COMPETENCIES REQUIRED FOR DOMESTIC AND INDUSTRIAL ELECTRICAL INSTALLATIONS FOR SELF-EMPLOYMENT IN THE INFORMAL SECTOR OF ECONOMY OF ENUGU STATE

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Abstract
The study identified competencies required for domestic and industrial electrical installations for successful self-employment in the informal sector of the economy of Enugu State. Two specific objectives guided the study. Accordingly, two research questions were posed that were in line with specific objectives, and two hypotheses were tested. The study adopted a descriptive survey research design. The study was conducted in Enugu metropolis. The population for the study was 95, made up of 52 technical teachers and 43 employers in electrical/electronics in Enugu State. There was no sampling as the population is manageable. A structured questionnaire developed by the researchers was used for data collection. The instrument was validated by three experts; two from the Department of Technology and Vocational Education and one from the Measurement and Evaluation in the Department of Computer and Mathematics Education all from the Faculty of Education, Enugu State University of Science and Technology (ESUT), Enugu. A reliability coefficient of 0.81 was obtained using Cronbach's alpha method. A total of 86 copies out of 95 copies of the instrument correctly filled and returned were used for the study, representing 90.5 percent return rate. Mean was used to answer the two research questions. The two null hypotheses were tested at 0.05 level of significance using t-test statistic. The study revealed that domestic and industrial installations competencies required for self-employment in the informal sector of Enugu include; ability to carry out connections in single phase distribution fuse board, ability to install electric motors, earth continuity conductor and electric motors. In addition, the study showed that technical college teachers and employers in electrical/electronic did not differ significantly in their opinions on the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State. It was recommended among others that competencies needed by the students as identified in the study should form the basis of instruction by technical college teachers.

Keywords: Competency, Domestic and Industrial electrical installations, Self-employment

Introduction

Technical education in Nigeria equips individuals with practical skills for industrial and economic development. According to Alshayea (2017), technical education is the act of receiving or giving systematic instruction, especially at a school or university. In the same vein, Lawal (2020) asserted that, the Federal Government of Nigeria has emphasized on the need for quality technical and vocational education as a strong weapon that can bring desirable changes for self-reliance and entrepreneurship. Lawal continued that, vocational and technical

education aspires to generate well-educated individuals who can effectively use their heads, hearts, and hands. Concerning this assertion, Agbo and Okoye (2022) stated that, technical, vocational education and training (TVET) is a set experiences through which an individual learns to successfully carry out any relevant work. According to Alio and Eze (2024), technical education is a form of education which is designed to prepare individuals to acquire practical skills, basic and scientific knowledge and attitudes required as craftsmen in various trades. Electrical installation and maintenance work is one of the trades offered in Technical Colleges.

Electrical installation is one of the specialized areas in the electrical trade. It is one of the courses taught at Technical Colleges in Nigeria (Ari, 2020). Electrical installation is the placement, connection and arrangement of electrical components and systems within a building or structure to facilitate the utilization of electrical power for different applications. The electrical installation trade is thus taught at the technical colleges to provide students with skills that would make them self-reliant on graduation (Amatrol, 2020). The acquisition of Electrical installations skills by technical college graduates is a sure way of being gainfully employed in the informal sector in Nigeria.

In Nigeria, the informal sector plays a significant role in the economy, with a large number of individuals finding employment in various informal businesses, including electrical installation services. The informal sector of the economy refers to economic activities that are not officially recognized or regulated by the government (Ekezie & Owo, 2019). The informal sector typically consists of small-scale businesses, self-employment, and household enterprises that operate outside of the formal economy. According to Ari (2020), the informal sector plays a significant role in providing employment opportunities to technical college graduates and contributing to economic growth.

Technical college graduates often seek employment in the informal sector, as they possess the necessary skills and knowledge to work in trades such as electrical installation. According to Lawal (2020), the acquisition of electrical installation competencies is crucial for technical college graduates seeking employment in the informal sector in Nigeria. Hence, possessing the necessary competencies ensures that graduates are capable of performing tasks effectively and efficiently, thereby increasing their chances of securing employment and earning a living in the competitive market. The self-employment and entrepreneurship landscape in Nigeria is expanding rapidly, with increasing opportunities for skilled electrical technicians to provide installation services in homes, offices, and industrial settings (Alio & Eze, 2024). To take advantage of these opportunities, technical college graduates must possess

a unique set of competencies that go beyond technical competencies.

Competency is the standard requirement for an individual to properly perform a specific task. Competency is the ability that is acquired through training to undertake a skill characterized with varying complexities and difficulties (Ogbuanya, 2019). Competency is the ability to acquire suitable and sufficient skills, knowledge and experience for carrying out a specific task. Ogbuanya, et al (2020) noted that competency is the knowledge, skills, attitude and judgment required to perform well at any given work. In the context of this study, competency is the ability of technical college graduates to possess the required theoretical knowledge, technical and practical skills in Electrical installations. Electrical installation consists of domestic and industrial installations.

Domestic installation has to do with installation of electrical components or equipment in a building and such other equipment or components which include home appliances fixed in positions for use. According to Ogwa (2019), domestic electrical installation refers to the process of setting up electrical systems within residential buildings or homes. This includes the installation of electrical wiring, outlets, switches, light fixtures, circuit breakers, and other components necessary to provide electricity for everyday use in a household. Domestic electrical installations are typically designed to meet the electrical needs of a family or individual living in a home, ensuring safety, functionality, and compliance with relevant regulations and standards (Okwelle & Owo, 2022).

On the other hand, industrial installation, according to the National Board for Technical Education (NBTE, 2019), provides the trainees with the knowledge and skills which will enable them to carry out all types of industrial/factory installations. Industrial electrical installation involves the setup and maintenance of electrical systems in industrial facilities, such as factories, manufacturing plants, warehouses, and other large-scale industrial operations. Industrial electrical installations are often more complex and demanding than domestic installations due to the higher power requirements, specialized equipment, and industrial processes involved (Agbo & Okoye, 2022). These installations are designed to support heavy machinery, production lines, lighting, heating, and other essential electrical systems needed for industrial operations to function efficiently and safely.

In Nigeria, especially in Enugu State, majority of graduates are jobless due to incompetence in the skill areas they are supposed to possess. Report by Owo and Ajie (2020) showed that graduates of technical colleges are incompetent and cannot be self-reliant on graduation, thereby constituting a nuisance in society. According to NABTEB chief examiner's

report, technical college examination conducted in 2023, many students performed below expectations, especially graduates of Electrical Installation. This implies that much effort is needed to impart to students the requisite competencies that would enable electrical installation graduate be employable in recognized institutions or become economically self-employed in the society.

Self-employment is a situation where an individual creates, begins and takes control of the business decision rather than working for an employer. Ado and Hudu (2018) described self-employment as an act of working for oneself. Self-employment is the act of generating one's income directly from customers, clients or other organizations as opposed to being an employee of a business or person. When one is self-employed, it means that one is carrying on one's own business rather than working for an employer (Agbo & Okoye, 2022).

In Nigeria's informal economy, self-employment has emerged as a vital avenue for individuals seeking financial independence and economic stability. The domestic and industrial installations present significant opportunities for entrepreneurship (Odika & Tom, 2020). However, there is a notable gap in understanding the specific competencies required for effective domestic and industrial installations, which hinders the ability of aspiring entrepreneurs to establish successful ventures, leading to subpar performance, customer dissatisfaction, and ultimately, reduced economic impact. This necessitated the need for the study.

Statement of the Problem

The informal economy in Nigeria plays a crucial role in the country's overall landscape, providing employment opportunities and income sources for millions of citizens. According to recent statistics, over 80% of Nigeria's workforce is engaged in the informal sector, which encompasses a wide range of economic activities that are not regulated by the government. Among these activities, electrical installations represent a significant area of self-employment that can be leveraged by technical college graduates for economic advancement. To successfully engage in the electrical installations, the acquisition of electrical installation skills by technical college graduates is inevitable.

The major expectation from students of electrical/electronic in technical colleges is to acquire adequate skills for either paid or self-employment after graduation. The majority of these students in Nigeria, especially in Enugu State graduates without employment by relevant industries and are also unable to set up their businesses. This may be as a result of little or no skills acquired while in training. Lack of skills requisite for paid or self-employment by these

graduates has contributed significantly to the alarming rate of unemployment in the nation.

Nigeria needs the labour force that possesses the needed competencies and can function efficiently in society as the economy keeps changing. The problem has been that the technical labour force available, particularly electrical trade graduate lacks or has failed in their duties to produce highly relevant and standard products and services that can compete favourably with the foreign ones. For instance, Researchers noted that this group of tradesmen in Nigeria, especially in Enugu State are not reliable in keeping a time schedule, have a poor value system and most electrical trade graduates have untidy finished work. Most of the electric fire outbreaks were as a result of incompetence among trade graduates. This implies that most of them are not skilled in their trades and one should not be surprised that their roadside shops are flooded with unrepaired electrical appliances. Therefore, it is in recognition of these ailing problems that the researcher set out to determine the competencies required by technical college graduates for domestic and industrial electrical installations in Enugu State.

Purpose of the Study

The general purpose of the study was to determine the competencies required of technical college graduates in domestic and industrial electrical installations for successful self-employment in the informal sector of the economy of Enugu State. Specifically, the study sought to:

1. determine the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector.
2. identify the industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector.

Research Questions

The following research questions guided the study.

1. What are the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector?
2. What are the industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the mean responses of technical college teachers and employers in electrical/electronic on the domestic electrical installations

competencies required of technical college graduates for self-employment in the informal sector.

2. There is no significant difference in the mean responses of technical college teachers and employers in electrical/electronic on the industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector.

Method

The study adopted a descriptive survey research design. The study was conducted in Enugu State. The population for the study was 95, made up of 52 technical teachers and 43 employers in electrical/electronic in Enugu State. Available statistics from the Technical College Management Board, Enugu and Ministry of Works and Infrastructure, Enugu State, (Planning Research and Statistics unit, 2023), at the time of this research, showed that the population of electrical/electronic teachers in technical college is 52 and there are 43 employers of electrical/electronic maintenance practice in the State. There was no sampling as the population was manageable. The entire population was used for the study A structured questionnaire developed by the researchers was used for data collection. The instrument was validated by three experts; two from Technology and Vocational Education Department and one from measurement and Evaluation of the Department of Computer and Mathematics Education all from the Faculty of Education, Enugu State University of Science and Technology (ESUT), Enugu. The questionnaire used four-point response options, namely; Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). To determine the reliability of the instrument, the researcher administered 20 copies of the questionnaire to technical teachers and employers in electrical/electronic in Anambra State. A reliability coefficient of 0.81 was obtained using the Cronbach's alpha method. A total of 86 copies out of 95 copies of the instrument correctly filled and returned were used for the study, representing 90.5 percent return rate. Mean was used to answer the three research questions. Any item with a mean score of 2.50 and above was regarded as Agree while items with mean score below 2.50 were regarded as Disagree. The two null hypotheses were tested at 0.05 level of significance using the t-test statistic. When the calculated t-value was equal to or greater than the critical value at an appropriate degree of freedom, the null hypothesis was significant and rejected but when the t-calculated value was less than the critical value, the null hypothesis was not significant, and not rejected.

Results

Research Question One

What are the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector?

Table 1: Mean Ratings of the respondents on the domestic electrical installations competencies required of technical college graduates for self-employment

S/N	Domestic electrical installations competencies:	Technical teachers			Employers		
		$\overline{X}$	SD	RMKS	$\overline{X}$	SD	RMKS
1	Ability to carry out connections in a single-phase distribution fuse Board	3.29	0.93	A	3.12	0.59	A
2	Ability to identify simple installation tools like gimlet, screw drivers, pliers and cutters	3.07	1.11	A	3.55	0.68	A
3	Ability to interpret working drawings	3.18	0.88	A	3.00	0.60	A
4	Ability to locate switches at the correct height from floor	3.55	0.70	A	3.01	0.60	A
5	Ability to install fuses in distribution boards	3.11	0.52	A	3.58	0.59	A
6	Ability to carryout insulation resistance test successfully	3.60	0.54	A	2.50	0.61	A
7	Ability to install earth continuity conductor	3.10	0.83	A	2.91	0.59	A
8	Ability to properly tighten contacts to obviate arching on partial contact	3.09	0.88	A	3.08	0.60	A
9	Ability to draw wires into conductors	3.13	0.70	A	3.21	0.60	A
10	Ability to install current breakers (earth leakage)	3.41	0.52	A	3.52	0.59	A
11	Ability to install lightning arrestors on buildings	3.20	0.54	A	3.50	0.61	A
12	Ability to arrange fuses for a single phase unit	3.10	0.83	A	3.30	0.59	A
13	Ability to test for short circuits	3.20	0.80	A	2.88	0.70	A
14	Ability to install a lightning arrestor on buildings	3.11	0.83	A	3.22	0.60	A
	Grand Mean	3.23	0.70	A	3.20	0.62	A

Data presented in Table 1 revealed that the respondents agree with the aforementioned items on domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State. This is evidenced by the cluster

mean scores of 3.23 and 3.20 which are above the criterion mean of 2.50. The cluster standard deviation of 0.70 and 0.62 also indicated that the respondents were consistent in their opinions.

Hypothesis One

There is no significant difference in the mean ratings of technical college teachers and employers in electrical/electronic on the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector.

Table 2: The t-test analysis of mean ratings of the respondents on domestic electrical installations competencies required of technical college graduates for self-employment

Group	N	X	SD	df	t-cal	t-crit	Decision
Teachers	49	3.23	0.70				Accepted
Employers	37	3.20	0.62	84	1.11	1.96	

Data analyzed in Table 2 showed that the calculated t-value at 0.05 level of significance and 84 degree of freedom is 1.11, while the table value is 1.96. Therefore, the null hypothesis was not rejected. This implies that technical college teachers and employers in electrical/electronic did not differ significantly in their opinions on the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State.

Research Question Two

What are the industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector?

Table 3: Mean Ratings of the respondents on the domestic electrical installations competencies required of technical college graduates for self-employment

S/N	Industrial electrical installations competencies:	Technical teachers			Employers		
		$\overline{X}$	SD	RMKS	$\overline{X}$	SD	RMKS
1	Ability to install electric motors	3.30	0.73	A	3.22	0.69	A
2	Ability to install generators	3.10	1.11	A	3.15	0.68	A
3	Ability to install a motor starter	3.00	0.80	A	3.14	0.63	A
4	Ability to calculate cable rating for motors	2.94	0.75	A	3.12	0.60	A
5	Ability to construct foundation for mounting generators	3.20	0.59	A	3.07	0.60	A
6	Ability to connect star-delta system	3.11	0.54	A	3.50	0.61	A
7	Ability to identify key elements in	3.05	0.80	A	3.54	0.59	A

	industrial installation						
8	Ability to demonstrate trunk wiring for industries	3.10	0.88	A	3.22	0.65	A
9	Ability to draw wires into trunks	3.00	0.72	A	3.33	0.72	A
10	Ability to install a bus bar	3.23	0.64	A	3.41	0.91	A
11	Ability to join trunks effectively	3.15	0.54	A	3.00	0.68	A
12	Ability to detect faults in motors	3.17	0.80	A	3.22	0.56	A
13	Ability to detect faults in generators	3.07	0.82	A	3.02	0.70	A
14	Ability to repair machine specifications	3.03	0.80	A	3.12	0.60	A
	Grand Mean	3.19	0.73	A	3.14	0.66	A

Data presented in Table 3 revealed that the respondents agree with the aforementioned items on industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State. This is evidenced by the cluster mean scores of 3.19 and 3.14 which are above the criterion mean of 2.50. The cluster standard deviation of 0.73 and 0.66 also indicated that the respondents were consistent in their opinions.

Hypothesis Two

There is no significant difference in the mean ratings of technical college teachers and employers in electrical/electronic on the industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector.

Table 4: The t-test analysis of mean ratings of the respondents on industrial electrical installations competencies required of technical college graduates for self-employment

Group	N	X	SD	df	t-cal	t-crit	Decision
Teachers	49	3.19	0.73				Not rejected
Employers	37	3.14	0.66	84	1.23	1.96	

Data analyzed in Table 4 showed that the calculated t-value at 0.05 level of significance and 84 degree of freedom is 1.23, while the table value is 1.96. Therefore, the null hypothesis was not rejected. This implies that technical college teachers and employers in electrical/electronic did not differ significantly in their opinions on the industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State.

Discussion of the Findings

The results of the analysis of research question one revealed that technical college graduates require domestic electrical installations competencies for self-employment in the

informal sector of Enugu State. The corresponding hypothesis revealed that technical college teachers and employers in electrical/electronic did not differ significantly in their opinions on the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State. The identified domestic electrical installations competencies were found relevant indicating that they are necessary for the occupational performance of the students of electrical installation trade upon graduation. Individuals who are competent in their trades can be motivated to perform satisfactorily in their jobs. The felt need of any programme before commencement of any training must be ascertained, therefore, the perceived needs of the students must be considered. Okwelle and Owo (2022) noted that technical college graduates should acquire technical and practical skills in electrical installations that afford employment and sustain their longevity as productive members in today's complex work environment.

In addition, evidence from the analysis of research question two showed that technical college graduates require industrial electrical installations competencies for self-employment in the informal sector of Enugu State. The corresponding hypothesis revealed that technical college teachers and employers in electrical/electronic did not differ significantly in their opinions on the industrial electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State. The findings of this study are in line with Agbo and Okoye (2022) who noted that the acquisition of industrial electrical installations skills by technical college graduates is a sure way of being gainfully employed in an informal sector in Nigeria and the world at large. Alio and Eze (2024) noted that the competency in industrial electrical installations ought to be all-encompassing as a deficit in knowledge and competence in any aspect of the occupation can cause far-reaching hazards to electrical users. Students of technical colleges need appropriate competencies in industrial electrical installations for relevant skilled psychomotor development that would enable them to fit as efficient workers in the world of work or be employable in recognized institutions that have to do with electrical installation work. Teachers are therefore faced with the onerous task of imparting required competencies in technical college students to enable them properly undertake electrical work in domestic premises.

Conclusions

Based on the findings made, the following conclusions were drawn. Sufficient possession of competencies in electrical installation by technical college students for effective demonstration of psychomotor skills in the world of work is paramount and basic. Students

need relevant competencies to effectively demonstrate the skills in domestic and industrial installations. The study revealed that technical college graduates require domestic electrical installations competencies for self-employment in the informal sector of Enugu State. The study further revealed that technical college teachers and employers in electrical/electronic did not differ significantly in their opinions on the domestic electrical installations competencies required of technical college graduates for self-employment in the informal sector of Enugu State.

Recommendations

The following recommendations were made given the findings of the study:

1. The industries should collaborate effectively with Nigerian technical colleges in the training and supervision of students so as to produce graduates with relevant work competencies.
2. The competencies needed by the students as identified in the study should form the basis of instruction by technical college teachers. The curriculum should be implemented to make students acquire the needed competencies. The teachers should ensure that domestic installation competencies are well taught to enable students acquire adequate psychomotor skills to carry out various aspects of domestic and industrial installation.
3. NBTE and curriculum planners should ensure that the students are exposed to all aspects of curriculum that will make them acquire needed competencies in industrial installation. The curriculum planners should therefore utilize the identified competencies in this study to develop the content of the curriculum for instruction for teachers of technical colleges. In-service training could be employed to upskill the electrical installation teachers to enable them impart on students the needed competencies.

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