

## **Capacity building of electrical/electronic instructors: A sure way of realizing skill training of polytechnic students in Rivers State, Nigeria**

Chijioke P. Okwelle & Offia Tugwell Owo

### ***Abstract***

*The study investigated the capacity building of electrical/electronic instructors as a sure way of realizing skill training of polytechnic students in Rivers State, Nigeria. Descriptive survey design was used for the study whose population comprised 46 instructors from the two state polytechnics in Rivers State. Purposive sampling technique was used to obtain 28 electrical/electronic instructors from the study population as sample. Three research questions guided the study. The instrument used for data collection was the researchers' self-constructed 30-item questionnaire titled "Capacity Building of Instructors for Skill Training Questionnaire (CBISTQ)". The instrument was face and content-validated by three experts in electrical/electronic engineering. The instrument's reliability was ascertained with Cronbach Alpha method and a reliability coefficient of 0.76 was obtained. Mean and standard deviation were the statistical tools used to analyze the research questions. The findings of the study revealed among others that capacity building of polytechnic electrical/electronic instructors enhances the skill training of students. Based on the findings of the study, it was recommended amongst others that Government should ensure continuous professional development of polytechnic electrical/electronic instructors for effective skill training of students in polytechnics in Nigeria.*

**Keywords:** capacity building, instructors, polytechnic, electrical/electronics, skill training

## **Introduction**

All over the world, relevant skills for improved job performance are mainly acquired from technical institutions such as Technical colleges, Colleges of Education (Technical) and Polytechnics. A polytechnic is an educational system that equips an individual for paid employment and self-reliance by providing the learner with the essential skills required in the agricultural, industrial and commercial sectors of the economy for maximum productivity (Oni, 2007). In the words of Oluwole and Lateef (2015), polytechnic is a generic term connoting a non-university higher educational institution whose major goal is to offer different courses in technical subjects, technology, industrial production, agriculture, commerce and communication in addition to the provision of knowledge and skills associated with the handling of relevant tools and equipment for effective development of students via adequate theoretical and practical experience.

Polytechnics provide technology education at tertiary level in Nigeria (Okwelle & Wordu, 2016). The Federal Republic of Nigeria (2013:30) in its national policy on education stated clearly among other goals that polytechnics shall provide the technical knowledge and skills necessary for agricultural, industrial, commercial and economic development of Nigeria; and to give training that impart the necessary skills for the production of technicians, technologists, and other skilled personnel who shall be enterprising and self-reliant. Thus, polytechnic education therefore is aimed at developing technicians and technologists in various vocations and trades such as electrical/electronic engineering technology.

According to the National Board for Technical Education (NBTE) (2006), electrical/electronic engineering technology is one of the accredited programmes in Nigerian polytechnics. It is a professional discipline that generally deals with the study and application of electricity, electronics and magnetism. Some of the major sub-fields of electrical and electronic engineering include electronic engineering, computer engineering, power system engineering, telecommunications engineering, control system engineering, radio frequency engineering, digital signal processing, instrumentation, microelectronics and nanotechnology among others. Thus, electrical/electronic engineering is an engineering field that deals with the study and application of relevant electrical/electronic engineering principles, circuits, systems, tools, and materials for effective engineering system designs and implementation.

In polytechnics, instructions in electrical/electronic engineering technology are given both in theories and practice. While the lecturers teach relevant theoretical contents of the programme, the instructors/technologists oversee the instructional delivery of the practical contents in which the students learn technical skills and competence. However, the graduates of electrical/electronic engineering technology from Nigerian polytechnics of recent have been observed to have acquired little or no practical competence in their chosen fields of specialization. Okwelle and Wordu (2016) posit that the standards of polytechnic education in Nigeria have considerably dropped over the past decades and the technology degree is no longer a sure guarantee of effective practical technical competence. This issue of incompetence limits the students' desire to becoming self-reliant upon graduation. Furthermore, Igberadja (2014) states

that Nigerian graduates do not possess the requisite employable skills due to poor implementation of educational curriculum.

One of the factors that could be responsible for the poor skill acquisition of electrical/electronic students in polytechnics is the issue of inadequate professional development of electrical/electronic instructors. This is because it is from the experience of the instructors that the learners construct their own learning thereby developing requisite skills for productive work. When the instructors are not well-developed professionally, the students will not be competent in their chosen fields as they depend mainly on the instructors' guidance. This issue of poor quality of electrical/electronic engineering graduates from polytechnics in Rivers State therefore motivated the researchers to carry out this study to ascertain how capacity building of polytechnic electrical/electronic instructors can improve students' achievements in Rivers State, Nigeria. Hence, the main purpose of the study is to determine the role of capacity building of electrical/electronic instructors in skill training of students in polytechnics in Rivers State, Nigeria. This study is therefore carried out to achieve three specific objectives in line with the following research questions:

1. What are the telecommunication/control engineering skills needed by electrical/electronic instructors for effective skill training of polytechnic students in Rivers State?
2. What are the electronic engineering skills needed by electrical/electronic instructors for effective skill training of polytechnic students in Rivers State?
3. What are the power system engineering skills needed by electrical/electronic instructors for effective skill training of polytechnic students in Rivers State?

## **Literature review**

The United Nations Education Scientific and Cultural Organization (UNESCO) (2002) views polytechnic education as a segment of the general education that prepares individuals for occupational fields and for effective participation in the world of work; including lifelong learning for responsible citizen preparation, sustainable development promotion, a best method of facilitating poverty alleviation and enables the development of technical and entrepreneurial skills and attitudes in individuals. According to the Federal Republic of Nigeria National Policy on Education (2013) polytechnics are generally established to train and produce skilled manpower majorly in technology, engineering, business management and other related areas for the technological development of the nation. In the same vein, Miller (2011) posits that polytechnic education was formerly restricted to technical education but presently involves the training in the processes of applying both scientific and technological knowledge to solving practical problems of mankind on a daily basis. Ukpai cited in Okwelle & Owo, (2018) views polytechnic education as a type of education resulting in the acquisition of practical and useful skills. Polytechnic education is one aimed at effective training of students for self-reliance and increased productivity in the world of work. However, for the goals of polytechnic education to be achieved, there is need for continuous capacity building of the teachers and instructors for effective instructional delivery in all programmes including electrical/electronic technology.

Capacity building as a concept is defined by Egbo (2011) as the process by which adequate skill, knowledge and expertise is achieved over time by an individual which enables him to become proficient in his job role. Akwegwu, Nwi-ue and

Etukudo-Eyo cited in Uchendu (2015) posit that capacity building is a process of developing and strengthening the skills, instincts, abilities, processes and resources of individuals, organizations and communities in order to survive, adopt and thrive in the fast changing world. Similarly, Chukwu (2009) describes capacity building as the process of developing skills and knowledge needed by groups in order to discharge their duties effectively in the labour market.

According to the United Nations Development Project (UNDP) bulletin (2015), capacity building is a long-term continuing process of development involving all stakeholders including ministries, local authorities, Non-Governmental Organizations, professionals, academics and many more stakeholders which entails the utilization of a country's human, scientific, technological, organizational, institutional resources and capabilities to achieve increased productivity. Furthermore, the World Health Organization (WHO) (2014) describes capacity building as the development and strengthening of human and institutional resources for effectiveness and increased productivity. In the same vein, the United Nations Committee of Experts on Public Administration (UNCEPA) (2006) views capacity building as the ability to perform functions, solve problems and achieve objectives at three levels-individual, institutional and societal.

In the context of this paper, capacity building therefore serves as a process of developing and strengthening the skills, knowledge and expertise of polytechnic electrical/electronic instructors and technologists to enable them discharge their job roles effectively. Capacity building is aimed at identifying the challenging areas faced by the instructors with a view to making improvement on such for the effective training of the students.

Therefore, the primary need to build the capacity of electrical/electronic instructors in polytechnics is to strengthen their practical competence so as to enhance their productivity which will ultimately lead to effective training of the students. Some of the ways by which capacity building of instructors in electrical/electronic engineering in polytechnics could be achieved include in-service training, seminars, conferences, workshops, symposia, membership of professional associations, and career advancement via enrolment in educational programmes at postgraduate levels among others.

## **Methods**

The study was carried out in Rivers state, Nigeria. Descriptive survey design was used for the study whose population comprised 46 instructors from the two state-owned polytechnics in Rivers State namely; Ken Saro-Wiwa Polytechnic, Bori and Captain Elechi Amadi Polytechnic, Rumuola, Port Harcourt. Purposive sampling technique was used to obtain 28 electrical/electronic instructors from the study population as sample. Three research questions guided the study. The instrument used for data collection from the respondents was the researchers' self-constructed 30-item questionnaire titled "Capacity Building of Instructors for Skill Training Questionnaire (CBISTQ)" constructed on a 5-point Likert scale of strongly agree, agree, undecided, disagree and strongly disagree corresponding to numerical values of 5,4,3,2 and 1 respectively. The instrument was face and content-validated by two experts in electrical/electronic engineering from Ken Saro-Wiwa Polytechnic, Bori and Captain Elechi Amadi Polytechnic, Rumuola, Port Harcourt, Rivers State. The instrument's reliability was ascertained with Cronbach Alpha correlation method and a

reliability coefficient of 0.76 was obtained which further attest to the fact that the instrument is reliable. The study instrument was distributed to the respondents by the researchers and all duly filled, retrieved and used for data analysis. Mean and standard deviation are the statistical tools used to analyze the research questions. Thus, it was decided that an item with a calculated mean value equal or greater than 3.00 is considered as ‘Agree’ while an item is regarded as ‘Disagree’ if its mean value falls below the criterion mean of 3.00. Standard deviation was used to show homogeneity in the responses of the respondents

## Results

The results were presented according to the three research questions that guided the study in Tables 1 – 3.

**Research question 1:** What are the telecommunication/control engineering skills needed by electrical/electronic instructors for the skill training of polytechnic students in Rivers State?

**Table 1: Telecommunications and control skills needed by electrical/electronic instructors**

| S/N | Item Statement   | $\bar{X}_1$ | SD   | Decision |
|-----|--|-------------|------|----------|
| 1   | Electrical/electronic instructors need to possess basic telecommunication engineering skills | 4.68        | 0.88 | Agree    |
| 2   | Electrical/electronic instructors need instrumentation skills.                               | 3.88        | 0.87 | Agree    |

|    |   |      |      |       |
|----|---|------|------|-------|
| 3  | Electrical/electronic instructors need to be skillful in measuring electrical/electronic quantities.          | 4.09 | 0.90 | Agree |
| 4  | Instructors need to be skillful in control and communication equipment installation.                          | 3.65 | 0.92 | Agree |
| 5  | Electrical/electronic instructors need to be skilled in the area of control/communication equipment testing.  | 3.58 | 0.81 | Agree |
| 6  | Electrical/electronic instructors need to be skillful in the application of digital communication principles. | 4.12 | 0.93 | Agree |
| 7  | Electrical/electronic instructors need to be skillful in the design of feedback control system.               | 4.15 | 0.82 | Agree |
| 8  | Electrical/electronic instructors need adequate skills in information and communication technology            | 3.92 | 0.98 | Agree |
| 9  | Instructors need to acquire digital signal processing skills.   | 4.29 | 0.84 | Agree |
| 10 | Electrical/electronic instructors need skills in instrument calibration.                                      | 3.88 | 0.86 | Agree |

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|----|--|------|------|-------|
| 11 | Electrical/electronic instructors need data transmission skills. | 3.96 | 0.77 | Agree |
|----|--|------|------|-------|

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From the Table 1, the respondents agreed that all the items (mean values greater than 3.00) are telecommunication and control engineering skills which electrical/electronic instructors need for effective skill training of students. The standard deviation (SD) of the items ranged from 0.77 to 0.98, suggesting that the respondents were close in their opinions

**Research question 2:** What are the electronic engineering skills needed by electrical/electronic instructors for the skill training of polytechnic students in Rivers State?

**Table 2: Electronic Engineering Skills needed by Electrical/Electronic Instructors**

| S/N | Item Statement   | $\bar{X}_1$ | SD   | Decision |
|-----|--|-------------|------|----------|
| 12  | Electrical/electronic instructors need radio and television maintenance and repair skills. | 4.02        | 0.93 | Agree    |
| 13  | Electrical/electronic instructors need electronic circuit troubleshooting skills.          | 3.92        | 0.86 | Agree    |
| 14  | Electrical/electronic instructors need general workshop safety skills.                     | 4.03        | 0.81 | Agree    |
| 15  | Electrical/electronic instructors need skills in electronic circuit analyses.              | 4.12        | 0.88 | Agree    |

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|    |  |      |      |       |
|----|--|------|------|-------|
| 16 | Electrical/electronic instructors need skills in building electronic circuits such as oscillators and amplifiers.        | 4.03 | 0.79 | Agree |
| 17 | Electrical/electronic instructors need skills in digital electronics design and analyses.                                | 4.20 | 0.85 | Agree |
| 18 | Electrical/electronic instructors need skills in electronic communications.  | 3.58 | 0.89 | Agree |
| 19 | Electrical/electronic instructors need skills in using basic electronic devices like oscilloscope and signal generators. | 3.73 | 0.97 | Agree |
| 20 | Electrical/electronic instructors need skills in engineering calculations.   | 3.76 | 0.51 | Agree |

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From Table 2, all the items recorded a mean value above the criterion mean of 3.00. This implies that the respondents believed that all the stated items represented electronic engineering skills needed by electrical/electronic instructors for the effective skill training of polytechnic electrical/electronic students. The standard deviation (SD) of the items which ranged from 0.51 to 0.92 indicates closeness in the opinions of both categories of respondents

**Research question 3:** What are the power system engineering skills needed by electrical/electronic instructors for the skill training of polytechnic students in Rivers State?

**Table 3: Power System Engineering Skills needed by Electrical/Electronic Instructors**

| S/N | Item Statement  | $\bar{X}_1$ | SD   | Decision |
|-----|---|-------------|------|----------|
| 21  | Electrical/electronic instructors need skills in the use of computer aided drafting tools for electric circuit diagrams and analyses.       | 4.65        | 0.65 | Agree    |
| 22  | Electrical/electronic instructors need skills in the use of power system circuit and simulators for electrical design testing and analyses. | 3.94        | 0.85 | Agree    |
| 23  | Electrical/electronic instructors need transformer installation skills.   | 4.22        | 0.74 | Agree    |
| 24  | Electrical/electronic instructors need skills in the application of power electronic devices for power conversion.                          | 3.89        | 0.93 | Agree    |
| 25  | Electrical/electronic instructors need skills in electrical power system protection.  | 3.98        | 0.76 | Agree    |
| 26  | Electrical/electronic instructors need troubleshooting (fault   | 4.68        | 0.58 |          |

|    |  |      |      |  |       |
|----|--|------|------|--|-------|
|    | tracing) skills.   |      |      |  | Agree |
| 27 | Electrical/electronic instructors need skills in electric machines usage and applications.                     | 3.88 | 0.81 |  | Agree |
| 28 | Electrical/electronic instructors need skills in industrial, commercial and domestic electrical installations. | 4.02 | 0.97 |  | Agree |
| 29 | Electrical/electronic instructors need power system generation, transmission and distribution skills.          | 4.16 | 0.87 |  | Agree |
| 30 | Electrical/electronic instructors need skills for effective use of electrical tools to avoid electric shock.   | 4.04 | 0.94 |  | Agree |

Table 3 above indicates that the respondents agreed with all the stated items as being electrical power system engineering skills needed by instructors for effective skill training of polytechnic electrical/electronic students. Standard deviation values ranging from 0.58 to 0.97 showed homogeneity in the responses of respondents.

## Discussion

The finding of the study as revealed in Table 1 shows that capacity building of electrical/electronic instructors in telecommunication and control engineering will enhance their technical skills which in turn bring about improvement in the

quality of skill training given to students of telecommunication and control engineering. This finding is in line with Chukwu (2009) who posits that capacity building strengthens the skills and technical competence of an employee thereby helping them to discharge their duties effectively in the labour market. Similarly, the finding corroborates Egbo (2011) who describes capacity building as a process by which adequate skills, knowledge and expertise is achieved over time by an individual through continuous professional development thereby becoming proficient in his job role.

The finding from Table 2 reveals that capacity building of electrical/electronic instructors in polytechnics will enhance the quality of skill training given students who specialize in electronic engineering. This finding is supported by the World Health Organization (WHO) (2014) who states that capacity building strengthens and develops human and institutional resources for job efficiency and effectiveness. This implies that the more professionally developed are the instructors, the better skill training they will impart to students and subsequently, the higher the level of practical skills acquired by the students. Also, this finding is in line with Johnson (2014) who in his findings reports that providing high quality professional development for teachers may be the most important thing schools can do to improve students' learning.

The finding of the study as presented in Table 3 reveals that building the capacity of electrical/electronic instructors in polytechnics will make them better equipped for the job role of training students in the practical aspect of their electrical power system engineering. This finding is similar to the assertion of Akwegwu et al. in Uchendu (2015) that capacity building strengthens the skills, instincts, abilities, processes needed to

thrive and succeed at work. Similarly, this finding agrees with Peretomode and Peremode (2005) who saw capacity building as any planned activities that focus on increasing and enlarging the capabilities of employees so that they can successfully have greater or assume higher positions in the organizational hierarchy to better handle current responsibilities.

As the saying goes, a teacher cannot give what he/she does not have; it follows then that training the trainer (instructors) will guarantee effective skill training of the trainee (students). Therefore, capacity building of polytechnic instructors is crucial in the development of practical competence of electrical/electronic engineering students who shall be required to perform various practical job roles in the industries upon graduation as well as setting their own businesses. However, for polytechnic education to be effective in the discharge of one of its core mandates of providing the industry with skilled manpower in electrical/electronic technology and other technological fields, there is need for the instructors to embrace continuous lifelong learning for their professional development in order to enhance their capacity for quality instructional delivery to the students especially now that the world is technologically changing fast. Since the instructors are the main people who facilitate learning when it comes to practical work, it implies that students' success or failure to acquire and develop requisite life skills for the world of work to a large extent depends on the instructors' capability to offer effective practical training to students.

## **Conclusion**

Teachers are the pivot of the education system at any level. They facilitate effective teaching and learning activities in schools. Electrical/electronic instructors who are practical teachers in

polytechnics are the pivot of hands-on training in polytechnics. It is believed that as continuous professional training and retraining are given to these teachers, the better their overall job effectiveness capable of enhancing students' achievement. Thus, it becomes imperative to build the capacity of instructors for increased productivity. This indeed, proves to be a sure way of realizing effective skill training of electrical/electronic engineering students in Nigerian polytechnics.

### **Recommendations**

Based the findings of the study, the following recommendations were suggested:

1. Government should ensure continuous mandatory professional development of electrical/electronic instructors to promote the effective training of polytechnic students in Nigeria.
2. Government should provide adequately equipped electrical/electronic laboratories to be used by these professionally trained teachers for effective skill training of electrical/electronic engineering students in Nigerian polytechnics.

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