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Technical Teachers' Competency Needs for Effective Teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States

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Abstract: This study determined Technical teachers' competency needs for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States, Nigeria. Two purposes and two research questions guided the study. Two null hypotheses were tested 0.05 alpha level. Descriptive survey research design was adopted for the study. The population comprised 105 (74 males and 31 females) Technical teachers who are teaching Basic Electricity in 14 Technical Colleges in Anambra and Enugu States. The entire population was used because the population was manageable. The instrument for data collection was 24-items structured questionnaire. The instrument was validated by three experts. Cronbach Alpha method was used to determine the internal consistency of the instrument with an overall co-efficient value of 0.91. Mean and standard deviation were used to answer the research questions, while t-test was used to test the null hypotheses at 0.05 alpha level. The findings of the study revealed that Technical teachers highly needed pedagogical and information and communication technology competencies for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States. Technical teachers in Technical Colleges in Anambra and Enugu States differed significantly in their mean ratings on the pedagogical and information and communication technology competencies needs for effective teaching of Basic Electricity based on their gender and teaching experience. It was recommended among others that improved teacher competency development should be sustained to ensure that graduates acquire industry-relevant skills needed for employment and self-employment.

Key Words: Technical teachers' competency needs, pedagogical and information and communication technology competencies, Basic Electricity, Technical Colleges in Anambra and Enugu States, Nigeria

INTRODUCTION

Technical and Vocational Education and Training (TVET) is a critical component of national development, as it provides the skilled manpower required for industrial and technological advancement. Michael (2019) described technical and vocational education as the aspect of education that equips individuals with practical knowledge and skills necessary for gainful employment or self-reliance. In Nigeria, TVET is offered at various educational levels, including universities, polytechnics, colleges of education, and technical colleges. This study focuses on technical colleges, which serve as the foundation for skills-based vocational training.

Technical colleges are institutions established by the Federal Government of Nigeria to provide learners with practical skills, basic scientific knowledge, and appropriate work attitudes. According to Okeke and Odu (2024), technical colleges are designed to produce skilled craftsmen in various occupational areas such as automobile technology, building and woodwork, business studies, computer trade, mechanical and electrical/electronic trades. The Federal Republic of Nigeria (FRN, 2013) stated that technical colleges are expected to produce

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craftsmen at both craft and advanced craft levels. The programmes offered in technical colleges lead to the award of the National Technical Certificate (NTC) and the Advanced National Technical Certificate (ANTC) (NBTE, 2019). The curriculum consists of general education, trade theory and practice, and supervised industrial work experience. The successful implementation of this curriculum depends largely on the competence of technical teachers, who play a central role in delivering both theoretical and practical instruction.

Technical teachers, also known as Career and Technical Education (CTE) teachers, are trained professionals responsible for preparing students for specific occupations through classroom teaching and hands-on workshop activities. Ado and Hudu (2018) and Auta (2022) described technical teachers as individuals trained in pedagogy and specialized technical subject areas. Teachers are regarded as the most critical factor in the success of technical education, as the quality of instruction largely determines students' learning outcomes (Sharmila, 2019).

Effective teaching of Basic Electricity requires that technical teachers possess adequate competencies. Competency refers to the combination of knowledge, skills, attitudes, and judgment required for effective task performance. Kwa and Mahmud (2018) viewed competency as functional adequacy for a given responsibility, while Ugwu (2017) emphasized the integration of appropriate knowledge, skills, and attitudes. In this study, competency refers to the ability of technical teachers to effectively teach Basic Electricity in technical colleges.

Among the various competency areas identified in the literature, this study focuses on pedagogical and ICT competencies. Pedagogical competency involves the ability to plan, implement, and evaluate teaching and learning processes, including lesson planning, use of appropriate instructional strategies, classroom management, and assessment of learners (Auta, 2015). Enemali (2021) emphasized that effective teaching of Basic Electricity requires strong pedagogical skills, particularly learner-centered and practical instructional approaches.

ICT competency refers to the ability to effectively use digital technologies to support teaching and learning. Okoye and Ugwuogo (2021) defined ICT competency as the integrated knowledge, skills, and attitudes required for functional ICT use in educational settings. For technical teachers, ICT competency is essential for accessing instructional resources, simulating electrical concepts, developing instructional materials, and enhancing students' understanding. Studies have shown that inadequate ICT competencies among technical teachers result in abstract and ineffective instructional delivery (Mbaga, Quahha and Babayo, 2017; Opara, 2024).

Basic Electricity is a core trade-related subject in Nigerian technical colleges that focuses on fundamental electrical principles such as electric charge, current, voltage, resistance, and simple circuits. According to the FRN (2014), the subject is taught in Technical College years I, II, and III and serves as a foundation for electrical, electronic, and engineering-related trades. Students' performance in Basic Electricity is assessed based on academic achievement and retention of concepts.

Despite the importance of Basic Electricity, studies have reported persistent challenges in its teaching and learning in Nigerian technical colleges. Ado and Hudu (2018) and Enemali (2021) identified issues such as inadequate teacher training, outdated technical knowledge, limited practical skills, and insufficient instructional resources. Okeke and Odu (2024) further noted that many teachers lack the competencies required to effectively handle all components of the subject, particularly in Anambra State. These challenges have contributed to poor student performance in Basic Electricity.

Teachers' competency needs may also be influenced by variables such as gender and teaching experience. Abdul-Raheem (2020) described gender as the socially constructed roles

and expectations associated with males and females. Okoye and Ugwuogo (2021) observed that sociocultural factors and unequal access to training may influence teachers' acquisition of ICT skills. Given the relatively low number of female technical teachers, it is necessary to examine the influence of gender and teaching experience on pedagogical and ICT competency needs.

In view of the persistent poor performance of students in Basic Electricity and the identified gaps in teachers' competencies, there is a need for empirical investigation. Therefore, this study seeks to determine the pedagogical and ICT competency needs of technical teachers for the effective teaching of Basic Electricity in technical colleges in Anambra and Enugu States, Nigeria.

Statement of the Problem

Basic Electricity is a foundational subject in Nigerian technical colleges, essential for students' employability and further technical training. However, students' performance in the subject, particularly in Anambra and Enugu States, has remained poor, as shown by low achievement and weak concept retention in examinations such as NABTEB. This poor performance has been largely linked to deficiencies in teachers' pedagogical, technical, and ICT competencies, as well as limited use of modern instructional strategies and professional development. Although studies exist on teacher competencies, there is limited empirical evidence on the specific pedagogical and ICT competency needs of Basic Electricity teachers in these states and the influence of gender and teaching experience. This study therefore seeks to determine the pedagogical and ICT competency needs of technical teachers for effective teaching of Basic Electricity in technical colleges in Anambra and Enugu States, Nigeria.

Research Questions

The following research questions guided the study:

1. What are the pedagogical competency needs of Technical teachers for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States?
2. What are the information and communication technology competency needs of Technical teachers for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States?

Hypotheses

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

1. There is no significant difference in the mean ratings of male and female Technical teachers on the pedagogical competency needs for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States.
2. There is no significant difference in the mean ratings of male and female Technical teachers on the information and communication technology competency needs for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States.

METHODS

The study adopted a descriptive survey research design. The population of the study comprised 105 technical teachers (74 males and 31 females) who teach Basic Electricity in 14 technical colleges located in Anambra and Enugu States, Nigeria. The entire population was used for the study without sampling because the population size was manageable. Therefore, a census survey method was adopted. Data for the study were collected using a 24-item structured questionnaire developed by the researcher. The questionnaire was structured on a five-point rating scale of: Very Highly Needed (VHN), Highly Needed (HN), Moderately Needed (MN), Lowly Needed (LN), and Very Lowly Needed (VLN), with corresponding weight values of

5, 4, 3, 2 and 1, respectively. Respondents were required to rate each item based on the extent to which the identified competencies were needed for effective teaching of Basic Electricity. The instrument was subjected to face and content validation by two experts in business education to ensure clarity, relevance, and adequacy of the items. To determine the internal consistency of the instrument, Cronbach Alpha reliability method was employed. The reliability analysis yielded coefficient values of 0.91 and 0.90 for clusters B1 and B2 respectively, with an overall reliability coefficient of 0.91, indicating that the instrument was highly reliable. Data collected were analyzed using mean and standard deviation to answer the research questions, while the t-test statistic was used to test the null hypotheses at 0.05 level of significance. The Statistical Package for Social Sciences (SPSS) version 23 was used for the data analysis. For hypothesis testing, the p-value approach was used for decision making. Where the calculated p-value was less than 0.05 ($p < 0.05$), the null hypothesis was rejected, indicating a significant difference between the respondents' mean scores. Conversely, when the p-value was greater than or equal to 0.05 ($p \geq 0.05$), the null hypothesis was not rejected, indicating no significant difference between the respondents' mean scores.

RESULTS

Research Question 1:

What are the pedagogical competency needs of Technical teachers for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States?

Table 1: Mean Ratings of Technical Teachers' Pedagogical Competency Needs for Effective Teaching of Basic Electricity

S/N	Pedagogical Competency	$\bar{X}$	SD	Remarks
1.	Ability to select instructional materials correctly	4.23	0.64	Highly Needed
2.	Ability to explain difficult or abstract concepts clearly	4.22	0.65	Highly Needed
3.	Ability to develop appropriate instruments for assessing students' performance in the three domains of learning	3.86	0.87	Highly Needed
4.	Ability to organise learning materials logically	4.40	0.54	Highly Needed
5.	Ability to connect lessons with students' life experiences	3.67	0.98	Highly Needed
6.	Ability to conclude lessons appropriately	4.24	0.62	Highly Needed
7.	Ability to engage students in activities that encourage them to think critically and construct knowledge by themselves	4.28	0.59	Highly Needed
8.	Ability to state lesson objectives correctly in the three domains of learning	3.87	0.86	Highly Needed
9.	Ability to set examination questions to cover various cognitive levels	4.08	0.68	Highly Needed
10.	Ability to arrange counseling programme based assessment results	3.88	0.84	Highly Needed
11.	Ability to use various methods in motivating students to learn	4.08	0.68	Highly Needed
12.	Ability to use a variety of instructional techniques to teach	3.88	0.84	Highly Needed

Data in Table 1 show that all the 12 items listed have mean ratings of 3.67 to 4.40 which indicate that pedagogical competency are highly needed for effective teaching of Basic Electricity in Technical Colleges. The standard deviation of 0.54 to 0.98 showed that respondents are not wide apart in their mean ratings which indicate homogeneity.

Research Question 2:

What are the information and communication technology competency needs of Technical teachers for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States?

Table 2: Mean Ratings of Technical Teachers' Information and Communication Technology Competency Needs for Effective Teaching of Basic Electricity in Technical Colleges

S/N	ICTs Competency	X	SD	Remarks
13.	Ability to use word processing in preparation of lesson notes	4.23	0.68	Highly Needed
14.	Ability to use electronic mails (email) for instructional purpose	3.57	0.83	Highly Needed
15.	Ability to integrate ICT into their pedagogy to enhance learning	4.34	0.64	Highly Needed
16.	Ability to design web pages	3.90	0.72	Highly Needed
17.	Ability to use spreadsheet to prepare students examination result	3.79	0.74	Highly Needed
18.	Ability to use computer aided design (AUTOCAD) to teach technical drawing	3.49	0.87	Highly Needed
19.	Ability the use different search engines to source for educational materials	3.51	0.85	Highly Needed
20.	Proficiency in using various software like Computer Aided Design (CAD) for simulation	3.62	0.81	Highly Needed
21.	Ability to use PowerPoint for instructional delivery	3.65	0.78	Highly Needed
22.	Ability to use video conferencing for instructional Delivery	3.67	0.77	Highly Needed
23.	Ability to use multimedia tools for engaging presentations	4.31	0.66	Highly Needed
24.	Ability to solve troubleshooting technical issues related to software and hardware	4.31	0.66	Highly Needed

Data in Table 2 show that all the 12 items listed have mean ratings of 3.49 to 4.34 which indicate that information and communication technology competency are highly needed for effective teaching of Basic Electricity in Technical Colleges. The standard deviation of 0.64 to 0.87 showed that respondents are not wide apart in their mean ratings which indicate homogeneity.

Testing of Hypotheses

Hypothesis 1: There is no significant difference in the mean ratings of male and female Technical teachers on the pedagogical competency needs for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States.

Table 3: Summary of t-test Comparison of Male and Female Technical Teachers' Mean Ratings on the Pedagogical Competency Needs for Effective Teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States

Gender	N	$\bar{X}$	SD	df	t-cal	p-value	Decision
Male	71	3.49	0.70				
				100	4.216	.002	Significant
Female	31	3.34	0.36				

The result in Table 3 shows that the mean score for male Technical Teachers (**$\bar{X}$**=*3.49, SD=0.70*) was significantly greater than that of the female Technical Teachers (**$\bar{X}$**=*3.34, SD=0.36*), t(100)=4.216, *P*-value of .002. The null hypothesis of no significant difference between the two groups on the pedagogical competency needs of Technical teachers for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States was therefore rejected.

Hypothesis 2: There is no significant difference in the mean ratings of male and female Technical teachers on the information and communication technology competency needs for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States.

Table 4: Summary of t-test Comparison of Male and Female Technical Teachers' Mean Ratings on the ICTs Competency Needs for Effective Teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States

Gender	N	$\bar{X}$	SD	Df	t-cal	p-value	Decision
Male	71	3.38	0.75				
				100	6.372	.000	Significant
Female	31	3.14	0.39				

The result in Table 4 shows that the mean score for male Technical Teachers (**$\bar{X}$**=*3.49, SD=0.70*) was significantly greater than that of the female Technical Teachers (**$\bar{X}$**=*3.14, SD=0.39*), t(100)=6.372, *P*-value of .000. The null hypothesis of no significant difference between the two groups on the information and communication technology competency needs of Technical teachers for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States was therefore rejected.

DISCUSSION

Findings of the first research question revealed that technical teachers highly needed pedagogical competency for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States, Nigeria. This indicates that teachers require strong pedagogical

skills to create effective learning environments, bridge theory with practice, and enhance students' understanding of electrical concepts. This finding agrees with Isa (2024) who reported high pedagogical competency improvement needs among electrical installation and maintenance trade teachers, and with Enemali (2021) who emphasized the importance of pedagogical competencies in professional education.

The findings of hypothesis one revealed that there was a significant difference in the mean ratings of Technical teachers on the pedagogical competency needs for effective teaching of Basic Electricity in Technical Colleges in Anambra and Enugu States, Nigeria based on their gender and teaching experience. This finding supports Isa (2024), who reported gender-based differences in technical teaching skills. These differences may be attributed to variations in exposure, experience, and instructional practice. Identifying pedagogical competency needs is therefore essential for improving the quality of Basic Electricity education and guiding targeted professional development initiatives.

Findings of the second research question indicated that technical teachers highly needed information and communication technology (ICT) competency for effective teaching of Basic Electricity. This suggests that teachers require ICT skills to enhance lesson delivery through simulations, multimedia resources, and access to digital instructional materials. The finding is consistent with Okoye and Ugwuogo (2021) who emphasized ICT as a meaningful learning tool, and with Opara (2024) who found a significant relationship between teachers' competency improvement needs and ICT use for effective teaching. The result also aligns with Okoye and Ugwuogo (2021), who reported that ICT competencies are required to a high extent for effective educational programmes.

The findings of hypothesis two revealed that there was a significant difference in teachers' mean ratings on ICT competency needs based on gender and teaching experience. This agrees with Umar (2018) and Okorieocha, Okparaeke and Ilojeme (2017) who reported gender-related differences in ICT application and learning outcomes. These results underscore the need for structured ICT training programmes to improve teachers' digital competence and enhance instructional effectiveness.

Conclusion

Based on the findings of the study, it was concluded that technical teachers in Technical Colleges in Anambra and Enugu States highly needed pedagogical and ICT competencies for effective teaching of Basic Electricity. Significant differences in competency needs were observed based on gender. Addressing these needs will enhance instructional quality, bridge the gap between theory and practice, and equip students with relevant skills for employment and self-reliance in the electrical industry.

Recommendations

Based on the findings and conclusion of the study, the following recommendations were made:

1. Technical teachers should integrate pedagogical and ICT competencies in the teaching of Basic Electricity to improve instructional effectiveness and students' practical skill acquisition.
2. Ministries of Education and Technical College Education Boards in Anambra and Enugu States should organize regular, targeted retraining programmes to address identified competency gaps among technical teachers.
3. Improved teacher competency development should be sustained to ensure that graduates acquire industry-relevant skills needed for employment and self-employment.

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