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VIRTUAL CLASSROOM COMPETENCES REQUIRED BY ELECTRICAL INSTALLATION AND MAINTENANCE WORKS TRADE TEACHERS IN TECHNICAL COLLEGES IN YOBE STATE, NIGERIA

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Abstract

This study investigated the virtual classroom proficiencies needed by Electrical Installation and Maintenance Works trade teachers in Technical Colleges in Yobe State, Nigeria. Employing a descriptive survey research design, the population of the study was 69 individuals, comprising 53 teachers and 16 ICT experts from eight Technical Colleges in Yobe State, Nigeria. Due to the manageable size of the population, the entire population was included in the study, eliminating the need for sampling. Data collection utilized the "Technical Colleges Virtual Classroom Competency Questionnaire (TCVCCQ)," structured with responses on a 5-point scale. Validation of the instrument was performed by three experts from the Department of Electrical/Electronic Technology Education, Federal College of Education (Technical), Potiskum, Yobe State, resulting in a reliability index of 0.82 determined through the Cronbach Alpha technique. Mean statistics were employed to analyze data for the research questions, while hypotheses were

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tested at a significance level of 0.05 using a t-test. The findings revealed a lack of proficiency among teachers in utilizing participant panels and video play features within virtual classrooms. The study recommends that principals arrange in-house workshops for teachers to acquire requisite proficiency in using participant panel features, and further suggests consultation with video experts to enhance the quality of instructional videos for improved utilization of video play features within virtual classrooms.

Keywords: Competences, Electrical Installation and Maintenance Works, Teachers, Technical Colleges, Virtual Classroom

INTRODUCTION

The objective of the Electrical Installation and Maintenance Works Trade academic program, offered in technical colleges, is to provide students with learning opportunities to cultivate skills applicable to their respective occupations, entrepreneurship endeavors, societal integration, and national advancement (Edomwonyi & Osarumwense, 2017). This program integrates components of general education alongside specialized coursework tailored to the field of electrical installation and maintenance. The growing demand for expertise in electrical works arises from both the industrial revolution in the Western world and indigenous policies aiming at self-reliance and economic development (Ezeani & Ogundola, 2018). The significance of Electrical Installation and Maintenance Works Trade has become increasingly pronounced in light of escalating unemployment rates, necessitating a focus on closing the skill gap among graduates from the nation's Technical Colleges to mitigate social vices and youth restiveness. According to Edomwonyi and Osarumwense (2017), Electrical Installation and Maintenance Works Trade education equips students with the requisite knowledge, skills, attitudes, and understanding to effectively function within the electrical industry as producers and/or consumers of services while also facilitating knowledge transfer to learners.

Incorporation of Information and Communication Technologies (ICT) into the Electrical Installation and Maintenance Works Trade curriculum is imperative to enhance the relevance of graduates within the Nigerian economy and the global job market. Given the advent of a technologically interconnected world, marked by advancements in communication capabilities, ICT integration is essential for preparing students to navigate modern workplaces effectively (Ibanga, Dawasa & Yaro, 2023). Recognizing this

imperative, the Federal Republic of Nigeria established the National Committee on Computer Education in 1998 to formulate strategies for integrating computer education into the national educational framework (Akpan, Etim, & Udom, 2016). The subsequent policy directive emphasized the importance of exposing individuals across educational levels to computer literacy, thus enabling them to harness its potential, understand its functionalities, and apply it to real-world challenges (Agbatogun, 2006).

In the contemporary era, proficiency in Information and Communication Technology (ICT) is considered a fundamental aspect of education, transcending traditional markers of literacy. Consequently, the integration of ICT presents a viable solution to address the challenges facing the Nigerian education system (Olaore, 2014). However, educators face various hurdles in leveraging ICT effectively for educational purposes, including technological incompatibilities and the need for innovative learning methodologies (Dhawan, 2020). As such, the adoption of e-Learning platforms and virtual classrooms has gained prominence, offering flexible and interactive modes of instruction.

Virtual classrooms represent a novel paradigm in education, offering a digital environment where students can engage in traditional classroom activities online, thereby reducing logistical barriers and enhancing accessibility (Ibanga, Dawasa & Yaro, 2023). These virtual environments facilitate collaborative learning experiences, enabling students to interact with peers and construct knowledge collectively (Anekwe, 2017). With diverse functionalities encompassing chat systems, audio-video conferencing, and online whiteboards, virtual classrooms accommodate learners of all levels, ages, and special needs (Ibanga, Dawasa & Yaro, 2023). Synchronous virtual classrooms facilitate real-time interaction between lecturers and students, while asynchronous platforms offer flexibility in accessing course materials and engaging with content at one's own pace (Angelone, Warner & Zydney, 2020). Despite the benefits offered by virtual classrooms, challenges persist, particularly in developing countries, including infrastructure limitations and the requirement for sophisticated devices and high-speed internet connectivity (Szeto & Cheng, 2016). However, the advent of asynchronous virtual classrooms addresses temporal constraints by providing students with the flexibility to access course materials and engage with content at their convenience.

Statement of the Problem

The availability of internet access in Nigeria's technical colleges, particularly in the second tier represented by secondary education, is notably sparse, especially in Yobe State. Technical colleges in the state often face limitations in accessing online services, a challenge exacerbated by unstable internet connectivity and inadequate technology infrastructure experienced by some lecturers. This issue extends beyond regional boundaries and is a nationwide concern. The lack of sufficient training, limited bandwidth, and minimal preparation compounds the challenge, posing a significant risk to the effectiveness of transitioning to online teaching and learning. Rushing into virtual classroom environments without adequate preparation may lead to a suboptimal user experience, potentially hindering the long-term growth and development of learners. Against this backdrop, this study seeks to identify the virtual classroom competencies required by electrical installation and maintenance works trade teachers in Technical Colleges in Yobe State, Nigeria.

Purpose of the Study

The main purpose of the study was to determine the virtual classroom competencies required by electrical installation and maintenance works trade teachers in Technical Colleges in Yobe State, Nigeria. Specifically, the study sought to:

1. Determine the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of available participant panel features in a virtual classroom in Technical Colleges in Yobe State, Nigeria
2. Determine the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of video play features in a virtual classroom in Technical Colleges in Yobe State, Nigeria
3. Determine the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of virtual whiteboard tools features in a virtual classroom in Technical Colleges in Yobe State, Nigeria

Research Questions

The following questions guided the study.

1. What is the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of available participant panel features in a virtual classroom in Technical Colleges in Yobe State, Nigeria?

2. What is the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of video play features in a virtual classroom in Technical Colleges in Yobe State, Nigeria?
3. What is the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of virtual whiteboard tools features in a virtual classroom in Technical Colleges in Yobe State, Nigeria?

Hypotheses

H_{O1}: There is no significant difference in the mean response of Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts in Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of available participant panel features in a virtual classroom in Technical Colleges in Yobe State, Nigeria.

H_{O2}: There is no significant difference in the mean response of Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts in Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of video play features in a virtual classroom in Technical Colleges in Yobe State, Nigeria

H_{O3}: There is no significant difference in the mean response of Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts in Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of virtual whiteboard tools features in a virtual classroom in Technical Colleges in Yobe State, Nigeria.

METHODS

A descriptive survey research design was used for the study, which was conducted in Yobe State, Nigeria. Yobe State, located in northeastern Nigeria with coordinates approximately 12.4541° N latitude and 11.5526° E longitude, is a region rich in history and cultural diversity. Covering an area of about 45,502 square kilometers, it shares borders with Bauchi, Gombe, Borno, Jigawa, and the Republic of Niger. Dominated by the Kanuri ethnic group, with significant populations of Hausa, Fulani, and others, the state's capital, Damaturu, serves as its political, economic, and cultural center. The study's population was

69, which included 53 teachers and 16 ICT experts from eight Technical Colleges in Nigeria's Yobe State. Because there was no sampling, the entire population was used for the study due to its manageable size. The researchers used a structured questionnaire called the "Technical Colleges Virtual Classroom Competency Questionnaire (TCVCCQ)" to collect data. The questionnaire responses were organized on a 5-point scale with Highly Competent (HC) = 5, Competent (C) = 4, Moderately Competent (MC) = 3, Somewhat Competent (SC) = 2, and Not Competent (NC) = 1. Three validates from the Department of Electrical/Electronic Technology Education, Federal College of Education (Technical), Potiskum, Yobe State, validated the questionnaire. Using the Cronbach Alpha technique, a reliability index of 0.82 was achieved after a trial test of the instrument on five teachers and three ICT Experts in Gombe State. The researchers gathered data for the study with the assistance of eight research assistants (One in each Technical College). The mean statistic was used to answer the study's three research questions, while the t-test was utilized to test the study's null hypotheses. All items with a mean score of 3.5 or higher were judged "Competent," while those with a score of less than 3.50 were rated "Not Competent." When deciding on a hypothesis, the null hypothesis was regarded "Significant" if the p-value was larger than the -value, and "Not Significant" if the p-value was less than the -value.

RESULTS

Research Question 1: What is the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of available participant panel features in a virtual classroom in Technical Colleges in Yobe State, Nigeria?

Table 1: Mean and Standard Deviation of Teachers' Level of Competency in the Use of Available Participant Panel Features in a Virtual Classroom

		N = 69		
S/NO	**Features**	$\bar{x}$	**SD**	**Remark**
1.	Capability to send private chat messages	1.97	0.18	NC
2.	Capacity to self-assign to a breakout room	2.01	0.24	NC
3.	Option to save the list of participants	2.02	0.42	NC
4.	Functionality to print the participants' list	2.03	0.59	NC
5.	Ability to monitor session joiners and their permissions	2.01	0.24	NC

6.	Feature to identify current users of session features (activity lights)	2.03	0.40	NC
7.	Ability to detect delays in receiving content (whiteboard, audio, application sharing, or video)	1.97	0.18	NC
8.	Interaction options such as entering/viewing polling responses, using emotion indicators, and raising hands	2.05	0.58	NC
9.	Capability to edit personal profile settings	2.07	0.55	NC
10.	Access to view user profiles	2.16	0.65	NC
11.	Authority to remove participants from the session	1.97	0.18	NC
12.	Privilege to assign or revoke moderator status	2.33	0.98	NC
13.	Ability to grant or revoke participant feature permissions	2.27	0.84	NC
14.	Functionality to create and distribute participants across breakout rooms or return them to the main room	2.25	0.83	NC
15.	Permission setting to allow participants to self-assign to breakout rooms	2.20	0.72	NC
16.	Option to invite others to join the session as participants	2.23	0.88	NC
17.	Ability to conduct polls	1.97	0.18	NC
	Group Mean	**2.09**		**NC**

$\bar{x}$= Grand Mean, SD = Standard deviation, N = Total Number of Respondents, NC= Not Competent

Table 1 displays the response on the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of available participant panel features in a virtual classroom in Technical Colleges in Yobe State, Nigeria. The respondents indicated that the teachers were not competent in the use of available participant panel features in a virtual classroom with a group's mean response of 2.09 which is below the criterion value of 3.50.

Research Question 2: What is the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of video play features in a virtual classroom in Technical Colleges in Yobe State, Nigeria?

Table 2: Mean and Standard Deviation of Teachers' Level of Competency in the Use of Video Play Features in a Virtual Classroom

S/NO	Features	N = 69 $\bar{x}$	SD	Remark
18.	Ability to preview a video transmission	2.37	0.96	NC
19.	Ability to transmit a video broadcast	2.26	0.91	NC
20.	Ability to receive a video broadcast	2.20	0.72	NC
21.	Ability to set video camera preferences	1.97	0.18	NC
22.	Ability to capture a video image and send it to the whiteboard	2.20	0.70	NC
23.	Ability to change what is shown in the primary video display	2.21	0.77	NC
24.	Ability to make the video display follow the current speaker	2.22	0.84	NC
25.	Ability to make the video display follow the moderator's focus	2.24	0.83	NC
26.	Ability to grant/revoke the video permission to/from participants	2.03	0.18	NC
27.	Ability to configure simultaneous cameras	1.97	0.18	NC
	Group Mean	**2.17**		**NC**

$\bar{x}$= Grand Mean, SD = Standard deviation, N = Total Number of Respondents, NC= Not Competent

Table 2 displays the response on the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of video play features in a virtual classroom in Technical Colleges in Yobe State, Nigeria. The respondents indicated that the teachers were not Competent in the use of video play features of the virtual classroom with a group mean response of 2.17 which is below the criterion value of 3.50.

Research Question 3: What is the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of virtual whiteboard tools features in a virtual classroom in Technical Colleges in Yobe State, Nigeria?

Table 3: Mean and Standard Deviation of Teachers' Level of Competency in the Use of Virtual Whiteboard Tools Features in a Virtual Classroom

		N = 69		
S/NO	**Features**	$\bar{x}$	**SD**	**Remark**
28.	Skill in utilizing drawing and text tools for creating objects	2.94	0.35	NC
29.	Proficiency in inserting images, clip art, and screen captures as objects	2.20	0.70	NC
30.	Ability to modify and edit both own and others' objects, including grouping and ungrouping	2.46	0.90	NC
31.	Capability to erase or delete own objects	2.17	0.66	NC
32.	Competence in managing objects using the object explorer	2.23	0.81	NC
33.	Skill in scaling pages within the content area	2.19	0.85	NC
34.	Ability to manage clip art collections effectively	2.16	0.65	NC
35.	Capability to save whiteboard pages to a file (non-proprietary whiteboard only)	1.97	0.18	NC
36.	Option to print whiteboard pages (non-proprietary whiteboard only)	1.97	0.18	NC
37.	Authority to set participant permissions for whiteboard usage	2.17	0.67	NC
38.	Ability to navigate through whiteboard pages seamlessly	2.17	0.74	NC
39.	Skill in managing pages within the explore pages window	2.41	1.05	NC
40.	Proficiency in exploring pages using explore mode	2.25	0.89	NC
	Group Mean	**2.26**		**NC**

$\bar{x}$= Grand Mean, SD = Standard deviation, N = Total Number of Respondents, NC= Not Competent

Table 3 displays the response on the Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of virtual whiteboard tools features in a virtual classroom in Technical Colleges in Yobe State, Nigeria. The respondents indicated that the teachers were not Competent in the use of virtual whiteboard tools features in a virtual classroom with a group mean response of 2.26 which is below the criterion value of 3.50.

Hypothesis 1: There is no significant difference in the mean response of Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts in Electrical Installation and Maintenance Works trade teachers' level

of Competency in the use of available participant panel features in a virtual classroom in Technical Colleges in Yobe State, Nigeria.

Table 4: t-test Analysis between Teachers and ICT Experts on Teachers' Level of Competency in the Use of Available Participant Panel Features in a Virtual Classroom

Respondents	N	Mean	SD	df	t	P – value	Remark
Teachers	218	2.09	0.31				
				67	0.83	0.41	Not Significant
ICT Unit Staff	34	2.04	0.55				

P >0.05 N= Number of respondents, SD= Standard Deviation

The outcomes presented in Table 4 represent the findings of hypothesis one testing at a significance level of 0.05. The calculated p-value was 0.41. Given that the obtained p-value exceeds the predetermined α-value of 0.05, the null hypothesis one is consequently retained.

Hypothesis 2: There is no significant difference in the mean response of Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts in Electrical Installation and Maintenance Works trade teachers' level of Competency in the use of video play features in a virtual classroom in Technical Colleges in Yobe State, Nigeria

Table 5: t-test Analysis between Teachers and ICT Experts on Teachers' Level of Competency in the Use of Video Play Features in a Virtual Classroom

Respondents	N	Mean	SD	df	t	P – value	Remark
Teachers	218	2.17	0.52				
				67	0.49	0.63	Not Significant
ICT Unit Staff	34	2.13	0.50				

P >0.05 N= Number of respondents, SD= Standard Deviation

The results of hypothesis two testing at a significance level of 0.05 are presented in Table 5. The obtained p-value is 0.63. Given that this p-value exceeds the α-value of 0.05, the null hypothesis two is consequently accepted.

Hypothesis 3: There is no significant difference in the mean response of Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts in Electrical Installation and Maintenance Works trade teachers' level

of Competency in the use of virtual whiteboard tools features in a virtual classroom in Technical Colleges in Yobe State, Nigeria.

Table 6: t-test Analysis between Teachers and ICT Experts on Teachers' Level of Competency in the Use of Virtual Whiteboard Tools Features in a Virtual Classroom

Respondents	N	Mean	SD	df	t	P – value	Remark
Teachers	218	2.27	0.50	67	0.87	0.39	Not Significant
ICT Unit Staff	34	2.19	0.52				

P >0.05 N= Number of respondents, SD= Standard Deviation

The outcome presented in Table 6 represents the test results for hypothesis three at a significance level of 0.05. The obtained p-value is recorded as 0.39. Given that the p-value exceeds the predetermined α-value of 0.05, it follows that null hypothesis three is upheld.

DISCUSSION

The study's findings indicate a lack of Competency among teachers in utilizing available participant panel features within a virtual classroom, as evidenced by a group mean response of 2.09, falling below the criterion value of 3.50. The supporting hypothesis suggests no significant difference in Competency between Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts in Yobe State's Technical Colleges. These results align with previous findings by Ibanga, Dawasa, and Yaro (2023), highlighting the need for virtual classroom competencies among teachers in Northeast Nigeria. However, the study also concurs with Patience, Chukwudi, and Abdulhakim (2020) and Ojokoh and Balogun (2008), underscoring the limited exposure of Nigerian teachers to virtual classroom environments, despite efforts to acquire relevant skills.

The study further reveals a lack of competence among teachers in utilizing video play features within virtual classrooms, with a group mean response of 2.17, falling below the criterion value of 3.50. The complementary hypothesis suggests no significant difference in competency between Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts. These findings align with prior studies by Badia, Meneses, and Sigales (2013) and Bhakta and Dutta (2016), emphasizing the expectation for teachers to be competent in video technology, despite their low

knowledge levels. Patience, Chukwudi, and Abdulhakim (2020) acknowledge the scarcity of teachers proficient in video technology within virtual classrooms.

Similarly, the study reveals a lack of Competency in utilizing virtual whiteboard tools features within virtual classrooms, with a group mean response of 2.26, below the criterion value of 3.50. The supporting hypothesis suggests no significant difference in Competency between Electrical Installation and Maintenance Works trade teachers and Information and Communication Technology experts. These findings align with research by Ibanga, Dawasa, and Yaro (2023), Anekwe (2017), and Akpan, Etim, and Udom (2016), emphasizing the importance of teachers being conversant with various components and features of virtual classrooms for effective teaching and learning.

CONCLUSION

The shift to virtual classrooms offers educators an alternative to traditional face-to-face teaching methods, particularly as in-person activities transition to online platforms. Virtual classrooms, electronically driven environments, facilitate self-directed learning by providing access to course materials and fostering interactive engagement. Despite being new to Nigerian teachers, especially in northeastern states, virtual classrooms serve the same instructional purpose as traditional settings, allowing students to interact with course content, instructors, peers, and subject matter. However, findings from the study reveal deficiencies among Electrical Installation and Maintenance Works trade teachers in utilizing participant panel features, as well as shortcomings among Electrical Installation and Maintenance Works trade instructors in utilizing video play and virtual whiteboard tools features within virtual classrooms.

Recommendations

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

1. The principals should organize an in-house workshop for teachers to acquire the required Competency in the use of available participant panel features in a virtual classroom
2. Video experts should be consulted to teach teachers how to improve the content of their videos that will be used for teaching and learning in a virtual classroom to

enhance the teacher's Competency in the use of video play features of the virtual classroom

3. Teachers should engage in self-development activities for them to be acquitted with virtual whiteboard tools features for better utilization of whiteboard tools features in a virtual classroom

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