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DEVELOPMENT AND VALIDATION OF EMPLOYABILITY-BASED SKILLS CONTENT FRAMEWORK FOR ELECTRICAL ENGINEERING TRADES IN GOVERNMENT TECHNICAL COLLEGES IN NORTH-EAST NIGERIA

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ABSTRACT

The study was designed to develop and validate an employability-based skill content framework for Electrical Engineering Trades in Government Technical Colleges in North-East Nigeria. Two research questions and two null hypotheses were formulated to guide the study. The hypotheses were tested at 0.05 level of significance. The study which was conducted in the North Eastern zone of Nigeria, adopted Research and Development (R&D) design. The population of the study was 850 respondents which comprises of 222 Electrical Engineering Trades Teachers from 36 Government Science and Technical Colleges and 628 Graduate employers from 84 industries that employs Electrical Engineering Trades graduates in North Eastern States. The sample was 387 respondents were selected using simple random sampling technique. The instrument for data collection was a structured questionnaire developed by the researcher titled: Employability-Based Skill Content Framework for Electrical Engineering Trades Questionnaire (ESCFEETQ). The reliability index of the instrument was 0.86 obtained using of Cronbach Alpha. The data collected in the study were analyzed using mean and standard deviation statistics. z-test statistics was used to test the null hypotheses at 0.05 level of significance. The findings there was a significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges. there was no significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges. Based on the findings it was recommended that. The government should establish a periodic review process for the curriculum, taking into account feedback from industry stakeholders. The government should establish a periodic review process for the curriculum, taking into account feedback from industry stakeholders, to ensure that it remains aligned with evolving industry needs and technological advancements

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KEYWORDS: Employability-Based Skills, Content Framework for Electrical Engineering Trades, Government Technical Colleges

1. INTRODUCTION

Employability-based skill refers to skills, knowledge and attitudes that lead to superior performance. Skill is the motor domain/unit of competency, knowledge- the intellect/cognitive, and attitudes, the character required for effective performance. In the view of Adeleke and Oduwole (2019) described employability-based skill refers to the knowledge, skills, attitudes and judgment generally required for the successful performance of a task. Judgment as used here means the use of many cognitive and affective skills in the process of making informed decisions on the level of skills required. Adeyemi (2019) described skills as individuals' abilities or characteristics that are key to effectiveness at work. Adeyemi further asserted that there are three major types of skills that can be developed in technical and vocational education such as Electrical engineering trades. These skills include basic, common and core competencies. In developing any educational training program like employability-based skill content framework for electrical/electronic technology, a good knowledge of curriculum theories is usually required to provide rationale, and necessary guide. Adams (2015) reviewed different curriculum models which include Competency based education theory, Human capital theory and System theory. Tida (2017) described linear curriculum model specified elements such as aims and objectives of the course, appropriate contents, and organization and evaluation techniques for the course of study. This implies that linear representation of curriculum design may enhancing the comprehensiveness of planning activities which will led to refinements such as system analysis and taxonomies of learning objectives. Development is expanding and organizing ideas or concepts. According to Solomon (2018), development is the act or process of growing ideas or projects to become larger or more advanced over a period of time. Lkama (2013) posited that development is the systematic use of scientific and technical knowledge to meet specific objectives or requirements. Development may be a process of economic and social transformation based on complex cultural and environmental factors, and their interactions. Development is an extension of theoretical or practical aspects of a concept, design, discovery or invention aimed at adding improvements to an existing idea or body of knowledge.

Content can be described as the concept, precept, task and generalization constituting the main body of knowledge to be learnt. Contents of employability-based skill framework in Electrical installation and maintenance works may include basic, common and core skills in Electrical installation and maintenance works that the teacher and students will pay attention toin the course of teaching and learning processes, in order to modify students' behaviours. Thesecontents demand effective teaching methods for proper implementation. Content framework, like curricular development as a whole has been subject to changesand aspirations, imposed by governments and changing public expectations; in the roles, responsibilities and public perceptions of the professions, Lkama (2013) further contended. Under-performance of skill-based professionals, such as Electrical installation and maintenanceworks trade graduates, has not only undermined public confidence in the way that electrical installation and

maintenance profession and organizations are monitored and managed, but hasled to an increased emphasis in accountability, quality control and self-regulation (Okafor & Eze, 2019). All these factors must be taken into account in developing employability-based skill content framework for electrical installation and maintenance works trade. The acquisition of skills by learners depends on the facilities used during training. Facilities sometimes determine the quality of competencies or skills acquired by learners.

Despite the well-intentioned goals, the graduates of EIMWT from Technical Colleges find themselves falling short in meeting the industry's essential manpower needs. The disheartening reality is that the gap between intention and achievement persists, underscoring the challenges and shortcomings that hinder the effective contribution of these graduates to the workforce demands of the industry. According to Ogunlela (2020) and Tida (2017), the graduates of the Technical Colleges are ill-prepared for the real work. They lack essential depth in competencies required to ensure appropriate placement in industry, and skill-less even in the rudimentary tasks like taking accurate measurements on measuring instrument, not to mention intricate tasks such as satellite tracking and repair of electrical motors and machines. Their failure to meet the expectations of the society who had hoped for a generation of enlightened craftsmen for quality repair installation works for their housing needs was a big let-down, and to say the least worrisome. Failed acquisition of appropriate skills for employment and self-reliance could jeopardize aspirations for career development and progression in EET, which may result in low esteem and frustration. Hence the need for developing a content framework that will inculcate into the students an employability skills to enable them secure and retain relevant employment in electrical installation industry or set up, run and flourish in their own enterprises economically. Against this background however, it becomes pertinent that attempts must be made to develop unique and innovative content framework containing basic, common and core skills required at work, to make the Electrical Engineering Trades products in Technical Colleges immediately employable in the industry and make sustainable living, upon graduation.

Purpose of the Study

The main purpose of this study was to develop and validate an employability-based skill content framework for electrical engineering trades in Government Technical Colleges in North-East Nigeria. Specifically, the study sought to Identify:

1. The component of electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges
2. The component of electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges.

Research Questions

The following research questions were raised to guide the study:

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1. What are the components of electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges?
2. What are the components of electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges?

Hypotheses

The following null hypotheses (Ho) were formulated to guide the study, and were tested at 0.05 level of significance.

HO_1: There is no significant difference in the mean responses of Electrical engineering trades teachers and Technical College graduate employers on the identified electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges

HO_2: There is no significant difference in the mean responses of Electrical engineering trades teachers and Technical College graduate employers on the identified electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges.

METHODOLOGY

The area of this study was North Eastern zone of Nigeria. The study adopted Research and Development (R&D) design. The target population of the study was 850 respondents which comprises of 222 EIMWTeachers from 36 Government Science and Technical Colleges offering Electrical installation and maintenance works trade and 628 Graduate employers from 84 companies that employs EIMW graduates in North Eastern States. The sample size was 387 respondents were determined using random sampling technique to select the respondents using purposive sampling technique to select theindustry that employed EIMW trade graduates and the Technical Colleges. The instrument for data collection was a structured questionnaire developed by the researcher titled: Questionnaire for Employability-Based Skill Content Framework for Electrical installation and maintenance works trade in Technical Colleges (QESCFEETECE). The reliability index of the instrument was 0.86 obtained using of Cronbach Alpha. The data collected were analyzed using mean and standard deviation and z-test.

Presentation of results

Research Question 1: What are the components of electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges?

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Table 1: Mean Responses of Respondents on the Components of Electrical Cable Jointing Skills Suitable for Inclusion

		RESPONDENTS						
		N_T = 143		N_E = 244		N = 387		
S/N	Item Statement	$\bar{x}_T$	SD_T	$\bar{x}_E$	SD_E	$\bar{x}_G$	SD	Remark
1.	Ability to identify different cable joints (Tee Joint, Married Joint, Lap Joint)	4.64	1.00	4.57	1.22	4.59	1.14	Suitable
2.	Ability to prepare cable appropriately for making a Joint	4.59	1.12	4.54	1.28	4.56	1.22	Suitable
3.	Ability to stripping insulation	4.66	0.96	4.58	1.20	4.61	1.12	Suitable
4.	Ability to proper connector crimping	4.76	0.83	4.64	1.15	4.68	1.04	Suitable
5.	Ability to adhere to proper soldering	4.64	1.00	4.57	1.22	4.59	1.14	Suitable
6.	Ability to apply proper heat shrinking	4.62	1.08	4.54	1.28	4.57	1.21	Suitable
7.	Ability to apply proper cable termination	4.57	1.20	4.57	1.22	4.57	1.21	Suitable
8.	Ability to use proper shield grounding	4.52	1.30	4.54	1.28	4.53	1.28	Suitable
9.	Ability to apply proper insulation resistance testing	4.54	1.19	4.58	1.19	4.57	1.19	Suitable
10.	Ability to use proper cable splicing	2.07	0.78	1.52	1.34	1.72	1.19	Not Suitable
11.	Ability to proper cable identification	4.52	1.30	4.54	1.28	4.53	1.28	Suitable
12.	Ability to use proper cable tagging	3.81	0.84	3.75	0.88	3.78	0.87	Suitable
13.	Ability to use proper conductor termination	3.84	0.81	3.77	0.87	3.80	0.85	Suitable
14.	Ability to apply cable sheath removal	3.46	0.50	1.29	0.86	2.09	1.29	Not Suitable
15.	Ability to use proper cable gland installation	4.59	1.19	4.57	1.21	4.58	1.20	Suitable
16.	Ability to use proper connector assembly	4.58	1.23	4.54	1.28	4.56	1.26	Suitable
17.	Ability to use proper cable bending	4.64	1.15	4.61	1.15	4.62	1.15	Suitable
18.	Ability to use proper heat treatment	4.66	1.03	4.60	1.16	4.62	1.11	Suitable
19.	Ability to use proper cable routing	1.08	0.58	1.81	1.60	1.54	1.37	Not Suitable
20.	Ability to use proper cable lugging	4.69	1.07	4.64	1.15	4.66	1.12	Suitable
21.	Ability to use cable lug crimping	4.71	1.01	4.63	1.14	4.66	1.09	Suitable
22.	Ability to use cable tie application	4.78	0.92	4.61	1.17	4.67	1.08	Suitable
23.	Ability to use cable tray installation	3.05	0.48	1.86	1.64	2.30	1.45	Not Suitable

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24.	Ability to use proper cable pulling	4.58	1.23	4.57	1.24	4.58	1.23	Suitable
25.	Ability to apply proper cable jacket stripping	4.62	1.16	4.60	1.17	4.61	1.17	Suitable
26.	Ability to use proper shield bonding	4.59	1.18	4.58	1.18	4.59	1.18	Suitable
27.	Ability to use insulation displacement	4.66	1.11	4.61	1.17	4.63	1.15	Suitable
28.	Ability to use a connector tightening	2.85	0.72	1.79	1.59	2.18	1.43	Not Suitable
29.	Ability to use cable tray routing	4.64	1.15	4.62	1.16	4.63	1.15	Suitable
30.	Ability to use connector alignment	4.57	1.19	4.58	1.18	4.58	1.18	Suitable
31.	Ability to use cable support installation	4.59	1.19	4.58	1.21	4.58	1.20	Suitable
32.	Ability to use cable bending radius control	4.55	1.27	4.56	1.26	4.56	1.26	Suitable
33.	Ability to use cable tie tensioning	4.58	1.21	4.54	1.26	4.56	1.24	Suitable
34.	Ability to use cable tray bonding	4.61	1.19	4.52	1.30	4.56	1.26	Suitable
35.	Ability to use jointing kit installation	4.66	1.11	4.58	1.21	4.61	1.17	Suitable
36.	Ability to use heat shrink tubing application	4.63	1.12	4.56	1.26	4.58	1.21	Suitable
37.	Ability to use insulating tape wrapping	4.51	1.27	4.55	1.24	4.53	1.25	Suitable
38.	Ability to use joint enclosure sealing	4.69	1.07	4.52	1.30	4.59	1.22	Suitable
39.	Ability to use cable dressing	4.59	1.16	4.56	1.22	4.57	1.20	Suitable
40.	Ability to use stress control	4.64	1.15	4.62	1.17	4.63	1.16	Suitable
41.	Ability to use cable tray fixing	4.59	1.04	4.55	1.24	4.57	1.17	Suitable
42.	Ability to use jointing compound application	3.69	0.83	3.64	0.97	3.66	0.92	Suitable
43.	Ability to use cable lug inspection	3.73	0.70	3.67	0.92	3.69	0.84	Suitable
44.	Ability to use cable gland tightening	3.75	0.81	3.64	0.97	3.68	0.92	Suitable
45.	Ability to use cable lug inspection	3.90	0.62	3.89	0.52	3.89	0.56	Suitable
46.	Ability to use jointing chamber inspection	3.85	0.68	3.82	0.68	3.83	0.68	Suitable
47.	Ability to use cable tie cutting	3.77	0.80	3.64	0.97	3.69	0.91	Suitable
48.	Ability to use jointing kit compatibility check	3.92	0.61	3.96	0.34	3.94	0.46	Suitable
49.	Ability to use cable continuity testing	3.88	0.61	3.83	0.80	3.85	0.73	Suitable
50.	Ability to use documentation completion	3.95	0.22	3.97	0.17	3.96	0.19	Suitable
	Cumulative Grand Mean					**4.15**	**1.10**	Suitable

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Key: *N_T = Number of Teachers, N_E = Number of Graduate Employers, $\bar{x}_T$ = Mean of Teachers, $\bar{x}_E$ = Mean of Graduate Employers,$\bar{x}_G$ = Item Grand Mean, SD = Standard Deviation, SD_T = Standard Deviation of Teachers, SD_E = Standard Deviation of Graduate Employers, SD = Item Standard Deviation*

Table 1 presents the components of electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges. Predominantly, item 1 – 9, 11, 12, 13, 15 – 18, 20, 21, 22, 24 – 27, and 29 – 50 were considered suitable with mean values which ranges between 3.66 and 4.66 which was above the criterion mean of 3.50. The accompanying standard deviation which also ranges between 0.19 and 1.27indicated that the responses are clustered together. However, items 10, 14, 19, 23, and 28 were considered not suitable with mean value between 1.54 and 2.09 with their related standard deviation ranging between 1.19 and 1.45 respectively. The cumulative grand mean of 4.15 indicated that the ability to identify different cable joints, prepare cables for jointing, stripping insulation, proper connector crimping, soldering, heat shrinking, cable termination, shield grounding, insulation resistance testing, cable identification, cable tagging, conductor termination, cable lugging, cable tie application, cable pulling, cable jacket stripping, shield bonding, insulation displacement, cable tray routing, jointing kit installation, heat shrink tubing application, insulating tape wrapping, joint enclosure sealing, cable dressing, stress control, cable tray fixing, jointing compound application, cable lug inspection, cable gland tightening, jointing chamber inspection, cable tie cutting, jointing kit compatibility check, cable continuity testing, and documentation completion were suitable electrical cable jointing skills for inclusion in the employability-based skill content framework.

Research Question 2: What are the components of electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges?

Table 2: Mean Responses of Respondents on the Components of Electrical Machine Windings Skills Suitable for Inclusion

		RESPONDENTS						
		N_T = 143		N_E = 244		N = 387		
S/N	Item Statement	$\bar{x}_T$	SD_T	$\bar{x}_E$	SD_E	$\bar{x}_G$	SD	Remark
1.	Ability to select proper winding wire	3.90	0.43	3.88	0.54	3.89	0.50	Suitable
2.	Ability to apply proper coil preparation	3.85	0.65	3.83	0.70	3.84	0.68	Suitable
3.	Ability to apply proper wire stripping accuracy	3.97	0.22	3.98	0.17	3.97	0.19	Suitable
4.	Ability to apply proper coil winding precision	3.95	0.22	3.92	0.41	3.93	0.35	Suitable
5.	Ability to apply proper layer insulation application	4.03	0.26	4.02	0.20	4.02	0.23	Suitable

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6.	Ability to apply proper slot insulation placement	4.02	0.32	4.01	0.25	4.02	0.28	Suitable
7.	Ability to apply proper coil shaping consistency	2.24	0.70	3.64	1.00	3.12	1.13	Not Suitable
8.	Ability to apply proper end winding tie-off proficiency	3.99	0.22	4.00	0.17	3.99	0.19	Suitable
9.	Ability to apply proper wedge insertion precision	4.64	1.13	4.63	1.16	4.63	1.15	Suitable
10.	Ability to apply proper urn-to-turn insulation application	2.87	2.00	1.85	1.64	2.23	1.85	Not Suitable
11.	Ability to apply proper bobbin loading accuracy	4.59	1.15	4.60	1.17	4.60	1.16	Suitable
12.	Ability to apply proper inter-turn connection soldering	4.59	1.15	4.58	1.18	4.59	1.17	Suitable
13.	Ability to apply proper lead wire termination skill	4.62	1.16	4.61	1.17	4.62	1.16	Suitable
14.	Ability to apply proper insulation varnish application	4.57	1.23	4.52	1.30	4.54	1.27	Suitable
15.	Ability to apply proper coil finishing aesthetics	4.55	1.17	4.59	1.17	4.58	1.17	Suitable
16.	Ability to apply proper coil resistance measurement accuracy	2.07	0.78	1.98	1.66	2.01	1.40	Not Suitable
17.	Ability to apply proper wire tension control	4.56	1.21	4.58	1.21	4.57	1.21	Suitable
18.	Ability to apply proper coil winding speed control	4.58	1.23	4.56	1.26	4.57	1.25	Suitable
19.	Ability to apply proper taping technique for insulation	4.64	1.13	4.54	1.26	4.58	1.22	Suitable
20.	Ability to apply proper lead wire dressing	2.10	0.85	1.92	1.69	1.99	1.44	Not Suitable
21.	Ability to apply proper handling of delicate windings	4.62	1.16	4.58	1.21	4.59	1.19	Suitable
22.	Ability to apply proper winding tension adjustment	4.58	1.23	4.56	1.26	4.57	1.25	Suitable
23.	Ability to apply proper wire tension monitoring during winding	4.85	0.68	4.80	0.84	4.81	0.79	Suitable
24.	Ability to apply proper attention to winding pattern	4.80	0.87	4.72	1.02	4.75	0.97	Suitable

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25.	Ability to apply proper insulation material compatibility	4.87	0.62	4.82	0.77	4.84	0.72	Suitable
26.	Ability to apply proper winding pattern adherence	4.97	0.33	4.95	0.36	4.96	0.35	Suitable
27.	Ability to apply proper core insulation application	4.85	0.68	4.81	0.80	4.82	0.76	Suitable
28.	Ability to apply proper winding termination alignment	4.80	0.87	4.75	0.96	4.77	0.93	Suitable
29.	Ability to apply proper wire gauge selection	4.00	0.31	3.90	0.59	3.94	0.51	Suitable
30.	Ability to apply proper lead wire routing	2.16	0.50	3.93	0.44	3.28	0.97	Not Suitable
31.	Ability to apply proper wire connection integrity	3.62	0.94	3.72	0.85	3.68	0.88	Suitable
32.	Ability to apply proper core fitting precision	3.93	0.74	3.85	0.79	3.88	0.77	Suitable
33.	Ability to apply proper winding documentation accuracy	3.92	0.30	3.93	0.36	3.92	0.34	Suitable
34.	Ability to apply proper impregnation process proficiency	3.78	0.74	3.84	0.66	3.82	0.69	Suitable
35.	Ability to apply proper winding equipment setup	3.80	0.87	3.88	0.67	3.85	0.75	Suitable
36.	Ability to apply proper safety protocol adherence	3.73	0.93	3.84	0.73	3.80	0.81	Suitable
37.	Ability to apply proper coil identification marking	3.69	0.95	3.82	0.74	3.77	0.83	Suitable
38.	Ability to apply proper wire joint quality	3.99	0.51	3.97	0.47	3.98	0.49	Suitable
39.	Ability to apply proper wire termination insulation	4.05	0.72	4.00	0.52	4.02	0.60	Suitable
40.	Ability to apply proper handling of special winding requests	3.75	0.78	3.79	0.73	3.77	0.75	Suitable
41.	Ability to apply proper tolerance adherence in winding	3.72	0.80	3.79	0.72	3.76	0.75	Suitable
42.	Ability to apply proper handling of irregular-shaped cores	3.81	0.50	3.84	0.54	3.83	0.53	Suitable
43.	Ability to apply proper coil arrangement in slots	3.92	0.64	3.94	0.53	3.93	0.57	Suitable
44.	Ability to apply proper tension control during winding transitions	3.48	1.06	3.60	1.01	3.56	1.03	Suitable

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45.	Ability to apply proper winding process troubleshooting	4.72	1.00	4.43	1.35	4.54	1.24	Suitable
46.	Ability to apply proper coil stacking alignment	3.90	0.57	3.90	0.54	3.90	0.55	Suitable
47.	Ability to apply proper core material handling	4.22	1.55	3.97	1.75	4.06	1.69	Suitable
48.	Ability to apply proper wire insulation integrity check	3.92	1.69	3.58	1.88	3.70	1.81	Suitable
49.	Ability to apply proper winding defect detection	4.24	1.47	4.07	1.64	4.13	1.58	Suitable
50.	Ability to apply proper final inspection and quality control	4.13	1.61	4.00	1.71	4.04	1.68	Suitable
	Cumulative Grand Mean					**4.03**	**0.91**	**Suitable**

Key: *N_T = Number of Teachers, N_E = Number of Graduate Employers, $\bar{x}_T$ = Mean of Teachers, $\bar{x}_E$ = Mean of Graduate Employers,$\bar{x}_G$ = Item Grand Mean, SD = Standard Deviation, SD_T = Standard Deviation of Teachers, SD_E = Standard Deviation of Graduate Employers, SD = Item Standard Deviation*

Table 2 presents the components of electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges. Primarily, item 1 – 6, 8, 9, 11 – 15, 17 – 19, 21 - 29, and 31 – 50 were considered suitable with mean values which ranges between 3.56 and 4.77 which was above the criterion mean of 3.50. The complementary standard deviation which also ranges between 0.17 and 1.69indicated that the responses are clustered together. However, items 7, 10, 20, and 30 were considered not suitable with mean values ranging between 1.99 and 3.38 with their related standard deviation ranging between 1.44 and 1.85 respectively. The cumulative grand mean of 4.15 indicated that some components related to coil shaping consistency, turn-to-turn insulation application, lead wire routing, coil resistance measurement accuracy, and handling of delicate windings were considered suitable for electrical machine skills for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges.

Hypothesis 1: There is no significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges.

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Table 3: Z-test Analysis of the Respondents on the Components of Electrical Cable Jointing Skills Suitable for Inclusion

Respondents	N	$\bar{x}$	SD	Z-Cal.	Z-Crit.	Remark
Teachers	143	4.23	0.65			
				2.34	1.96	Rejected
Graduate Employers	244	4.11	0.97			

P >0.05, N= Number of respondents, $\bar{x}$ = Mean Response, SD = Standard Deviation

Table 3 presents the Z-test analysis comparing the mean responses of Electrical Installation and Maintenance Works trade teachers and Technical College graduate employers on the identified electrical cable jointing skills suitable for inclusion in the Employability-Based Skill Content Framework for electrical engineering trades in Technical Colleges. The mean response for teachers is 4.23 with a standard deviation of 0.65, and for graduate employers, it is 4.11 with a standard deviation of 0.97. With a calculated Z-value of 2.34 exceeding the critical Z-value of 1.96 for a significance level of 0.05, the null hypothesis is rejected. This implies that there is a statistically significant disparity in the mean perceptions of these two respondent groups, highlighting a divergence in their views regarding the relevance of electrical cable jointing skills within the specified framework.

Hypothesis 2: There is no significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges.

Table 4: Z-test Analysis of the Respondents on the Components of Electrical Machine Windings Skills Suitable for Inclusion

Respondents	N	$\bar{x}$	SD	Z-Cal.	Z-Crit.	Remark
Teachers	143	4.02	1.66			
				0.12	1.96	Accepted
Graduate Employers	244	4.04	1.43			

P >0.05, N= Number of respondents, $\bar{x}$ = Mean Response, SD = Standard Deviation

Table 4 presents the Z-test analysis comparing the mean responses of Electrical Installation and Maintenance Works trade teachers and Technical College graduate employers on the identified electrical machine windings skills suitable for inclusion in the Employability-Based Skill Content

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Framework for electrical engineering trades in Technical Colleges. The mean response for teachers is 4.02 with a standard deviation of 1.66, and for graduate employers, it is 4.04 with a standard deviation of 1.43. The calculated Z-value of 0.12 is below the critical Z-value of 1.96 for a significance level of 0.05, leading to the acceptance of the null hypothesis. Consequently, this indicate a consensus between teachers and graduate employers, implying that their perceptions align on the relevance of electrical machine windings skills within the employability-based skill content framework.

FINDINGS OF THE STUDY

Based on the results presented, the following findings emerged:

1. Forty-five electrical cable jointing skills task items were suitable for inclusion into the employability-based skill content framework. The supporting hypothesis revealed that there was a significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges.
2. Forty-six electrical machine skills task items were considered suitable for inclusion into the employability-based skill content framework for electrical engineering trades in Technical Colleges. The supporting hypothesis revealed that there was no significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges.

DISCUSSION OF FINDINGS

The findings of the study in regard to research question one revealed that 45 electrical cable jointing skills task items were suitable for inclusion into the employability-based skill content framework. The supporting hypothesis revealed that there was a significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical cable jointing skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges. The findings is in agreement with Adeyemi and Adebola's (2021) who investigated the challenges and innovations in the electrical power sector in Nigeria provides crucial context to these findings. The authors highlighted the important role of skilled professionals in cable jointing to enhance the reliability and efficiency of power distribution networks. This emphasizes the practical implications of cable jointing skills in ensuring a robust electrical infrastructure, aligning with the broader goals of the nation's power sector. Building on this, Okafor and Eze (2019) explored the practical implications of cable jointing skills in the construction industry, shedding light on the importance of precision and safety in electrical installations. The study contributes to a holistic understanding of cable jointing, recognizing its role not only in power distribution networks but also in various construction projects where electrical installations are integral. The insights from this research are valuable in informing educational

programs that prepare individuals for diverse applications of cable jointing skills. Usman and Bello's (2020) work further enriched the discourse by focusing on the evolving technological landscape. The study emphasized the necessity of incorporating modern cable jointing techniques and materials into the skill content framework. This forward-looking perspective recognizes the dynamic nature of the electrical engineering field, urging educational institutions to adapt their curricula to align with industry advancements. This insight is particularly relevant in the context of Nigeria's push towards technological innovation and infrastructure development.

The findings of the study in regard to research question two revealed that 46 electrical machine skills task items were considered suitable for inclusion into the employability-based skill content framework for electrical engineering trades in Technical Colleges. The supporting hypothesis revealed that there was no significant difference in the mean responses of Electrical installation and maintenance works trade teachers and Technical College graduate employers on the identified electrical machine windings skills suitable for inclusion in the employability-based skill content framework for electrical engineering trades in Technical Colleges. Yusuf et al. (2021) delved into the challenges and prospects of technical education in Nigeria, particularly focusing on the nuanced aspects of electrical machine operations. The authors emphasized the critical role of practical skills development in enhancing the employability of graduates, aligning with the study's core emphasis on hands-on electrical machine skills crucial for success in the industry. Expanding on this, Okoro and Adenuga (2019) explored the implications of integrating industry-relevant electrical machine skills into technical education curricula. The study highlighted the imperative for educational programs to adapt to the dynamic demands of the job market, advocating for a curriculum that provides students with practical skills directly applicable to the electrical engineering industry. This aligns seamlessly with the broader goals of the employability-based skill content framework, which aims to bridge the gap between academic knowledge and industry needs. Furthermore, Adegbite and Balogun's (2020) work contributed valuable insights into the evolving landscape of electrical machine technology in Nigeria. The study underscored the importance of adapting technical education curricula to stay abreast of technological advancements. The authors emphasized the need for a forward-looking perspective to ensure that graduates are not only well-versed in traditional skills but also equipped with the latest knowledge and techniques relevant to the contemporary electrical engineering industry. This forward-looking approach is crucial for preparing students to navigate the rapidly evolving technological landscape.

CONCLUSION

The study, "Develop and Validate an Employability-Based Skill Content Framework for Electrical Engineering Trades in Government Technical Colleges in North-East Nigeria," culminates with a profound recognition of the transformative potential of the proposed framework. The framework's development and subsequent validation process stand as a testament to the commitment to producing highly employable graduates who possess a comprehensive skill set aligned with industry requirements. The study advocates for a dynamic and responsive education system that continually adapts to the evolving needs of the electrical engineering industry, ultimately fostering a workforce

that is not only technically proficient but also equipped with the soft skills and adaptability required for sustained success in the competitive job market.

RECOMMENDATIONS

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

1. The government should establish a periodic review process for the curriculum, taking into account feedback from industry stakeholders, to ensure that it remains aligned with evolving industry needs and technological advancements.
2. Technical College administrators should encourage the use of the identified 25 teaching methods suitable for delivering the employability-based skill content framework. This diversification will cater to different learning styles and enhance the effectiveness of knowledge transfer.

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