Exploring Engineering Education as a Remedy for Economic Instability in Nigeria: Students' Perspectives from Federal Polytechnic Bali, Taraba State

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Abstract

This paper examined Engineering Education as a tool for curing economic instability in Nigeria such as Recession, inflation, and unemployment. To overcome these financial challenges, Nigeria has to invest in a range of industries, particularly engineering, and diversify its economy. Engineering education is crucial to producing a skilled labor force that can support the country's economic success. From the viewpoint of the students, how engineering education may help Nigeria's economic instability. The study was guided by two objectives and two research questions under the auspices of Survey as the research design, conducted in Federal polytechnic Bali, Taraba State. The population of the study was 412, which is comprised of all students in the school of engineering. Since every member of the population was used as a sample for this investigation, there was no sampling strategy. Structured questionnaire was used in data collection for the study which was validated experts; the instrument's internal consistency was assessed using the Cronbach Alpha coefficient formula, which produced a coefficient value of 0.77, indicating that it is dependable. The Statistical Package for Social Science (SPSS) software, version 22, was used to analyze the data using the mean and standard deviation. . The result indicates that curriculum needs to be periodically evaluated and revised to make sure it complies with industry requirements and worldwide standards. The students also suggest that tertiary institutions should have sufficient funds to make sure they have the facilities and tools needed to provide good engineering education. Additionally, students suggest that to guarantee that engineering graduates have the abilities and knowledge required to satisfy industrial demands, there should be more cooperation between academic institutions and business sectors.

Keywords: *Engineering Education, Practical Courses, Sustainable Development Goals, Educational Sustainability.*

Introduction

Nigeria's economy has been afflicted by serious concerns, such as a recession, inflation, and high unemployment rates. These difficulties have highlighted the need for the nation to invest in industries that can foster innovation and growth, as well as to diversify its economic base. In this context, engineering education stands out as essential because it is critical to producing a workforce with the necessary skills to meet the complicated needs of a variety of industries.

Engineering is the application of scientific and mathematical concepts to solve practical problems. It is essential to both the advancement of technology and the economy. On the other hand, concerns have been expressed regarding the standard of engineering education in Nigeria. Many industries contend that graduates lack the practical experience and understanding required to excel in the field. This gap between industry demands and educational achievement has led to calls for modifications to engineering education to better match it with the needs of the economy.

Engineering education forms the basis for preparing a workforce with skills to tackle complex challenges around infrastructure, technology and industry. As per Naqvi and Syed , it is engineers who considerably affect infrastructure development, government policies as well as environmental sustainability all of which contribute to economic growth. Additionally, they assert that engineers not just design or create tangible structures but also participate in management and policy formulation because of their technical knowledge which aids decision making in issues related to the economy.

Manikandan and Muthumeenakshi (2018) point out that engineering students need not only subject knowledge, but also problem solving, communication and entrepreneurship skills. Such an all-encompassing way of understanding engineering education means that graduates are equipped with the tools to handle the intricacies of the contemporary economy and help in attaining sustainable economic growth.

The importance of engineering education as a major catalyst for technological progress and economic development cannot be overemphasized. Azubuike and Okafor (2019), observe that one of the major causes of Nigeria's economic recession is neglect of engineering education in that country. Infrastructural development, innovation and enhancement of living standards are predicated on availability of engineering graduates. A body that promotes engineering as a discipline which uses science and mathematics to solve real world problems hence aiding national growth is UNESCO (2010).

Challenges facing Engineering Education in Nigeria

Numerous obstacles prevent Nigerian engineering schools from graduating students who can support the growth and development of their nation's economy. According to Oloyede et al. (2017) these issues include out-of-date curricula, inadequate equipment and infrastructure, a lack of funding, a lack of mentorship for engineering lecturers, trouble recruiting students, cultural norms that deter women from pursuing engineering education and careers, and a lack of sustainability education in engineering curricula.

One major issue with Nigerian engineering education is the use of outdated curricula. To make sure that the curriculum satisfies industry demands and is in line with international standards, it must be periodically evaluated and revised. Oloyede et al. (2017) noted that poor university-industry links, a lack of finance, and inadequate infrastructure and equipment all contribute to ineffective engineering teaching and learning. Cultural norms that dissuade women from pursuing engineering degrees and careers, as well as the absence of sustainability

instruction in engineering curricula, aggravate these issues.

Several scholarly investigations have identified significant obstacles within Nigeria's engineering education framework. Engineering education has historically been given minimal importance, which has resulted in poor training and a shortage of trained professionals, according to a report by Ojiakor (1986) Important concerns consist of:

Inadequate funds: A lot of engineering programs struggle with a lack of funds, which has an impact on the standard of instruction as well as the accessibility of facilities and resources. Azubuike and Okafor (2019).

Outdated Curriculum: Graduates often lack the necessary abilities since the curriculum frequently does not meet modern industrial standards. Their employability and capacity to make a meaningful contribution to the economy are hampered by this imbalance. Ojiakor (1986).

Inadequate Infrastructure: Ojiakor (1986) and Azubuike and Okafor (2019) note that the practical training of engineering students is severely hampered by the absence of contemporary laboratories, workshops, and instructional facilities. Even though it is essential for the purpose of enabling students to understand and comprehend the true replication of the outside industries, the government should provide engineering practical facilities (equipment and materials) in the laboratories and workshops of tertiary educational institutions as recommended by Nuri (2023).

Weak Industry-Academia Collaboration: There is a clear gap between industry and academic institutions, which keeps students from experiencing real-world engineering problems and makes them less marketable. Ojiakor (1986). Furthermore, students are not exposed to as many real-world applications of their knowledge due to the gap between academics and industry. According to Naqvi and Syed , increasing industry-university collaboration is crucial to raising the employability of engineering students and increasing the relevance of engineering education.

Insufficient Human Resources: According to Azubuike and Okafor (2019), the dearth of competent teachers and mentors makes engineering education in Nigeria even more difficult. Even though, calls have been made to counteract as Nuri (2023) recommended that The government should set up all the means for employing the technologists, lecturers, and technicians required to teach students engineering. Additionally, it is essential to provide retraining through workshops, seminars, and in-service training to counteract brain drain and keep up with the latest advancements in technology that are being released worldwide.

Statement of the Problem

Nigeria's engineering training is acknowledged to be a significant element in fixing the country's socioeconomic ambiguities such as downturns, rising costs of living and high rates of joblessness. Notwithstanding engineering education's prospects in generating an apt labor force for economic expansion and creativity, some immune barriers limit its success. The quality engineering education stimulates the technical capacity of the workforce leading to competent engineers who can support economic growth and development, Igbokwe et al. (2019).

In respect to contemporary industry requirements and economic realities, students are expressing apprehensions about the significance and standard of their engineering education. The program is normally misaligned with the fast shifting technological world hence there exists a disparity between competencies picked up during schooling and those necessary in employment. Besides, poor funding together with lack of resources inhibits institutions from offering contemporary amenities, thus denying them chances for hands-on learning.

The students studying engineering education in Nigeria are right that the universities which confer degrees in engineering are not thoroughly examined when it comes to infrastructure thus creating doubts about the certificates awarded to graduates. "It is quite embarrassing to discover that there are some graduate of such professional fields who never experience to handle or touched tool throughout their program" as lamented by (Adedokun, 2011).

Nevertheless, Idris and Rajuddin (2012) have, however, highlighted the declining quality of engineering education in Nigeria lately which became serious concern for most especially the industries. As a result, there is a gap between labour market requirements and graduates' expectations. In response to this situation, it has been suggested that existing degree programs should be updated to align with contemporary labor demands.

Academics and industries hardly work together enough, thus causing a gap that makes it impossible for learners to understand practical engineering problems or gain exposure in the field. The outcome of such disconnection is disappointing in terms of education quality as well as less opportunities for graduates leading to persistent levels of joblessness and rarely taken positions within the technical profession.

Weiwei and Wu (2011) is of opinioned that one major issue impeding engineering education is the lack of interaction between industry and educational institutions. Contrary to traditional science, management, psychology, medicine, art, and other education, engineering education is regarded as having an uncountable reputation for helping students develop their creativity. For this reason, learning by doing is essential, and conducting engineering education in conjunction with industries will be extremely important for engineering students' training.

Apart from the previously mentioned statement about the relationship between universities and industry, Onwuka (2009), also mentioned that "industry hiring of students, graduates; temporary researcher exchanges; consultancies; collaborative research between academia and industry, engineers and scientists; grants and contracts offered by the industries to academia, conferences, seminars, publications etc. in some cases, the stake holders of industries are made advisory board in a number of universities and is increasingly seeing as an effort in promoting science and technology." Regretfully, the Nigerian education system continues to be utterly blind to such interactions between the institutions and industry.

This study aims to quantitatively assess Federal Polytechnic Bali engineering students' perceptions regarding the importance of education in lowering economic insecurity in Nigeria. By focusing on students' views, the study hopes to illuminate the effectiveness of present-day engineering curriculum, students' challenges as well as show how much engineering education can propel national economic development.

Research Objectives

1. To assess students' perceptions of the relevance of their engineering education in addressing Nigeria's economic instability.
2. To identify the challenges faced by students in their engineering education that may impact their contributions to economic development.

Research Questions

1. How do students perceive the impact of engineering education on economic instability in Nigeria?
2. What specific challenges do students encounter in their engineering education?

Methodology

A quantitative survey research design was used in the study. The study's focus was Federal Polytechnic Bali in Taraba State, where all five engineering departments' students were

enrolled. There are 412 students in total, all of whom are enrolled in the Federal Polytechnic Bali, Taraba State, departments of Agriculture and Bio-Environmental Engineering, Building Technology, Civil Engineering, Computer Engineering, and Electrical/Electronics Engineering. Since every member of the population was used as a sample for this investigation, there was no sampling strategy.

The researcher developed the questionnaire, which was the study's instrument, based on a review of relevant literature which consist of closed-ended questions designed to capture students' perceptions regarding:

1. The relevance of their engineering education in addressing economic instability.
2. The challenges they face in their engineering education.
3. Their suggestions for improving engineering education to better prepare graduates for the workforce.

Three professionals examined the questionnaire to guarantee the instrument's validity. Using SPSS version 22 software, the internal consistency of the instrument was ascertained by applying the Cronbach Alpha coefficient method to establish the instrument's reliability. The instrument demonstrated strong reliability with an average reliability coefficient of 0.71 alpha value, as the value was above 0.70. The greater the item consistency of the rating scale, the closer the reliability value is to 1, and vice versa, Enemali (2010).

Data collected from the retrieved questionnaires was analyzed using mean and standard deviation with the help of Statistical Package for Social Science (SPSS) software, version 22. The mean and the standard deviation were used in answering research questions.

RESULTS:

Table 1: The relevance of their engineering education in addressing economic instability

Question	% of the respondents	Mean score	Standard deviation	Remarks
Relevance of Engineering Education	70%	3.4	0.6	very relevant
Preparedness for Economic Contribution	65%	3.5	0.7	prepared to some extent

From Table 1: Perceived Relevance: 70% of the respondents mentioned that they believe the engineering education they have received is highly relevant or relevant in relation to economic issues faced by Nigeria. The mean score for this item was 3.8 (out of 4), with a standard deviation of 0.6, showing that students strongly agreed on the importance of engineering education.

Preparation for Economic Development: When asked about their preparedness to contribute to economic development, 65% of students felt they were prepared to "some extent" or "to a great extent," with a mean score of 3.5 and a standard deviation of 0.7.

Table 2: The challenges they face in their engineering education

Question	% of the respondents	Mean score	Standard deviation	Remarks
Insufficient Funding	80%	3.9	0.5	Inadequate Funding
Outdated Curriculum	75%	3.7	0.6	Outdated Curriculum
Practical Training opportunities	70%	3.6	0.7	Insufficient practical training opportunities

From Table 2: Insufficient Funding: With an average score of 3.9 and a variation of 0.5, 80% of the respondents cited a lack of cash as an important constraint.
Outdated Curriculum: With a mean score of 3.7 and a standard deviation of 0.6, 75% of students expressed worries about the curriculum's relevance.
Practical Training opportunities: With a mean score of 3.6 and a standard deviation of 0.7, 70% of respondents said there were not enough opportunities for practical training

.**Table 3: Suggestions for improving engineering education to better prepare graduates for the workforce**

Suggestions for improving engineering education to better prepare graduates for the workforce				
Question	**% of the respondents**	**Mean score**	**Standard deviation**	**Remarks**
Need for curriculum update	85%	4.0	0.4	Regular update needed
Increasing funding	90%	4.2	0.3	Need for more financing
Industry Collaboration	75%	3.8	0.5	improve collaboration between academic institutions and industries

From Table 3: Curriculum Updates: With a mean score of 4.0 and a standard deviation of 0.4, 85% of respondents suggested that the curriculum be updated on a frequent basis to better meet the needs of the industry.
Increasing financing: With a mean score of 4.2 and a standard deviation of 0.3, 90% of students emphasized the need for more financing for engineering programs.
Industry Collaboration: With a mean score of 3.8 and a standard deviation of 0.5, 75% of respondents suggested enhancing collaboration between academic institutions and industries to offer possibilities for hands-on training.

Conclusion

The study of Federal Polytechnic Bali students' perspectives reveals a high belief in the value of engineering education as a strategy for resolving Nigeria's economic challenges. To improve the effectiveness of engineering education, however, significant challenges including limited funding, out-of-date curricula, and a lack of opportunities for practical training must be addressed.

The results indicate that in order to effectively prepare engineering graduates for the demands of the economy, stakeholders, including legislators and educational institutions, should prioritize curriculum revisions, enhance financing, and promote stronger cooperation with industry. By putting these suggestions into practice, engineering education may significantly reduce economic uncertainty and advance Nigeria's development as a whole.

Recommendations

Based on the findings, there are several recommendations that will enhance the effectiveness of engineering education as a means of addressing Nigeria's economic instability:

1. Curriculum Reform, Regular Review and Update. To ensure that it is current with new developments from the world of technology and industry standards, educational authorities must systematically review the engineering curriculum. Involving business specialists in curriculum development could help bridge the gap between what takes place within firms and classroom teaching.
2. Increased Funding, Government and Institutional Investment. An increase in public and commercial funding is urgently needed to lift the quality of engineering education. In order to enhance laboratory facilities, purchase new equipment, and modernize infrastructure, this financing should be directed towards these areas.
3. Strengthening Industry Partnerships and Collaboration Initiatives. Academic institutions are encouraged to actively seek collaborations with business sectors to enable internships, industrial attachments, and joint ventures. Students' employability will increase as a result of getting practical experience and exposure to real-world engineering difficulties.
4. Focus on Practical Training and Integration of Practical Experiences. Prioritizing learning through practical means is essential in all engineering programs as it helps in acquiring a higher level of knowledge compared to theoretical teachings. As such, laboratories holding projects ought to be part of the curriculum since these two factors effectively equip one with skills required by industries where they will work afterward.
5. Promotion of Research and Innovation and Encouraging Research Activities. Institutions need to promote research projects that get academics and students involved in resolving local engineering problems. This could improve the value of engineering education and help Nigeria grow technologically.
6. Policy Advocacy, Supportive Government Policies. In order to enable engineering education, policymakers have to formulate policies that prioritize funding, infrastructure development and industry collaboration. A strong engineering education system capable of addressing economic problems will be promoted through this.

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