Nigeria, the School of Engineering, (Nsukka). [Unpublished].*

11. *Sicherman, C.N, (2015). Becoming an African University, Makerere, 1922-2000, Trenton. Africa World Press.Federal Republic of Nigeria .National Policy on Education (4th Edition) Lagos NERDC Press. ch.5 pp12-16, Sept.(2004)*