



Electrical Machines Skills Needed by Polytechnic Graduates for Employment in Oil and Gas Industry in Niger-Delta, Nigeria

Prof. Paulinus Chijioke Okwelle, Dr. Offia Tugwell Owo and Ibekwe, Chima Christian

Department of Vocational and Technology Education, Rivers State University P.M.B. 5080,
Port Harcourt, Nigeria

Corresponding author details: email: tugwelloffia@gmail.com, offia.owo1@ust.edu.ng
(Tel: +2347035477126); ORCID: 0000-0001-8754-3531.

Abstract: The study was conducted to assess the electrical machines skills needed by polytechnic graduates for employment in oil and gas industry in Niger-Delta, Nigeria. A total of 82 electrical supervisors and graduates working in oil and gas industry were purposively sampled and used for the study which was guided by a research question and hypothesis. A 39-item, self-structured questionnaire designed on a 5-point Likert scale was used to gather data from the respondents. The instrument was face and content-validated by two electrical engineering experts from oil and gas industry and one expert in measurement and evaluation from Rivers State University. The reliability of the instrument was established using Cronbach Alpha having yielded a reliability coefficient of 0.83. Mean and standard deviation were used to answer the research question while t-test was used to test the null hypothesis at 0.05 level of significance. The study found that polytechnic graduates need electrical machines skills to be able to represent energy balance block diagrams, connect transformer for star-star, star-delta, delta-delta operations, carry out transformer winding operations, carry out open circuit tests on synchronous machines among others in the oil and gas industry. Based on the findings of the study, it was recommended among others that government should adequately provide modern engineering and technology tools and gadgets in polytechnics, restructure the Student Industrial Work Experience Scheme, as well as promote industry-institution synergy in the training of engineering students to produce quality graduates for the oil and gas industry.

Key words: Electrical machines skills, unemployment, oil and gas industry, polytechnic, electrical/electronic graduates.

Introduction

Globally, one major threat to the economies of developing countries is unemployment. Unemployment represents a situation whereby the active workforce of a nation is without jobs. The active workforce in Nigeria is made up of youths who formed about 2/3rd of Nigeria's population. According to the National Population Commission (NPC) (2007), about 80 million youths are unemployed in Nigeria. Youth unemployment in Nigeria comes as result of inadequate skilled personnel capable of meeting employers' demands (Omoniwa & Adedapo, 2017). Unemployment pictures a scenario where persons of workable age who are eager to work in order to earn a living could not secure job

placements. Supporting this assertion, Owo and Ajie (2020) submit that presently, unemployment rate in Nigeria has increased significantly due to the aftermath effects of the corona virus pandemic. In the words of Owo (2020), Nigerian youths including graduates who are in dire need of jobs are adversely hit by unemployment due to poor skills acquisition. In other words, to secure job placements in the industry, specifically, graduate youths need to acquire salient skills needed in the industry for productive performance. According to Owo and Ajie (2020), poverty and unemployment which are two monsters causing many Nigerians to go through excruciating situations can be addressed if majority of Nigerians especially the youths are willing to acquire relevant skills.

Skills refer to special abilities or expertise developed by someone for performance improvement on a given job role. In the same vein, Lindner and Dooley (2002) see skill as capacity to apply present competence to execute observable actions yielding some observable outcomes. In the words of Okorie (2000), skill denotes the expertise, dexterity and tact with which one controls situations in the field of work. Furthermore, Osinem (2008) opines that skill is an individual's capacity to control elements of behaviour, thinking and feeling within specified contexts and within particular task domains to achieve meaningful results at work. Also, Ekezie and Owo (2019) posit that skills comprise special abilities gained through committed learning and practice through quality education and training which enables an individual to be proficient at work in any chosen vocation. Thus, from the forgoing, skills could be seen as effective tools for excellent job performance in the industry and as such graduates need to acquire as many relevant skills possible in preparation for an exciting career in the industry. One industry where Nigerian graduate needs to acquire relevant skills for employment is the oil and gas.

Oil and gas industry is any industry supplying energy. Oil and gas industry which came to limelight due to the discovery of petroleum in 1956 in Oloibiri, a community in present day Bayelsa state Niger-Delta, supplies about 80% of the total revenue accrued to the Nigeria's Government. According to Chizoba, Gwen and Chike (2012), the Nigerian oil and gas industrial operations yield much revenue to the Nigerian Government thereby served as the prime mover of the nation's economy. Correspondingly, Atakpu (2007) posits that oil and gas alone generated about \$600 billion to the Nigerian government. As prominent as this industry appears, skills are needed to effectively carry out exploration and production duties. Thus, the oil and gas industry in Nigeria always require the services of skilled graduates of engineering for a rewarding career in the industry. One key area in which skills are sought in the oil and gas sector is electrical machines installation, operation and maintenance.

Thus, electrical engineering graduates from polytechnics who acquired relevant technical skills in electrical motor operation, coil winding, motor speed control, transformer installation and operation, maintenance services among others are always in high demand in the oil and gas industry as these skills are often needed for productive work. This is because polytechnics are special institutions that train local manpower in skills relevant in local industries for the technological and economic advancement of the nation. Graduates of electrical/electronic engineering technology from polytechnics are those who received standard technical training in theories and practice of electrical engineering technology

and consequently, specialized in any one of the numerous areas of electrical/electronic engineering technology such as power system engineering, electrical machines, telecommunications, electronics and computer engineering, instrumentation and control engineering, acoustic engineering and automation technology. Fresh graduates of electrical/electronic engineering from Nigerian polytechnics need to develop skills and proficiency in engineering design, technical drawing, mathematical modeling, basic engineering software like MATLAB, tools and machines usage, instrument calibration, coil winding, digital signal processing, electronic components maintenance and repair, electrical maintenance and repairs, electrical design and drafting, computer graphics, data communication and networking, electronic system design, measuring instruments, information and communication technology, logic, innovation, creativity and among others (NBTE, 2001). According to Owo and Isaac (2020), the electrical/electronic engineering graduates from Nigerian polytechnics are expected to acquire adequate technical competencies in telecommunications, instrumentation, data and information technology, digital electronics, power system technology, electrical machines, power electronic devices, automation, control engineering, among others. This becomes crucial as electrical technologists with expertise in these areas are highly needed for the implementation of the local content policy in oil and gas industry. Therefore, fresh electrical graduates at the point of entry into oil and gas industry for a rewarding career need to have awareness of the skills demand and safety rules applicable within the work environment of the oil and gas industry in order to function effectively in their roles comprising designing of a complex electrical system for oil and gas facilities, carrying out electrical maintenance and operations on an oil and gas facility, executing electrical project engineering or site management roles available in a wide variety of locations. Thus, with relevant electrical machine skills, graduates can be gainfully employed in the oil and gas industry for a rewarding career.

Electrical machines skills are technical skills required for installing, operating and maintaining of electrical systems and devices for optimal workability. Electrical engineering graduates from Nigerian polytechnics are therefore taught to gain pertinent theoretical awareness and practical skills in electrical machines operation to work productively in the industries (NBTE, 2001). Consequently, the National Board for Technical Education (2001) clearly indicates the electrical machines skills required of graduates of electrical engineering from Nigerian polytechnics by stating that electrical graduates need skills in representing the energy balance block diagrams, connecting three single phase transformer star to star operation, star to delta operation, delta to delta operation, sketching the arrangement of three transformer windings, connecting single phase transformers, connecting three phase transformer, conducting heat run test on two single phase transformers, conducting efficiency tests on transformers, executing transformer parallel operations, conducting experiments on induction, interaction and alignment principles of electrical machines, representing the equivalent circuits of synchronous machines, drawing phasor diagrams of synchronous machines working as a motor, drawing the phasor diagrams of synchronous machines working as a generator, sketching the phasor illustration of electrical machines having salient poles, determining open-loop characteristics of synchronous machines, determining the short circuit characteristics of synchronous machines among others. Therefore, with these skills set,

electrical graduates can work excellently in the oil and gas sector. These skills are generally referred to as work skills since they are needed to accomplish tasks.

Work skills are superior set of technical skills applicable in the industry which enable an employee to be productive in the world of work (Ademu, Adah & Atsumbe, 2018). Skillful feats demand the application of already acquired knowledge and competence through training to achieving optimistic outcomes including the acquisition of new knowledge. Thus, a skilled worker is a valuable asset to any organisation as such fellow works meticulously towards the realization of the organizational cardinal objectives. Thus, technical or career skills cover any skill sets, knowledge and competencies that can enhance the capacity of prospective employee to secure, retain and progress at work.

Statement of the Problem

Prior to this time, Nigerian polytechnics produced skilled engineering technologists who served the nation's industries extraordinarily. However, the reverse is the case presently as most Nigerian graduates from polytechnics are found to be lacking in skills (Ejiofor, 2016). Graduates of electrical/electronic technology from polytechnics lack relevant work skills for job placements (Ismail & Mohammed, 2015). The issue of lack of technical skills among graduates is one major reason for ever-increasing unemployment rate in Nigeria. Skills deficiency syndrome among electrical/electronic engineering graduates paves way for non-Nigerians to dominate the nation's petroleum sector thereby impoverish the indigenes (Ojerinde, 2015). Corroborating this assertion, Ari (2020) reports that the disparity between the school curriculum and the actual needs of the local industry in Nigeria results to a situation whereby polytechnic engineering graduates could not secure jobs in oil and gas industry. This observed missing link therefore necessitates this study titled 'Electrical Machines Skills needed for Employment in Oil and Gas Industry in Niger-Delta, Nigeria'.

Purpose of the Study

The purpose of the study is to determine the electrical machines skills needed for employment in oil and gas industry in Niger-Delta, Nigeria. Specifically, the study was conducted to:

Find out the electrical machines skills needed by polytechnic electrical/electronic engineering graduates for employment in oil and gas industry in Niger-Delta, Nigeria.

Research Question

What are the electrical machines skills needed by polytechnic electrical/electronic engineering graduates for employment in oil and gas industry in Niger-Delta, Nigeria?

Hypothesis

There is no significant difference in the mean responses of electrical supervisors and graduates on electrical skills needed by electrical/electronic engineering graduates for employment in oil and gas industry in Niger-Delta, Nigeria.

Methods

The research design adopted in this study was descriptive survey design. A descriptive survey study is a type of study in which data from a large sample drawn from a given

population were collected and certain features of the sample as they are at the time of the study and which are of interest to the researcher were described without altering any independent variable of the study (Nwankwo, 2016). Purposive sampling was used to obtain 89 electrical/electronic technologists consisting of (27 supervisors and 62 graduates) who currently work in Green Energy International Ltd., AMNI and Total Production and Exploration companies. One research question and one hypothesis guided the study. The instrument for data collection was a 40-item self-structured questionnaire titled "Electrical Machines Skills needed for Employment Questionnaire (EMSEQ)". The questionnaire was designed on a 5-point Likert Scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD) having numerical values of 5, 4, 3, 2 and 1 respectively. The instrument was first and content validated by two experts in electrical engineering who work as electrical supervisors in oil and gas industry and another expert in measurement and evaluation from Rivers State University Port Harcourt. The reliability of the instrument was ascertained using Cronbach's alpha method having yielded a reliability index of 0.83. A total of 89 copies of the questionnaire were administered to the respondents by the researchers and one other research assistant. The research assistant was properly educated on how to support the researchers in the administration and retrieval of the instrument after duly filled. From the 89 copies of the questionnaires distributed, 82 was retrieved and used for data analysis. Mean and standard deviation are descriptive statistical tools used to answer the research question. Statistical package for social sciences (SPSS) version 20.0 was used to perform all statistical analysis on the hypothesis using t-test. For the research question, decision to accept or reject any item in the questionnaire was based on the Mean of the item. Any item in the questionnaire with a calculated Mean value equal to or greater than 3.00 was accepted, while any item with a calculated Mean value less than 3.00 was rejected. Standard deviation values close or wide apart were used to determine homogeneity in the responses of the respondents. The hypothesis was tested at .05 level of significance using t-test. The decision for accepting or rejecting the null hypothesis was as follows: If the calculated value of t (t_{cal}) is equal or less than the critical value of t (t_{crit}), the hypothesis will be accepted otherwise, rejected.

Result

The findings of the study were stated in accordance with the research question and hypothesis that guided the study as follows:

Research Question

What are the electrical machines skills needed by polytechnic electrical/electronic engineering graduates for employment in oil and gas industry in Niger-Delta, Nigeria?

Table 1: Mean Responses of Electrical Supervisors and graduates on Electrical Machines Skills Needed by Polytechnic Electrical/Electronic Graduates for Employment in Oil and Gas Industry in Niger-Delta, Nigeria

S/N	Item Statement	Supervisors (N ₁ = 24)			Graduates (N ₂ = 58)		
		\bar{X}_1	SD ₁	RMK	\bar{X}_2	SD ₂	RMK
1	Skills in representing energy balance block diagrams.	4.53	0.51	Agreed	4.69	0.47	Agreed
2	Skills in connecting three single phase transformer for Star-Star operation.	4.59	0.51	Agreed	4.67	0.48	Agreed
3	Skills in connecting three single phase transformer for Star-Delta operation.	4.71	0.47	Agreed	4.83	0.38	Agreed
4	Skills in connecting three single phase transformer for Delta-Delta operation.	4.53	0.51	Agreed	4.83	0.38	Agreed
5	Skills in undertaking the connection of three transformer windings.	4.53	0.62	Agreed	4.72	0.45	Agreed
6	Skills to practically demonstrate single phase transformer connections.	4.59	0.62	Agreed	4.72	0.51	Agreed
7	Skills to practically demonstrate three phase transformer connections.	4.41	0.51	Agreed	4.53	0.56	Agreed
8	Skills to carry out heat run test on two single phase transformers.	4.35	0.49	Agreed	4.25	0.60	Agreed
9	Skills to carry out regenerative efficiency test on two single phase transformers.	4.18	0.81	Agreed	4.67	0.53	Agreed
10	Skills in executing parallel operations in transformers.	4.35	0.70	Agreed	4.67	0.48	Agreed
11	Skills to connect three single phase transformers to form a single-three phase transformer.	4.24	0.56	Agreed	4.44	0.69	Agreed
12	Skills in experimenting on the principles of electrical machines.	4.12	0.70	Agreed	4.58	0.55	Agreed
13	Skills in carrying out energy conversion.	4.35	0.49	Agreed	4.61	0.55	Agreed
14	Skills in drawing the development diagrams of electrical windings.	4.29	0.59	Agreed	4.36	0.76	Agreed
15	Skills in representing through drawing, the magnetomotive force (mmf) due to distributed windings using graphical method.	3.88	0.70	Agreed	4.44	0.69	Agreed
16	Skills in interpreting the equivalent circuit of synchronous machines.	4.53	0.62	Agreed	4.75	0.60	Agreed

17	Skills in representing the phasor diagram for synchronous machine operating as a motor.	4.29	0.59	Agreed	4.72	0.45	Agreed
18	Skills in representing the phasor diagram for synchronous machine operating as a generator.	4.18	0.81	Agreed	4.72	0.51	Agreed
19	Skills in drawing the phasor diagrams for salient pole machine.	4.29	0.47	Agreed	4.47	0.56	Agreed
20	Skills in determining the open-circuit characteristics of synchronous machines.	4.29	0.59	Agreed	4.53	0.56	Agreed
21	Skills in determining the short-circuit characteristics of synchronous machines.	3.71	0.69	Agreed	3.94	0.83	Agreed
22	Skills in representing Potier diagram.	3.82	0.73	Agreed	4.08	0.87	Agreed
23	Skills in determining direct axis synchronous reactance.	3.94	0.66	Agreed	4.47	0.61	Agreed
24	Skills in determining the load characteristics of an alternator.	4.06	0.43	Agreed	4.67	0.48	Agreed
25	Skills in carrying out parallel operations of synchronous machines.	3.94	0.75	Agreed	4.47	0.61	Agreed
26	Skills in representing the effect of variation of excitation of synchronous generator connected to an infinite bus-bar.	4.35	0.61	Agreed	4.44	0.61	Agreed
27	Skills in determining the torque angle characteristics of synchronous generator.	4.12	0.49	Agreed	4.28	0.78	Agreed
28	Skills in determining the power angle characteristics of synchronous generator.	4.18	0.81	Agreed	4.39	0.64	Agreed
29	Skills in drawing the operating chart for synchronous machines.	3.82	0.64	Agreed	4.17	0.70	Agreed
30	Skills in drawing the winding arrangement for charge motor.	4.18	0.81	Agreed	4.39	0.60	Agreed
31	Skills in drawing the winding arrangement of the universal motor.	4.00	0.50	Agreed	4.69	0.52	Agreed
32	Skills in determining the rise in temperature in an electrical machine.	4.06	0.66	Agreed	4.58	0.65	Agreed
33	Skills in determining the cooling curves of an electrical machine.	4.24	0.56	Agreed	4.42	0.60	Agreed
34	Skills in determining speed control of direct current (D.C.) motor using Ward Leonard system.	4.06	0.66	Agreed	4.58	0.55	Agreed
35	Skills in determining the characteristics of speed control systems.	4.47	0.62	Agreed	4.26	0.61	Agreed
36	Skills in determining the various speeds of an A.C. commutator.	4.30	0.72	Agreed	4.75	0.50	Agreed
37	Skills in determining the torque/speed characteristics of charge motor	4.29	0.69	Agreed	4.61	0.64	Agreed

38	Skills in determining the speed control of A.C. motors using thyristors.	4.35	0.70	Agreed	4.72	0.51	Agreed
39	Skills in determining the speed control of D.C. motors using thyristors.	4.35	0.70	Agreed	4.83	0.38	Agreed
Average Mean/SD		4.2	0.6			0.5	
		4	2		4.54	8	

Source: *Researchers' Field Result; 2022*

The result in Table 1 shows the response of electrical supervisors and graduates on electrical machines skills needed by polytechnic electrical/electronic graduates for employment in oil and gas industry in Niger-Delta, Nigeria as well as their decisions on each item. The result revealed that electrical supervisors and graduates' responses show that all the items are electrical machines skills needed by polytechnic electrical/electronic graduates for employment with average mean values of 4.24 and 4.54 for electrical/electronic supervisors and graduates respectively which are both greater than 3.00 being the cut-off point. The standard deviation values ranging from 0.00 to 0.99 indicate that the respondents were close in their responses while standard deviation values of 1.00 and above implies that the respondents (electrical supervisors and graduates) were far apart in their views.

Hypothesis: There is no significant difference in the mean responses of electrical supervisors and graduates on electrical machines skills needed by polytechnic electrical/electronic graduates for employment in oil and gas industry in Niger-Delta, Nigeria.

Table 2: t-Test Analysis on Electrical Machines Skills Needed by Polytechnic Electrical/Electronic Graduates for Employment in Oil and Gas Industry in Niger-Delta, Nigeria

S/N	\bar{X}	SD	N	df	α	t_{cal}	t_{crit}	Remark
Supervisors	4.24	0.62	24	80	0.05	2.00	1.67	Rejected
Graduates	4.54	0.58	58					

Source: *Researchers' Field Result; 2022* Accept H_0 if $t_{cal} \leq t_{crit}$, Otherwise Reject H_0 .

From Table 2, the calculated mean was greater than the value obtained from the table. Therefore, as calculated value of t ($t_{cal} = 2.00$) is greater than the critical value of t ($t_{crit} = 1.67$) at .05 level of significance, the null hypothesis is rejected. Thus, there is a significant difference in the mean responses of electrical supervisors and graduates on electrical machines skills needed by polytechnic electrical/electronic graduates for employment in oil and gas industry in Niger-Delta, Nigeria.

Discussion

The finding of the study as indicated in Table 1 reveals that for polytechnic graduates to secure employment in the oil and gas sector, they need to acquire adequate technical skills in line with the present demands of the labour market in oil and gas industry. In other words, electrical/electronic graduates need to acquire skills in representing energy balance block diagrams, connecting three phase single phase transformer windings for star-star, star-delta and delta-delta operations, drawing winding diagrams, determining open-circuit characteristics of synchronous machines, running tests on transformer, installing all kinds of industrial motors among others. This study corroborates the views of Ogwo (2010) that graduates needed technical skills in operating industrial production engines, equipment and machines in oil and gas industry. This finding was further supported by the National Board for Technical Education (NBTE) (2001) which states that electrical engineering graduates from Nigerian polytechnics are expected to develop relevant skills in electrical machines installation, operation and maintenance as these skills are needed to drive the technological advancement of Nigeria as applicable in many industries including oil and gas which demands the services of indigenous skilled electrical/electronic engineering graduates. This finding however disagrees with Omoniwa and Adedapo (2017) who emphasize that Nigerian graduates have all it takes to secure quality employment in the industry. The implication of this assertion is that, Nigerian graduates possessed the needed technical skills for job placement in the world of work upon graduation. Furthermore, the study disagrees with Agbonna, Yusuf, Ajidagba and Olumorin (2009) who posit that Nigerian graduates were employable. This means they possessed the requisite job specific skills needed for employment and as such can be employed in the oil and gas industry in Nigeria.

Conclusion

In the industrial world, skills are more preferred to paper qualifications because the world of work needs to proffer solutions to any observed technical issues capable of halting production processes which only skilled workforce can offer. Electrical machines are key tools for increased productivity in the oil and gas industry as the efficiency of the workforce is enhanced with the acquisition of these skills. Thus, in oil and gas industry, the services of skilled electrical engineers and technologists are greatly needed and for graduates of electrical/electronic engineering to be employed in the industry to perform technical roles, they need to have good knowledge and skills for installing, operating and maintaining electrical machines and devices.

Recommendations

From the findings of the study, the following recommendations are suggested:

1. Government should adequately provide modern engineering and technology tools and gadgets in all accredited polytechnics in Nigeria for the training of polytechnic electrical/electronic graduates.
2. Government should restructure the Student Industrial Work Experience Scheme (SIWES) to ensure its effectiveness.

3. Industrial visits/field trips should be made compulsory in all skill-based programmes of polytechnics in Nigeria.
4. The industries should collaborate effectively with Nigerian polytechnics in the training and supervision of engineering students so as to produce graduates with relevant work skills.
5. Polytechnic education in Nigeria should not be treated as inferior to university education to attract the best brains.

Authors' Biographical Notes

Prof. Paulinus Chijioke Okwelle is a professor of Industrial Technology Education at Rivers State University, Port Harcourt. He is a seasoned academic with track records of uncommon achievements. He is a prolific writer, researcher and consultant to various institutions. Presently, He is the Executive Secretary, National Commission for Colleges of Education, Abuja, Nigeria.

Dr. Offia Tugwell Owo holds a PhD in Technical Education (Electrical/Electronics) from Rivers State University Port Harcourt, Nigeria. He is a licensed electrical Engineer and researcher with interests in vocational education, electrical/electronic engineering and technology education. He has published extensively in various International and Local Journals.

Ibekwe, Chima Christian is a PhD student in the Department of Vocational and Technology Education, Rivers State University Port Harcourt, Nigeria. He has to his credit, some articles duly published in peer-reviewed journals. His areas of research interests include electrical/electronic devices and systems, vocational, technology and entrepreneurship education among others.

References

- Ademu, A., Adah, O. & Atsumbe, J. (2018). Approaches for enhancing graduates of Agricultural education work skills towards social and economic transformation in Nigeria. *Journal of Poverty, Investment and Development*, 45, 26-31.
- Agbonna, S. A., Yusuf, A., Ajidagba, U. A. & Olumorin, C. O. (2009). Assessing the employability of Nigerian graduates using employer-based assessments. A Paper presented at the 1st International Conference of the Collaboration of Education Faculties in Nigeria (CEFAN), held at the University of Ilorin, Kwara State, Nigeria from 12th to 16th July.
- Ari, J. N. (2020). Industrial Training Fund decries disparity in school curriculum, industrial need as unemployment rate soar. Lagos: BusinessDay NG.
- Atakpu, L. (2007). *Resource-based conflicts: Challenges of oil extraction in Nigeria*. A paper presented at the European Conference hosted by the German EU Council Presidency (March 29 and 30), Berlin, Germany.
- Chizoba, C., Gwen, A. & Chike, J. (2012). Oil and gas resources management and environmental challenges in Nigeria. *Journal of Environmental Science and Engineering*, 3 (1), 535-542.

- Ejiofor, A. (2016). Deepening Local Participation in Oil and Gas. *ThisDay Newspapers*, November 29.
- Ekezie, A. I. A. & Owo, O. T. (2019). Assessment of agricultural education resources for vocational skills development of students in universities in Rivers State, South-South, Nigeria. *International Journal of Education and Evaluation*, 5(6), 1-14.
- Ismail, S. & Mohammed, D. S. (2015). Employability skills in TVET Curriculum in Nigeria Federal Universities of Technology. *Procedia-Social and Behavioral Sciences*, 204, 73-80.
- Lindner, J. R. & Dooley, K. E. (2002). Agricultural education competencies and progress toward a doctoral degree. *Journal of Agricultural Education*, 43(1), 57-68.
- National Board for Technical Education (2001). *Curriculum and Course Specifications for Higher National Diploma (HND) Programme in Electrical Engineering*. Kaduna, Nigeria: UNESCO-Nigeria Project.
- National Population Commission (NPC) (2007). Report of Nigeria's National Population Commission on 2006 Census. *Population and Development Review*, 33(1), 206-210.
- Nwankwo, O. (2016). *A practical guide to research writing for students in education and social sciences* (6th ed.). Port Harcourt: M & J Grand Orbit and Communication Ltd.
- Ogwo, D. (2010). Employability of Nigeria tertiary institutions graduates and observed skills gap in general and physical sciences, engineering architecture, urban and regional planning, surveying, estate management: The curricular challenges to the institution. Paper Presented at Colloquium on organized Private Sector and Public Service demand for Nigerian Universities, College of Education and Polytechnics Graduates Employability organized by Bureau of Tertiary Institutions Abeokuta, October 12.
- Ojerinde, D. (2015). Polytechnic education: Key to development. *The Nation Newspapers*, October 29.
- Okorie, J. (2000). *Developing Nigeria's workforce*. Calabar: Page Environs Publishers.
- Omoniwa, O. B. & Adedapo, A. A. (2017). Assessing Nigerian Graduate Employability. *Global Journal of Business Disciplines*, 1 (2), 58-75.**
- Osinem, E. (2008). Managing agricultural education and training resources: Principles and Methods. *Enugu: Belong International Publishers.***
- Owo, O. T. & Ajie, P. M. (2020). Impediments to effective utilization of e-learning platforms for quality teaching and learning in universities in Niger-Delta, Nigeria. ***International Journal of Innovative Research and Development*, 9(7), 128-133.**
- Owo, O. T. & Isaac, U. C. N. (2020). Assessment of the employability skills of polytechnic electrical/electronic engineering graduates for employment in oil/gas industry in Niger-Delta, Nigeria. *International Journal of Engineering Applied Sciences and Technology*, 5(3), 142-150.

Owo, O. T. (2020). Education and training of youths: A panacea for sustainable development of Andoni (Obolo) nation in Niger Delta, Nigeria. *The International Journal of Humanities and Social Studies*, 8 (2), 142-146.