



Competencies Needed for Improving Teaching Among Lecturers of Polytechnics in North-Western Nigeria

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Abstract: The study was carried out to determine the competencies needed for improving teaching among lecturers of polytechnics in North-western Nigeria. A polytechnic was established in Nigeria to train individuals to learn a specific skill using competent lecturers for employment or self-reliance after graduation. These lecturers are very essential to the quality of students of electrical/ electronic technology in the polytechnics. However, technology dynamism has become a serious challenge for the lecturers to perform their teaching tasks. Hence the need for lecturers to continually improved on their competence and knowledge of the subject matter content they teach. The study is also to identify any difference of competency needed among the institutions. 122 electrical/electronic lecturers from nine universities were purposely selected as respondents for the study whose consisted of 55 lecturers from five state polytechnics and 67 lecturers from four federal polytechnics. The study adopted survey research design and used structured questionnaire as the main instrument for the data collection. The questionnaires were developed and distributed to respondents. Mean and improvement needed index analysis were used for data analysis to achieve the research objective whilst t-test was used to test the significance difference between the institutions. It was found that electrical/electronic lecturers in polytechnics need improvement of their competencies related to knowledge and skills in the subject matter. However, there was no significant difference of competency needed between the lecturers in state and federal polytechnics on the teaching subject matter. The implication of the finding is that the location of the lecturers did not significantly affect their opinion in the competencies. In conclusion, lecturers of electrical/electronic technology from the polytechnics has low competency in executing technical task assigned to them within the study area which required adequate investigation by determining the competencies of lecturers who happen to be the main implementers of the electrical/electronic programme. Therefore, it is recommended that the schools administrators should continually organized workshop and training for lecturers to build their capacity in order for the lecturers to always develop their competencies to effectively teach the contents of the subject assigned to them.

Keywords: Competency, teaching, electric and electronic, technology, polytechnic

1. Introduction

A polytechnic is a formal institution where individuals acquire practical skills, academic knowledge, and emotional attitude in a specific occupation (Narasauai, Setiawan and Noermijati (2018); Kamaruddin and Ibrahim, 2010). Polytechnic in Nigeria is one of the Technical and Vocational Education and Training (TVET) institutes which annually graduated well over 472,000 students with a 20% annual increment (Ojonugwa (2015). According to National Board

for Technical Education (2012), a polytechnic is an educational environment that exposes students to learning academic knowledge, social skills, proficiency, and practical skills for self-reliance. Polytechnics are established in Nigeria to train individuals not only for the skilled and competent person but also to become responsible citizens. Polytechnic among other tertiary institutions was established by both State and Federal governments in Nigeria and these institutions are supervised by National Board for Technical Education (NBTE). Nigerian polytechnics offered various technical courses amongst which are auto-mechanics, building, drafting, metalwork, woodwork and electrical/electronic.

Electrical/electronic technology is a course of study where students acquire knowledge and practical skills about various electronic appliances to fulfil human life needs. Among the goals of the electrical/electronic technology programme is to produce electrical/electronic personnel for power generation, transmission, distribution and utilization. The main objective of the electrical/electronic technology program in polytechnics is to prepare and produce qualified graduates with the precise skills to participate in industrious work as well as for self-reliance. This objective can only be achieved when electrical/electronic technology lecturers of polytechnics are competent in the subject matter they teach.

Competent lecturers are highly significant to the productivity of quality graduates for effective work performance, (Liang, Blackstock, Howard, Briggs, Leggat, Wollersheim, & Rahman, 2018). In it is significant for the lecturers' emotional intelligence competency to improve their teaching pedagogy and performance. Boyatzis and Sala, (2004 pp5) defined emotional intelligence competency as "an individual's ability to recognize, understand and use emotional information about oneself and others that lead to or causes effective or superior performance". Whilst, competency is defined as an individual ability or talent, and also understand to be a group of interrelated but different groups of behaviour structured within an underlying construct. The behaviours are alternate exhibitions of the intent, as appropriate in a few times or situations (Boyatzis & Sala, 2004). Competency is the skills, attitudes, and knowledge, that individuals acquired to effectively perform the activities of a given job, which lecturers need to always update for effective teaching of electrical/electronic technology courses to students in polytechnics.

Lecturers who are involved in teaching and learning in polytechnics as the demand is particularly for electrical/electronic lecturers to improve their competence for optimal performance. Electrical/electronic lecturers of polytechnic jobs generally encompass teaching activities and administration tasks (Ogbuanya & Chukuwedo, 2017). Therefore, for effective teaching and learning to take place, it is necessary for the lecturers to always improve their knowledge and competence of the subject matter content they teach. Hence, this study was conducted to determine the competency needs of electrical/electronic lecturers of polytechnics in North Western Nigeria. Specifically, the study is sought to identify the competency needed for improving teaching among polytechnic lecturers of electrical/electronic technology programmes.

1.1 Background of the Study

Technical and vocational education (TVE) is a programme of study which were implemented in Nigeria with the objectives of developing skills and proficiency to prepare students for work after graduation, a tool for promoting an environment for sustainable development and growth, and a method for facilitating poverty alleviation among Nigerian graduates. A polytechnic is an institution of higher learning offering national diplomas, higher national diplomas and post-graduate diplomas in various specializations for occupational use to an individual especially in vocational and technical subjects, thus; civil, building, computer, mechanical and electrical/electronic technology. These courses offered are taught by lecturers. Lecturers in polytechnics need to be competent in effective teaching and learning of electrical/electronic technology to students. And this can only be achieved through constant competence improvement. However, dynamism in technology, change in the job market demand, growing competition among job seekers, and issues toward the work exhibited demanded new technological skills from polytechnics lecturers for them to effectively teach the electrical/electronic technology graduates in north-western Nigeria the needed skills to participate in the changing world of industry 4.0 (Ibrahim, 2014; Ogbuanya, 2017). To respond to these challenges, it is compulsory for the lecturer to improve their teaching competencies of the subject matter content they teach, to prepare the electrical/electronic technology graduates with the skills they needed for employment after they have graduated (Suarda, 2017).

The problem of this study is that the students who passed through electrical/electronic technology are expected to establish their own businesses to solve societal problems. Unfortunately, these students after graduation find it very difficult to start their businesses because of the limited skills acquired while in training, the reason that, the training offered to the graduates does not guarantee success of graduates in their occupational area, is simply because the graduates lack the practical skills to handle faulty electrical/electronic appliances and equipment's or successfully participate in electrical installation in home and industry as they could not work independently with the exception of others who were trained informally. This is because of the polytechnic lecturer in the study's lack of competence to effectively impart adequate knowledge and skill to the students of electrical/electronics. Consequently, it enables the graduate's secured employment or be self-reliant after graduation. Therefore, it is necessary to ascertain the competency development needs for improving teaching among lecturers of polytechnics in north-western Nigeria.

2. Competencies Needed for Lecturers of electrical /electronic technology in Polytechnic

Effective teaching of electrical /electronic technology required competencies (Liang, Blackstock, Howard, Briggs, Leggat, Wollersheim, & Rahman, 2018), as it is very imperative for a teacher to competently handle themselves and their relationship to teach the content of the subject matter competently for effective teaching and learning (Boyatzis & Sala, 2004; Ogbuanya, 2017). It was observed that teachers with a high level of emotional intelligence competencies such as emotional self-awareness, emotional self-regulation, empathy, ability and motivation and relationship management are significant to their teaching career (Akpochofo, 2011; Chinyere & Afeez, 2022). Competence according to Houston (2011) is described as the optimal level of knowledge, skills, attitude and judgment which individuals must achieve to be appraised as successful and effective. Olaitan (2013); Copriady (2014); Marcial and Rama (2015) described teachers' competency in teaching and learning as ability, awareness, understanding and perfection which one requires to perform successfully at a specified skill in any profession, Optimal perfection depends on an individual exhibition of emotional competence which is highly expected of polytechnic lecturers.

Academicians in the Nigerian Polytechnics are expected to show brilliance in the context of research, teaching, publication, writing, public service, management and consultancy (Otache and Anakwe, 2021). Polytechnics lecturers who are supervised by the National Board for Technical Education in Nigeria, are held with the responsibility of teaching and evaluating in their individual disciplines, curriculum planning, developing and managing courses, assisting in organizing events and activities, industrial liaison and much more. Lecturers at Nigerian polytechnic's performance are high in academic and practical skills teaching and willing to work for long hours even though these lecturers warrant insufficient resources and rewards (Abboh, Majid, Fareed & Abdussalam, 2022). With the heavy responsibility held by lecturers, it is necessary to provide adequate resources for healthy work-life in their teaching career (Kumar & Muniandy, 2012; Abboh et.al, 2022). Prasestia, Akrim and Pratiwi, (2020) stated that an exhibition of emotional competencies based on the subject matter is the first quality every teacher of technology must possess, as nobody can teach what he/she does not know. For a teacher to competently teach, he/she must be the content expert which is to have knowledge of the subject matter. Branch (2020); Ntibi, Neji, and Agube (2020) also stated that subject matters may be defined generally to mean a broad field of study made up of an array of knowledge, skill and attitudes that an individual must acquire to become professionally competent that contributors to the growth and development of his/her family, community, state and nation. Meanwhile, Osakwe (2014); Fafunwa (2018); Ntibi, et.al., (2020) stated that a teacher as a positive role model must know the subject he is going to impact the learners and that without a good background in the subject matter, the teacher may not be able to teach competently and that will lead the students to lose confidence in the teacher and the teacher may soon lose his or her job if the employer gets to know that he/she actually lacking knowledge. One good way a teacher can maintain knowledge is by reading continuously in addition to whatever they may have graduated with and to keep abreast of research and new publications in his or her specialized field. The world is turning into a global village where students are liable to be exposed to all sorts of new knowledge in their subject areas such as new technological developments, which make it very crucial for teachers to be competent in the subject matter. If the teacher lacks the practical knowledge or skills, it will be difficult to impart the necessary skills to the students and as such, no optimum result will be obtained in the training. Electrical/electronic technology lecturers must be grounded in all the contents areas of electrical/electronic to be taught for effective assimilation to take place.

Many teachers enter the field with a moral purpose, the ability of teachers to serve as change agents relies on four core capacities: vision, inquiring, mastery and collaboration. Adirika (2019) argued that those capacities are not developed individually but must be nurtured and consciously developed in a professional setting. Professional development programmes can serve as a space to purposefully develop the alignments of school reforms and professional development. According to Igbokwe (2015), streams of reforms can be considered on two aspects of how teacher training programs might help teachers of basic technology develop the capacities of change agents. First, models of professional development that focus on developing extensive subject matter, knowledge pedagogy that departs from test-book centered teaching and instructional design which engages students in learning. This type focuses on building mastery of basic technical knowledge and developing of pedagogical content knowledge. The second stream of professional development experiences centres on problems of equity and aims to assist teachers to identify and alter classroom practices that contribute to failure and undermine equal opportunities to learn (Igbokwe, 2015). Some of the difficulties encountered by the teacher in the teaching of electrical/electronic technology is teaching as much in a lesson and failing to provide enough time and teaching facilities in the lesson which makes the learning and understanding of certain principles being taught difficult to explain. According to Eze, Chinedu and Bello, (2018), Nigeria is in short supply of professional modern learning facilities such as textbooks, training manuals and instructional media. The authors further stated that the scarcity of professional textbooks and training manuals is a national threat to the technological development of the nation if professional modern learning facilities i.e., textbooks training manuals and instructional media are not available for teachers and students to work with and that will hinder the capacity of teachers. It is essential for electrical/electronic technology teachers to be competent in both theory and practical skills. Ntibi, et.al. (2020) stated that teachers should teach knowledge before teaching the skills. They further reported that for effective learning to occur the learners should have a good command of this information before practising based on the knowledge of the subject matter and knowledge of how to teach the subject would still not enable a teacher to be of the maximum value in his profession. A good lecturer must have an in-depth knowledge of other subjects of the curriculum which is of social and economic

aspects of education or background that broadens their knowledge and outlook thereby attaining the goals of the educational system. Adirika (2019) also stated that having mastered the subject matter, the teacher must possess certain qualities which are largely physical, psychological, emotional and intellectual competence in order to be effective. Some of the qualities included a good personality, the ability to understand students’ psychology, the ability to inspire students, resourcefulness, the skills to improvise and the ability to observe and evaluate them.

It is therefore necessary for electrical/electronic technology lecturers to be equipped with knowledge of the subject matter and at the same time explore specific skills for effective teaching. Having emotional competence skills will aid their capacity of creating a seamless teaching-learning atmosphere in the classroom.

3. Research Methodology

The study adopted a survey research design. Krosnick (2018) referred to a survey research design as one of the best approaches for conducting research, the author also stated that, in a survey study, views and facts are collected through questionnaires, interviews, and email among others, analysed and used for answering research questions. The survey research design is suitable for this study since data were collected through questionnaires from lecturers in state and federal polytechnics who are teaching electrical/electronic technology.

The study adopted a survey research design. The study was carried out in nine polytechnics which comprise five state polytechnics and four federal polytechnics offering electrical/electronic technology in the North-western States of Nigeria which include Jigawa, Kano, Kaduna, Katsina, Kebbi, Sokoto and Zamfara. The population for the study were 122 electrical/electronic technology lecturers in the selected polytechnics that were purposely selected based on specific characteristics. The entire population has been selected as respondents consisting of 55 lecturers from five state polytechnics and 67 lecturers from four federal polytechnics.

The main instrument for the data collection was a structured questionnaire which was developed by the researchers. The questionnaire consisted of 15 items/statement which was used to determine competencies needed for improving teaching among lecturers of polytechnics in North Western Nigeria as indicated in table 1.

Table 1 - Items for the questionnaire

S/N	Competency improvement needs in subject matter contents.
1	Teach relevant contents in electrical maintenance and repair
2	Uses and application of electronic measuring instruments
3	Connections of electronic measuring instruments to the circuit
4	Troubleshooting of faulty electrical circuits
5	Electrical installation and practice
6	Methods of cable jointing in electrical installation
7	Domestic and industrial installation
8	Design of electrical systems
9	Uses and applications of wiring accessories
10	Understand and select components of electric motors and generators
11	Make calculations relevant in electric motor and generators
12	Methods of power generation in Nigeria
13	Principles and operation of various power stations
14	Knowledge about generation, transmission, and distribution stations.
15	Safety practices in electrical/ electronic technology

The instrument for data collection was face validated by three lecturers from the Department of Vocational Teacher Education University of Nigeria, Nsukka. The Cronbach Alpha coefficient method was used to determine the internal consistency of the instrument. It was determined by administering the questionnaire to 20 lecturers of electrical/electronic technology in polytechnics of South-eastern Nigeria. The reliability of the instrument was determined using the Cronbach Alpha coefficient method. The Cronbach alpha is 0.87 that indicated all the items are suitable for the real study. According to Hair, Anderson, Tatham & Black (1995) and Cohen et al. (2010), a Cronbach’s alpha scale of at least 0.70 is acceptable for the internal consistency reliability of the items and can therefore be accepted for real data collection purposes.

The data collected were analysed using the Mean and Improvement Needed Index (INI) to answer the research questions while the t-test was used to test the hypotheses at a 0.05 level of significance. Competency improvement need was determined as follows:

- The mean (Xn) of the needed category was determined for each item.
- The mean (Xp) of the performance category was determined for each item.
- The performance gap (PG) was determined by finding the difference between the values of the two means.

That is, $X_n - X_p = PG$.

Where PG is zero, it means that improvement is not needed for that item because the level at which the lecturers performed the competency is equal to the level at which the competency is needed. Where PG is negative (-), it means improvement is not needed for that item because the level at which the lecturers performed the competency is higher than the level at which it is needed. Where PG is positive (+), it means improvement is needed because the level at which the lecturers perform the competency is lower than the level at which it is needed (Olaitan and Ndomi in Ellah (2007).

In taking a decision for needed, any item with Mean of 3.50 or above was considered as highly needed, 2.50 – 3.49 was considered as moderately needed while any item with mean of less than 1.50 was considered as not needed while for performance, any item with Mean of 3.50 and above was considered as high performance, 2.50 – 3.49 was considered as moderate performance while any item with Mean of less than 1.50 was considered as no performance. For the null hypotheses, a hypothesis was accepted when t-calculated value was less but rejected when t-calculated value was greater than t-table value.

4. Results and Discussion

The result is discussed based on the objectives of this research which is to identify the competencies of electrical/electronic lecturers of polytechnics in the subject matter. There are 122 lecturers involved in this study from nine institutions, as such the study is also to evaluate the different between the institutions.

4.1 Competencies of lecturers in the Subject Matter

The data for competencies of lecturers is presented in Table 2.

Table 2 - Analysis of the gap of competencies of lecturers

S/N	Competency items	Mean X _n	Mean X _p	PG (X _n – X _p)
1.	Teach relevant contents in electrical maintenance and repair	4.45	3.12	1.33
2.	Uses and application of electronic measuring instruments	4.39	3.02	1.36
3.	Connections of electronic measuring instruments to the electric circuit	4.30	3.71	0.59
4.	Troubleshooting of faulty electrical circuits	4.14	2.90	1.24
5.	Teach electrical installation and practice	4.26	2.89	1.37
6.	Methods of cable jointing in electrical installation	4.37	3.78	0.59
7.	Demonstrate domestic and industrial installation to students	4.28	3.21	1.07
8.	Design electrical systems	4.17	2.19	1.98
9.	Uses and applications of wiring accessories	3.25	3.55	-0.30
10.	Select components of electric motors and generators	3.70	3.67	0.03
11.	Make complex calculations relevant to electric motor and generators	3.69	3.04	0.65
12.	Methods of power generation in Nigeria	3.72	3.67	0.05
13.	Principles and operation of various power stations	3.19	3.45	-0.26
14.	Knowledge about generation, transmission and distribution stations.	4.36	3.08	1.28
15	Safety practices in electrical/ electronic technology	3.28	3.67	-0.39

Data in Table 1 revealed that 12 out of 15 items had performance gap values ranged from 0.03 to 1.98 and were positive indicating that the lecturers of electrical/electronic technology need improvement in twelve competencies of electrical/electronic subject matter. Three out of 15 items have negative performance gaps of -0.30, -0.26 and -0.39 indicating that improvement is not needed by lecturers in the three items. Generally, the lecturers need improvement in all the 15 competency items but less emphasizes on the three items with negative performance gap values. The finding of the study revealed that lecturers of electrical/electronic technology needed improvement in twelve competencies of subject matter. These competencies include teach relevant contents in electrical maintenance and repair, uses and application of electronic measuring instruments, troubleshooting of faulty electrical circuits, connections of electronic measuring instruments to the electric circuit, knowledge about generation, transmission and distribution stations, methods of cable jointing in electrical installation, demonstrate the domestic and industrial installation to students, design electrical systems, select components of electric motors and generators and make complex calculations relevant to electric motor and generators. This result is related to previous scholars finding by Ismail, Nopiah, Rasul, and Leong (2017) which

found that Malaysian TVET lecturers lack competency in ICT knowledge and skills, lack technical skills training and issues related to unemployment of TVET students. the researcher observed that the competency of teachers in teaching subject matter content is relevant to TVET student employment success, in which the researcher lastly suggested that there is a need for proposed competency improvement among TVET trainers in Malaysia. This study also agreed with the finding of Michika and Manabete, (2019) that lectures of polytechnics in the northeast zone of Nigeria need competence improvement to effectively use ITC peripheral equipment for proper teaching. The researcher would agree with Bakare, et al. (2011) assertions on the competency improvement needs of instructors in teaching electronic measurement and instrumentation to students in polytechnics in Southwestern Nigeria.

4.2 Analysis of significant difference between the mean responses of lecturers in institutions

This section presents the findings of the difference between the mean responses of lecturers in state and federal polytechnics on the competencies needed in the subject matter. The data is presented in Table 3.

Data presented in Table 3 revealed that each of the fifteen competency items had different values ranging from 0.04 to 0.72 which were less than 1.98 at 0.05 level of significance and at 120 degrees of freedom (df). This indicated that there was no significant difference between the mean responses of lecturers in state and federal polytechnics on the competencies needed in the subject matter. Therefore, the null hypothesis was accepted. The researcher would agree with Bakare, et al. (2011) assertions on the competency improvement needs of instructors in teaching electronic measurement and instrumentation to students in any institution. Hence, it is necessary for institutions to prepare instructors with specific competencies to help their graduates to have the skills and ability to adapt to different environments to succeed in today’s world of work (Suarta, 2017). The result of the finding in this study indicated no significant difference in the competency of lecturers in studied polytechnics in north-western Nigeria.

Table 3 - The t-test analysis of the competencies needed in the subject matter content between the institutions

S/N	Competency Items	Standard		Standard		Diff
		Mean	deviation	Mean	deviation	
		1	1	2	2	
1	Teach relevant contents in electrical maintenance and repair	4.34	0.78	4.54	0.61	0.33
2	Use and apply electronic measuring instruments	4.42	0.72	4.38	0.83	0.24
3	Connections of electronic measuring instruments to the electric circuit	4.26	0.83	4.34	1.00	0.38
4	Troubleshooting of faulty electrical circuits	4.18	0.80	4.12	0.89	0.34
5	Teach electrical installation and practice	4.28	0.92	4.24	1.04	0.23
6	Methods of cable jointing in electrical installation	4.31	0.87	4.42	0.73	0.60
7	Demonstrate domestic and industrial installation to students	4.10	1.03	4.42	0.67	0.72
8	Design electrical systems	4.02	1.05	4.28	0.70	0.35
9	Uses and applications of wiring accessories	4.31	0.74	4.20	0.86	0.66
10	Select components of electric motors and generators	3.50	1.22	3.86	1.27	0.33
11	Make complex calculations relevant to electric motor and generators	3.50	1.11	3.84	1.16	0.38
12	Methods of power generation in Nigeria	3.65	0.87	3.78	0.97	0.60
13	Principles and operation of various power stations	4.21	0.87	4.18	0.87	0.16
14	Knowledge about generation, transmission and distribution stations.	4.36	0.78	4.36	0.80	0.04
15	Safety practices in electrical/ electronic technology	4.34	0.58	4.24	0.74	0.69

Key: S_f^2 = Variance of lecturers of electrical/electronic in state polytechnics

5. Implication of Study

The findings in this study had implications for administrators of polytechnics, governments, students, and lecturers of electrical/electronic technology in polytechnics. Administrators such as rectors will permit the electrical electronics technology lecturers to attend short courses and training on instructional planning to improve themselves for proper teaching and learning to take place in polytechnics. The government at the state and federal levels will organize seminars and workshops based on the result of the study to build the lecturers' capacity based on this study found.

For further research, it is suggested to identify the competencies needed for improving the teaching of electrical electronics among lecturers of polytechnics in other geopolitical zones of Nigeria. At the same time to determine capacity

building needs of lecturers for effective teaching of electrical/electronic courses in Technical Colleges in north-western Nigeria

6. Conclusion

The purpose of establishing polytechnics in Nigeria can only be realized when there are relevant facilities, equipment, tools and competent teachers. Polytechnic students can only acquire technical skills for employment or self-reliance under the supervision of competent lecturers. The electric/ electronic technology course was incorporated into the programme of polytechnics to equip students with skills, knowledge and attitude (competence) for employment after graduation. Due to the lack of competence from the graduate, society usually blames their incompetence on the lecturers based on the quality of instruction received while in training (Prasetya, Akrim & Pratiwi 2020). However, Shulman, (2000) has suggested that lecturers can focus on building mastery of basic technical knowledge and developing of pedagogical content knowledge to improve their competency. Nonetheless, this study suggested that polytechnic lecturers in the study lack the competence to effectively impact adequate knowledge and skill to the students of electrical/electronics. This study aims to identify competencies needed for improving teaching among lecturers of polytechnics in teaching electric/electronic programs at North-western Nigeria polytechnics. The result of the study proved that all the 122 lecturers of electrical/electronic technology need improvement in twelve competencies of electrical/electronic related to knowledge and skill of subject matter. While based on the lecturer's response from different institutions, the result indicated no significant difference between the mean responses of lecturers in state and federal polytechnics on the competencies needed in teaching the subject matter. The finding of the study indicated that the lecturers must improve on most of the competencies as measured in the questionnaire. Overall, it can be suggested that all the lecturers from both federal and state polytechnic need improvement in knowledge and skills competence in the subject matter content they teach. The state or federal Government can help to improve the lecturers' competencies by continuously organizing workshops, training and retraining based on the outcome of the study to build the capacity of lecturers for the lecturers to always develop their competencies to effectively teach the contents of the subject assigned to them.

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