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Contents **Page**

Appraising Capacity Building among Engineering Students in Selected Universities in Southwestern Nigeria

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Abstract

This paper examined capacity building among engineering students in selected universities in south-western Nigeria. One hundred and fifty-one final year engineering students took part in the survey. A structured questionnaire were administered to the respondents as a tool for data collection. The data collected were subjected to descriptive and inferential statistical analysis using SPSS. The results showed that 66.9% of the respondents had passion for their choice of engineering courses. Out of 110 students that had access to computer system, about 87.4% had related engineering application software on their personal computer while only 76.2% could use them proficiently. Based on the students' responses, 93% of them expressed that their departments lacked adequate and state-of-the art equipment for practicals, 54% stated that practicals were carried out occasionally, while 95.6% indicated that Students Industrial Work Experience Scheme (SIWES) was very relevant to their study of engineering. The ANOVA conducted on the data showed that SIWES had significant effect on the understanding of their core courses ($p<0.005$). Also, the core values of the universities were significant to capacity building. The paper concluded that Nigerian universities had potentials to develop the needed human capacity in engineering but they can do better through provision of adequate equipment, strengthening the SIWES programme and laying more emphasis on vocational as well as entrepreneurial skills.

Introduction

Capacity building has been identified as a critical element in education reforms. The needed reforms required that all students meet new and more challenging expectations of learning. Therefore, capacity building in education has two components: one that focuses on professional learning and leadership development for educators, parents and community members who support education; the other focusing on developing the academic capacity of learners at all levels in the educational system (Jesse et al., 2010).

Universities, being the nation's ivory tower in providing education, are expected to train the needed human capacity to drive the various aspects of national development. In recent times, efforts are being made to measure this most important role of the universities through curricula development, human resource, organizational, institutional and framework development. However, there has not been documented report on appraising the capacity building of the students themselves especially engineering students, despite the pivotal role of engineering in the society. Engineering and technology are vital in addressing poverty, sustainable development and the other Millennium Development Goals (MDGs), climate change mitigation and adaptation, bridging the "knowledge divide" and promoting international dialogue and cooperation (Daniel et al., 2010). Addressing these societal problems will continue to be a mirage if the potential players, engineers, are not well trained. Thus, there is need for continuous appraisal of the universities on capacity building of the engineering students, who are would-be engineers.

There are many variances as to what capacity building entails. According to Henry (2004), capacity building is building of human, institutional, and infrastructural capacity to help societies develop secure, stable, and sustainable

economies, governments, and other institutions through mentoring, training, education, physical projects, the infusion of financial and other resources, and, most importantly, the motivation and inspiration of people to improve their lives. While Southwell et al. (2005) stated that capacity building is more than training programmes, but based on needs analysis and audits of capability and potential. They stressed that it requires the design of strategic interventions that employ and challenge the enhancement of strengths, exploit opportunities, confront constraints and supplement gaps and limitations. Fullan (2000) applied the term capacity building to education, stating that capacity building encompasses investment and activities that range from training for local school councils through redesign of initial teacher education to the creation of professional learning communities inside and outside school. Other definitions were given by Fort (1999), Etuk (2004) and Ushie (2004). Whatever meaning is given to capacity building, what is most important is its efficacy which must be evaluated to make appropriate decision(s).

In Nigeria, university education commenced when the University College of Ibadan was established in January 1948 as a College of the University of London and became independent of in 1962 as University of Ibadan (Ogunu, 2013). Thereafter, more universities were established by Federal and State governments, and more recently by private individuals and corporate bodies. Presently, there are 36 Federal, 37 State and 45 privately owned universities in the country. Of these, only about 31% are running close to thirty (30) engineering and technological based courses with various levels of accreditation (NUC, 2012).

Nevertheless, a number of factors have been identified as challenges facing universities in capacity building of the students generally. In the work of Akintoye (2008), inadequate funding of universities, lack of adequate

infrastructure and shortage of staff were some of the factors identified as challenges facing capacity building in Nigerian universities. However, in his study he did not address the peculiarity of engineering students. Similarly, Akpan and Etor (2012) assessed and studied the challenges of human capacity development in Federal Universities in Akwa Ibom and Cross River States. They concluded that insufficient funding of the universities cum prevalence examination malpractices resulted in poor attitude of students towards learning. Other factors identified included, and not limited to, were poor methods of teaching, poor maintenance of facilities and large population of students (Akpan et al., 2009; Omole, 2009; Tilak, 2009).

This paper presents the results of a survey carried out among the final year engineering students from Obafemi Awolowo University, Ile-Ife and Federal University of Agriculture, Abeokuta, with a view to assessing their capacity at understanding and practising engineering as well as to identify the possible challenges. The results were compared with the philosophy and objectives set by the National University Commission (NUC) for engineering courses. It is expected that the results of the study will give an idea of the capacity building of engineering students in these universities and possibly others.

Methodology

Hypothesis

This survey aims at testing the following hypothesis:

i) That inadequate teaching aids hinder capacity building among engineering students.

ii) That the institutional emphasis affects capacity building among engineering students.

iii) That exposure to industrial experience enhance capacity building among engineering students.

Study areas

Obafemi Awolowo University (OAU), Ile-Ife, and Federal University of Agriculture, Abeokuta (FUNNAB) were selected as the study areas. Both universities are within the South-West geo-political zone of Nigeria. OAU was established in 1962 while FUNAAB started in 1988. The choice of the selection was deliberate. Firstly, the two universities are owned by Federal Government of Nigeria and therefore expected to be relatively better funded compared to those owned by State Governments and private bodies. Secondly, one of the universities (OAU) belongs to the first generation universities while FUNAAB belongs to the new generation. This is to test whether the age of the university has significant effect on their capacity building of engineering students. Table 1 summarizes the engineering programmes that are being run in the universities and their accreditation status since 1990 to date. It is observed that all the engineering programmes of the selected universities have been accredited.

Sample and sampling procedure

The study focused on the final year students (Part V) of different engineering programmes from the selected universities. One hundred and fifty one (151) students from FUNAAB and OAU took part in the survey. Simple random sampling technique was adopted. Final year students were purposely chosen as they were expected to have gone through the rudiments of engineering programmes and were about to graduate into the labour market.

Table 1

Accreditation Status of the Engineering Programmes of the Selected Universit

University	Engineering Programmes	Year of Accreditation Exercise							Maturity Date
		1990	1999 / 2000	2002	2005	2006	2007	2008	
OAU	Agricultural	I	I		I		F		2012
	Chemical	I	I		F		F		2010
	Civil	D	F			F			2011
	Mechanical	I	F			F			2011
	Computer			F			F		2012
	Electrical & Electronics	I	F			F			2011
	Material or Metallurgical.	I	I		I		F		2012
	Food Science & Tech/Food	F	I		F				2010
FUNAAB	Agricultural				I			F	2013
	Civil				I			I	2010
	Electrical & Electronics				I			I	2010
	Mechanical				I			F	2013
	Food Science & Tech/Food				F				2010

I - Interim; D – Denied; F – Full.

Source: NUC (2012).

Data collection and analysis

The instrument for data collection was a structured questionnaire developed by the researchers and titled 'Questionnaire on Capacity Building among Engineering Students'. The questionnaires were structured to retrieve personal information of the students, their interest in engineering courses as well as their performances. The students were asked questions on the extent to which their universities laid emphasis on developing the following qualities: academic. scholarly, intellectual, aesthetics, expressive, creative, critical, evaluative, and analytical. Other questions asked the extent to which their universities laid emphasis on developing vocational and occupational competencies as well as

personal relevance and practical value of their courses. The responses were numbered from 5 to 1, with the highest and lowest points illustrated. Similar ratings were also attached to their experience on "acquiring knowledge and skills applicable to a specific job (vocational preparation)", "acquiring background information and specialization for further education in a professional field", "ability to function with minimal supervision" and "ability to compete with colleagues in Diasporas (abroad)".

The data collected was analysed for descriptive statistics and analysis of variance (ANOVA) was equally conducted using Statistical Package for Social Sciences (SPSS) version 19.0.

Results and discussion

Socio-demographic characteristics of the respondents

Table 2 summarizes the socio-demographic features of the students that took part in the survey. It is shown that out of the one hundred and fifty one (151) students, only 10 were females representing about 6.6% of the population. This is an indication that engineering courses are still sex biased as more males study the profession than their female counterparts. The reason may have been due to the nature of the profession and the belief that it is a man's profession.

The data also suggested that about 98.7% of the students gained admission into universities at the age of 16 years and above while only two (2) must have gained admission below the minimum mandatory age of 16 years. This showed that the right population was selected. As regards place of residence and neighbour during the study, which could have impacted on the capacity development of the students, the results showed that 85 of the students lived on campus and the remaining reside off campus while 52.3% and 44.4% of them lived alone and with other students respectively. The rest (3.3%) lived with their parents.

Table 2

Socio-Demographic Characteristics of Respondents

Variable	n	%
Gender		
Male	141	93.4
Female	10	6.6
Age (years)		
19 or younger	2	1.3
20 - 24	110	72.8
25 – 29	35	23.2
30 or older	4	2.6
Residence		
On campus	85	56.3
Off campus	66	43.7
Reside with whom		
Alone	79	52.3
Other students	67	44.4
Parents	5	3.3

Academic information of the respondents

The relevant academic data of the respondents as given by them are presented in Table 3. One hundred and two (102) students from Obafemi Awolowo University (OAU), Ile-Ife and forty nine from Federal University of Agriculture, Abeokuta (FUNAAB) took part in the survey. This population represents about 30% of the overall students studying engineering in each university. Most of the students (98%) commenced their university education at each of the universities with engineering profession. The survey covered students from seven departments as shown in Table 3.

Furthermore, it is also observed that the respondents were not studying engineering by accident as 98.7% of the students actually chose the profession while only 1.3% were offered engineering by their universities. This observation is further supported when 44.4% and 22.5% of them were

enthusiastic about their course of study and liked it (Table 3). Thus, lack of interest may not likely be responsible for any challenge in developing their capacity for engineering profession as shown in their grades (more than 90% had grade above "C" in their core courses) (Table 3). Many of the respondents spent less than a day (24 hours) in a week on course related activities outside the classroom, suggesting that the students depended more on their lecturers or that they were not fully engaged after classroom.

Table 3

Academic Information of the Respondents

Variable	n	%
University		
FUNAAB	49	32.5
OAU	102	67.5
Commence study at the university		
Yes	48	98.0
No	3	2.0
Department		
Civil	39	25.8
Mechanical	30	19.9
Electrical	25	16.6
Chemical	12	7.9
Material	10	6.6
Computer	13	8.6
Agricultural	22	14.6
Reason for Choosing Engineering Course		
Interest	101	66.9
Advised to choose it	48	31.8
Offered by university	2	1.3
Passion for engineering		
Enthusiastic about it	67	44.4
Like it	34	22.5
Neutral	50	33.1
Hours spent outside the classroom on course related activities per week		
5 or less	86	57.0
6 – 10	44	29.1
11 – 15	12	7.9
> 15	9	6.0
Grades		
A	53	35.1
B,C	88	58.3
Below C	10	6.6

Availability of learning aids

Learning aids are core to training of students at any level of education be it primary, secondary or tertiary. Engineering as a profession is in dire need of adequate and state-of-the art equipment for developing manpower needed to provide engineering services. This study probed the availability of adequate learning aids for capacity development of engineering students. The responses of students are summarized in Table 4. It was observed that about 79.5% of them were of the opinion that their universities lack latest and adequate equipment for practicals and that they engaged in practicals occasionally. However, about 50% of them opined that they engaged in practical often. In order to juxtapose non-availability of equipment and the practicals, it could be that they were engaging in theory of practicals which has almost replaced *real* practicals in most universities.

According to more than 50% of the respondents (Table 4), relevant books were also not available. Though, about 130 students had access to Internet which could serve as alternative source of information for the students, 87.7% of them have to pay for the Internet services which were either provided by the university (47%) or through personal modem (43.7%). It is shocking that about 6.6% never used the Internet. Perhaps, if the university had provided the Internet services for free this might not have occurred. A major contributing factor to this problem is inadequate funding as also identified by Akintoye (2008) and Tilak (2009).

On the use of engineering application software, 87.4% of the students had access to them but only 76.2% could use them proficiently while about 72.8% had personal computers (PCs), despite the directive of the Council for Regulation of Engineering in Nigeria (COREN) that at least each at Part III

engineering student must have a PC. However, of the appreciable number of students that could use engineering application software, about 64% learnt them as a personal effort.

Effect of Students Industrial Work Experience Scheme (SIWES) on capacity building of engineering students

The Students Industrial Work Experience Scheme (SIWES) is the accepted skills training programme, which forms part of the approved Minimum Academic Standards in the various degree programmes for all Nigerian Universities. It is aimed at providing an avenue for students to acquire industrial skills and experience in their course of studies amongst other objectives.

The scheme is also in tune with the philosophy of engineering discipline as provided by the National Universities Commission (NUC). The relevant part of the philosophy states that engineering and technology education should be geared towards:

i) The development of a thorough practice in engineering and technology training;
ii) Broad–based training in general engineering and technology at the early stages of the programme;
iii) Practical application of engineering, technology and manufacturing processes (NUC, 2007, p. 7).

Table 4

Respondents' Views on Availability of Learning Aids

Variable	n	%
Personal Computer		
Yes	110	72.8
No	41	27.2
Total	**151**	**100.0**
Access to engineering application software		
Yes	132	87.4
No	19	12.6
Total	**151**	**100.0**
Can you use the software proficiently?		
Yes	115	76.2
No	36	23.8
Total	**151**	**100.0**
Where did you learn the use of the software?		
University	55	36.4
Personal	96	63.6
Access to Internet		
Personal	66	43.7
University for fee	71	47.0
University for free	4	2.6
Never	10	6.6
Availability of current, relevant and adequate textbooks		
Yes	69	45.7
No	82	54.3
Current and adequate equipment for practicals		
Yes	31	20.5
No	120	79.5
Frequency of practicals		
Very often	44	29.1
Often	38	25.2
Occasionally	69	45.7
None	0	0

The students' views on the relevance of SIWES to their capacity building as engineering students are presented in Table 5. Almost all of them (99.3%) did their industrial training in relevant industries while more than 70% believed that it had aided their understanding of the core courses in their chosen field of

engineering. Analysis of variance (ANOVA) conducted on the data showed that SIWES had significant effect on the understanding of the students' core courses ($p<0.005$).

To support this assertion further, rating of their understanding of core courses without SIWES indicated that an insignificant number (3.3%) understood their core courses without SIWES while remaining affirmed that SIWES was relevant at different degrees (Table 5).

Table 5

Respondents' views on Relevance of SIWES

Variable	n	%
Relevance of place of industrial training to course of study		
Very relevant	112	74.2
Relevant	34	22.5
Somewhat relevant	4	2.6
Never relevant	1	0.7
Usefulness of SIWES in better understanding your core courses		
Very useful	78	51.7
Useful	33	21.9
Not really	5	3.3
Never useful	35	23.2
Rate your understanding of your core course without SIWES		
< 10%	5	3.1
10 - 29%	17	11.3
30 - 49%	83	55.0
50 - 69%	41	27.2
> 70%	5	3.3

Effect of university core values on respondents' capacity development

Table 6 presents the rating laid on emphasis on capacity development by the university. Apart from "developing vocational and occupational competence" and "personal relevance and practical values of courses", which were rated as low as 2.33 on the average, all other core values were rated relatively higher

(above 3). This showed that less emphasis is laid on vocational and entrepreneurial skills, which could be a result of inadequate exposure of the students to practicals. The likely implication is that graduates of engineering may not be employable and employers will expend more resources to re-train them to possess these needed skills that they ought to have acquired right from the universities. In order to address the situation, the universities need to lay more emphasis on vocational and practical skills.

Table 6

Views of the Respondents on the University's Emphasis

University's Emphasis	Frequency (Percentage) Ratings				
	1	2	3	4	5
Developing academic, scholarly, and intellectual qualities	2 (1.3)	4 (2.6)	64 (42.4)	34 (22.5)	47 (31.1)
Developing aesthetics, expressive and creative qualities	4 (2.6)	23 (15.2)	44 (29.1)	25 (16.6)	53 (35.1)
Developing critical, evaluative, and analytical qualities	2 (1.3)	8 (5.3)	45 (29.8)	64 (42.4)	32 (21.2)
Developing vocational and occupational competence	59 (39.1)	22 (14.6)	44 (29.1)	13 (8.6)	13 (8.6)
Personal relevance and practical value of your courses	40 (26.4)	46 (30.5)	32 (21.3)	20 (13.2)	13 (8.6)

Areas of capacity building gained

According to Table 7, more than 70% of the respondents had acquired much of background information and specialization for further education and had potential to present ideas and information effectively but 71.5% of them had acquired little or very little of knowledge and skills applicable to a specific job (vocational preparation). Also, about 60% possessed little or very little skills to function on the field with minimal supervision while more than 50% could not compete well with their counterparts in Diasporas. The reason for this opinion may have been due to minimal exposure to practicals occasioned by inadequate

equipment and other learning facilities. It could also be partly attributed to the environment and teaching methodology. The later reasons could not be established by this study.

Table 7

Areas of Capacity Building Gained by the Respondents

Areas of capacity building gained by students	Frequency (**Percentage**) Ratings			
	Very Much	**Much**	**Little**	**Very Little**
Acquiring knowledge and skills applicable to a specific job (Vocational Preparation)	9 **(6.0)**	34 **(22.5)**	53 **(35.1)**	55 **(36.4)**
Acquiring background information and specialization for further education in a professional field	64 **(42.4)**	41 **(27.2)**	39 **(25.8)**	7 **(4.6)**
Presenting ideas and information effectively when speaking to others	58 **(38.4)**	42 **(27.8)**	45 **(29.8)**	6 **(4.0)**
Learning on your own, pursuing ideas and finding information you need	26 **(17.2)**	42 **(27.8)**	82 **(54.3)**	1 **(0.7)**
Ability to function in my field with minimal supervision	3 **(2.0)**	40 **(26.5)**	70 **(46.4)**	38 **(25.2)**
Ability to compete with colleagues in diasporas (abroad)	6 **(4.0)**	63 **(41.8)**	42 **(27.8)**	40 **(26.5)**

Conclusion

The survey on appraising capacity building of engineering students selected from two Nigerian universities was carried out and concluded as follows:

- Socio-demographic and academic information of respondents showed that they were appropriate for the subject of study.
- There were inadequate learning aids that could be used to enhance capacity development of the students.
- SIWES played a significant role in exposing the students to relevant practical, which aided their understanding of core courses of their field of engineering.

- The survey suggested that the universities, as may be applicable in other universities, did not put much emphasis on the vocational preparation that is highly needed for national development.
- The individual universities did not appreciably influence the responses of the students.

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