Improvement Needs of Electrical and Electronics Technology Education Curriculum for Sustainable Self-Employment of Graduates of Universities in Northern Nigeria

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ABSTRACT

The study determined the improvement needs in Electrical and Electronics Technology Education curriculum for sustainable self-employment of graduates of universities in Northern Nigeria. A descriptive survey research design was adopted. A total of 175 which comprises 25 Lecturers, 76 Industry workers and 74 self-employed graduates were used as the sample of the sudy. The research objectives that guided the study include to determine the improvement needs of renewable energy, and electrical machines, among others for sustainable self-employment of Electrical Electronics Technology Education graduates. Four research questions and four hypotheses guided the study. A structured questionnaire titled Improvement needs of Electrical Electronics Technology Curriculum for Sustainable Self-employment questionnaire (INESS) was used as instrument for data collection; the questionnaire was validated by three experts. The instrument was subjected to pilot test at University of Nigeria Nsukka and a reliability coefficient of 0.76 was obtained, which indicated a good reliability index. Statistical packeage SPSS version 2.9 was used to analysed the research questions, while the rsult of the one way ANOVA was tested at 0.05 level of significance using cronbanch Alpha. The findings of the study showed that the lecturers, industry workers, and self-employed graduates have consensus on the need for curriculum enhancements in areas such as energy conversion and renewable energy, electrical machines, pedagogical skills, and educational administration and planning aspects which are crucial for equipping graduates with the expertise skills needed for self-employment. Furthermore, the findings from the study revealed no significant differences in the mean rating for the improvement needs among the different respondent groups regarding the energy conversion and renewable energy, electrical machines, pedagogical skills, and educational administration and planning aspects of the curriculum for sustainable self-employment of Electrical Elevtronics Technology Education graduates. The study recommended that Electrical Electronics Technology curriculum should incorporated AI skills, Photo-voltaic technology, hydro-panels technology, High Temperature Superconductor (HTS) for increased power density, project-based learning approaches of pedagogical skills, soft skills development, problem solving skills, and a contemporary system to track and assess the efficacy of the educational process, human resources and financial planning expertise, among others to address these curriculum gaps for equipping graduates with the necessary skills for sustainable self-employment, thereby contributing to economic development in Nigeria.

Keywords: Curriculum, EETE, Sustainable Self-employment, Graduates

INTRODUCTION

Technical and Vocational Education and Training (TVET), including Electrical and Electronics Technology Education (EETE), plays a vital role in equipping students with practical skills, knowledge, and competencies for employment and self-employment in a rapidly evolving technological environment. Electrical and Electronics Technology Education Curriculum are designed to provide learners with the necessary theoretical foundations as well as practical expertise in areas such as energy conversion, electrical machines, and related

technologies. These competencies are critical in industries that rely on electrical systems, power generation, maintenance, automation, and renewable energy solutions (Bawa, Duhu & Ezugu, 2025).

Despite the importance of these technical skills, existing research indicates that current curricula in Nigerian universities and other higher education institutions often struggle to keep pace with rapidly changing industry standards and emerging technological requirements. The curriculum in many cases places greater emphasis on theoretical instruction at the expense of hands-on, practical training that would enhance employability and self-employment capabilities among graduates (Mohammed & Ismail, 2015). This indicated that energy conversion and renewable energy is not fully captured in the curriculum of Electrical and Electronics technology education programme and the 2018 BMAS contents of Electrical and Electronics Technology Education, except few contents which are more of basic power supply, that is, conversion of AC to DC and vice versa, and AC and DC generators and motor. This gap is especially evident in specialised technical areas such as energy conversion systems—which include the generation, transformation, and efficient use of electrical energy—and electrical machines, where modern industry demands advanced skills in installation, diagnostics, maintenance, and design. There are no much course contents related to renewable energy, power sources, generation and transmission that provide contents for training students in renewable energy (Poudyal, et al, 2020). Also, the contents and the hours allocated to some practical courses for the training are not enough to provide sufficient training and skills development necessary for self-employment. The objective of some practical courses is more of theory than practice, as it requires students to identify, state and handle calculations more. Hence, the course is only aimed at making students to recognize the importance and advantage of the energy sources. Therefore, updating the Electrical and Electronics Technology curriculum to include the most up-to-date knowledge of renewable energy, particularly in the fields of solar energy (photovoltaics), wind energy, and bioenergy, can aid in the creation of additional jobs for independent contractors.

Furthermore, there is a clear need to strengthen pedagogical skills among EETE lecturers and instructors to ensure that modern teaching methods—such as competency-based training, problem-based learning, and experiential instruction—are adopted. Traditional lecture-focused instruction limits students' engagement with practical work, critical thinking, and industry-aligned problem solving, which are essential for graduates aspiring to start their own enterprises or take up technical consultancy roles (Fatokun & Gumbo, 2024). Some little aspects of the pedagogy have only been captured in educational management of the Electrical Electronics Technology Education curriculum. The contents in the curriculum are not enough to train the students to acquire the necessary skills to establish a self-supporting business including proprietorship of private business. This view is supported by Okoli and Yinka-Banjo (2017), who emphasized that the establishment of privately owned Technical and Vocational Education and Training (TVET) institutions in Nigeria would increase access to practical-oriented education and improve the employability of graduates. Pedagogical skill will equip the students with the practices, processes, and methods regarding teaching and learning. For students to learn more effectively and for them to develop high-order thinking skills, an effective and well-considered pedagogy is essential. A robust pedagogy is necessary to guarantee that students can learn well through offline and online learning which poses certain problems and opportunities for instructors. Pedagogy is the mix of teaching methods (what instructors do), learning activities (what instructors ask their students to perform), and learning assessments. Pedagogy emphasizes the importance of active learning and student interaction in the learning process, it focuses on the method the knowledge is constructed by the student rather than merely being imparted by the teacher (Adigun, Adejumo, & Adepoju, 2018).

Additionally, effective curriculum administration and planning are crucial to aligning programme content with real-world industry needs. Curriculum administrators must ensure that objectives, course content, assessment strategies, and institutional support systems are consistently updated to reflect current trends in electrical and electronics technologies and entrepreneurial requirements. When planning is weak, graduates are likely to emerge with outdated skills, undermining both employment and self-employment prospects (Bawa et al., 2025). For effective and sustainable self-employment, the possession of administration and planning skills is necessary. Electrical Electronics programme has a course on educational administration and planning which can help the individuals acquire skills in administration. Administration is the planning and use of people and resources to achieve a stated goal thorough organizing, directing, and facilitating team of people brought

together to attain that specific predetermined goals. In current Electrical and Electronics curriculum, there is no courses to specifically address this area of administration and planning skills to provide graduates with the skills and expertise to establish and mange school or organization. This means that there are some gaps that need to be address in order to equip students of Electrical and Electronics Technology with the knowledge and expertise in establishing and managing new businesses for self-reliant job, and at the same time the graduate can be contracted to manage other institute based on their skills of administration displayed. Improving the curriculum contents to includes aspect of leadership with knowledge on how to establish and manage new organization, and at the same time train other in different managerial positions in schools for successful development and self-employment is highly needed.

Research on curriculum improvement needs in EETE programmes highlights that curriculum gaps hinder graduates from effectively participating in the labour market or innovating their own technical enterprises. For example, studies in related contexts have shown that overreliance on theoretical courses, without equal emphasis on practical and entrepreneurial competencies, reduces the employability and self-reliance of technical education graduates (Mohammed & Ismail, 2015). Similarly, emerging technological fields—such as smart energy systems, automation, and advanced electrical machinery—require curriculum updates so that students acquire both cognitive and technical skills relevant to modern industrial and entrepreneurial environments (Fatokun & Gumbo, 2024).

Hence, based on the above identified needs for curriculum improvement; updating the Electrical and Electronics Technology Education curriculum in universities is essential for sustainable self-employment. The present study involved Lecturers of Electrical and Electronics Technology Education, self-employed graduates, and industry workers who studied Electrical Electronics Technology Education in order to receive feedback from them on the need to include emerging technologies in all the aforementioned gray areas identified for updating the curriculum. By incorporating the findings upon completion of the study into the curriculum, universities can better prepare graduates for self-employment and contribute to the overall development of Nigeria and beyond.

Statement Of The Problem

Electrical and Electronics Technology Education (EETE) curriculum in universities are designed to prepare graduates with technical and pedagogical competencies for employment and self-employment in electrical-related industries. However, despite the objectives of the programme, many graduates remain unemployed or underemployed, and some lack the practical and entrepreneurial skills required to establish sustainable self-employment ventures.

Studies have shown that technical education curricula in many institutions are heavily theory-oriented, with insufficient emphasis on practical training and emerging technological trends (Ismail & Mohammed, 2015). In critical areas such as energy conversion and electrical machines, rapid advancements in renewable energy technologies, automation, smart grids, and modern diagnostic systems demand updated competencies that may not be adequately reflected in current curricula (Fatokun & Gumbo, 2024). Consequently, graduates may lack the advanced technical skills necessary for installation, maintenance, troubleshooting, and innovation in modern electrical systems.

In addition to technical gaps, weaknesses in pedagogical skills among instructors may limit the effectiveness of instructional delivery. Traditional teaching methods often fail to promote experiential learning, creativity, and entrepreneurial thinking—qualities essential for self-employment success. Furthermore, inadequate curriculum administration and planning can result in outdated course content, weak industry collaboration, and poor integration of practical and entrepreneurial components.

If these gaps persist, the EETE programme may continue to produce graduates who are insufficiently prepared to meet industry expectations or create sustainable employment opportunities for themselves. Therefore, there is a need to systematically identify the curriculum improvement needs in energy conversion, electrical machines, pedagogical practices, and administration and planning within EETE programmes. Addressing these needs is essential for enhancing graduate competence, promoting sustainable self-employment, and

contributing to national development. Hence, there is need to conduct a study on the improvement needs of electrical and electronics technology education curriculum for graduates' sustainable self-employment in Northern Nigeria.

Purpose Of The Study

The main purpose of this study is to determine the improvements needs of electrical and electronics technology education curriculum in Northern Nigeria universities for sustainable self-employment of graduates.

Specifically, the study intends to:

1. determine the improvements needs of the energy conversion and renewable energy areas to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates.

2. determine the improvements needs of electrical machines components to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates.

3. determine the improvements needs in the pedagogical skills of teaching and learning contents to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates.

4. determine the improvements needs in the educational administration and planning aspects to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates.

Research Questions

The following research questions guided the study.

1. What are the improvements needs of the energy conversion and renewable energy areas to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

2. What are the improvements needs of electrical machines components to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

3. What are the improvements needs in the pedagogical skills of teaching and learning contents to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

4. What are the improvements needs in the educational administration and planning aspects to be included into the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

Research Hypotheses

The following null hypotheses were formulated to guide this study:

Ho_1: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of energy conversion and renewable energy areas to be included into the curriculum of universities.

Ho_2: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of electrical machine components to be included into the curriculum of universities.

H_{O3}: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of pedagogical skills to be included into the curriculum of universities.

H_{O4}: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of educational administration and planning aspects to be included into the curriculum of universities.

METHODOLOGY

The type of research design employed for this study is descriptive survey research design. This method of collecting and analyzing data aims to describe the characteristics or behaviors of a particular population, group, or phenomenon without manipulating or changing any variables (Babbie, 2016). In this research, a sample of participants was selected from the population, and data is collected through questionnaires. The data collected was analyzed using statistical techniques method to summarize the findings and draw conclusions.

The area of the study is Northern Nigeria, which is the location where the researcher is conducting the survey. Specifically, the states hosting the University offering Electrical and Electronics Technology Education programmes, that is Adamawa, Bauchi, Benue, Kano and Niger States of Nigeria. The target population in this research are is One hundred and eighty (180) lecturers, industry workers, self-employed graduates in the area of the study. The self-employed graduates are those that graduated from Electrical Electronics Technology Education programme who are working for themselves or managing their workshop, whereas industry workers are specifically the Electrical and Electronics Technology Education graduates who secured employment in the industry.

The sample for the research involved all the population, but during the collection of data, only one hundred and seventy-five returned the questionnaire out of one hundred and eighty, that is, Twenty (25) lecturers, Seventy-six (76) industry workers and Seventy-four (74) self-employed graduates, from the total population of the study. The instrument used in this study is questionnaire titled Improvement Needs of Electrical and Electronics Education Curriculum for Sustainable Self-employment (CINESS). This helps in collecting the appropriate data for analysis.

One Electrical Technology Education department staff from Modibbo Adama University, Yola, one staff from Abubakar Tafawa Balewa University Bauchi and one from Bayero University, Kano validated the instrument. Face and content validation were carried out. For face validation, the validates scrutinized the items for appropriateness of grammar, and ambiguity in statements. Content validation was carried out to ascertain the inclusiveness of the content areas and to identify all the relevant skill contents of the various courses identified for the study. All the corrections made by the validates were duly incorporated in the final copy of the instrument for improvements. Also, a reliability coefficient using statistical analysis tool known as SPSS version 29 to determine the internal consistency of the instrument was obtained. Cronbach Alpha method of establishing reliability was used in order to determine the coefficient value of the questionnaire items. The α-value obtained for the instrument stood at 0.75, which make the instrument good and reliable for the study.

RESULTS

Research Questions

The results of the four research questions are presented as follows:

Research Question 1: What are the improvements needs of the energy conversion and renewable energy areas of the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

Table 1: Mean and Standard Deviation of responses of Respondents on Improvements Needs of the Energy Conversion and Renewable Energy Areas of the Curriculum for Sustainable Self-Employment.

S/N	ITEMS	X_L	SD_L	X_{IN}	SD_{IN}	X_{SE}	SD_{SE}	X_{MOM}
1	Infusing Photo-Voltaic (PV) technology in the EET curriculum.	2.50	.89	3.20	.81	3.37	.68	3.17
2	Incorporation of hydro-panels technology general principles in the EET curriculum.	2.71	.86	3.03	.99	3.15	.87	3.03
3	Adding basic biomass/biogas technology in the EET curriculum to provide graduates with up to date knowledge.	2.58	.78	2.90	.77	2.74	.85	2.79
4	Inclusion of primary transducers for alternative energy conversion technology skills in the EET curriculum	2.60	.71	2.89	.95	2.86	.92	2.84
5	Inclusion of repairs techniques in wind energy of the EET curriculum	2.68	.63	2.88	.85	2.83	.78	2.83
6	Inclusion of repairs in solar energy facilities in the EET curriculum	2.66	.78	2.71	.89	2.71	.75	2.70
7	Inclusion of solar panel and battery maintenance technology in the EET curriculum.	2.58	.72	3.07	.79	2.82	.93	2.89
	GRAND MEAN	**2.62**		**2.95**		**2.93**	**.82**	**2.89**

Source: Field Survey, 2025

KEY: X_{MOM}- Mean of Means**, X_L**-Mean of Lecturers, **X_{IN} -**Mean of Industry Workers**, X_{se} –** Mean of Self-Employed graduate**, SD_L, -** Standard Deviation of Lecturers**, SD_{IN} -** Standard Deviation of Industry workers**,**

SD_{se} -Standard Deviation of Self-employed graduates

From the 7-items questionnaire addressing research question one as presented in Table 1, it shows that all categories of the respondents scored them 2.50 and above, which is above the decision point of 2.00. The grand mean of means stood at 2.89. This means that from the ratings in research question five, all the respondents agreed with the suggestion on the improvements needs of the Photo-Voltaic (PV) technology, repairs techniques in wind energy, repairs of solar panel and battery maintenance in the energy conversion and renewable energy areas of the curriculum for graduate sustainable self-employment.

Research Question 2: What are the improvements needs of electrical machines components of the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

Table 2: Mean and Standard Deviation of responses of Respondents on Improvements Needs of the Electrical Machines Components of the Curriculum for Graduates Sustainable Self-Employment.

S/N	ITEMS	X_L	SD_L	X_{IN}	SD_{IN}	X_{SE}	SD_{SE}	X_{MOM}
1	Digitalizing and modernizing electrical machine component of the EET curriculum to reflect modern trends in the field.	3.64	.57	3.42	.62	3.43	.80	3.46

2	Inclusion of energy extraction from AC generators for storage in batteries/capacitors in the EET curriculum.	3.44	.51	3.28	.79	3.12	.74	3.24
3	Inclusion of multi-level converters with silicon carbide (SiC) devices along with AC machines in the EET curriculum	3.08	.64	3.22	.77	3.21	.71	3.20
4	Inclusion of permanent magnet synchronous motors (PMSMs) in electric vehicles, wind turbines, and industrial machines in the EET curriculum	3.44	.65	3.07	.81	3.09	.76	3.13
5	Inclusion of winding tools technology into the EET curriculum	3.16	.85	3.03	.78	3.26	.86	3.15
6	Inclusion of skills in high temperature superconductors (HTS) for increased power density and efficiency in the EET curriculum.	3.08	.78	2.64	.80	2.78	.76	2.76
7	Inclusion of heavy-duty industrial machine and AC to DC conversion and vice-verse in the EET curriculum	3.12	1.05	3.20	.73	3.19	.76	3.18
8	Adding technology of variable control motors and programmable logic control (PLC) in the EET curriculum.	3.08	.91	2.87	.93	3.04	.91	2.97
	GRAND SD AND MEAN	**3.26**		**3.09**		**3.14**	**.77**	**3.14**

Source: Field Survey, 2025

For the Eight questionnaire items presented in Table 2, all the three categories of the respondents scored them high, among which item 1 was rated 3.64 by the lecturers. However, item 6 was scored 2.64 by industry workers and 2.78 by the self-employed graduates; also item 8 was scored 2.87 by the industry workers. But, it all showed that the respondents agreed with the items with scores above 2.00. The grand mean of means still stood at 3.14. In any case, all the respondents agreed with the improvements needs of Digitalizing and modernizing electrical machine component of the EET curriculum, inclusion of energy extraction from AC generators for storage in batteries/capacitors, and inclusion of heavy-duty industrial machine and AC to DC conversion and vice-verse in the electrical machines components of the curriculum for graduate sustainable self-employment.

Research Question 3: What are the improvements needs in the pedagogical skills of teaching and learning contents of the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

Table 3: Mean and Standard Deviation of responses of Respondents on Improvements Needs in the Pedagogical Skills of Teaching and Learning Contents of the Curriculum for Graduates Sustainable Self-Employment.

S/N	ITEMS	X_L	SD_L	X_{IN}	SD_{IN}	X_{SE}	SD_{SE}	X_{MOM}
1	Project-based learning approaches of pedagogical skills to equip the	3.60	.50	3.28	.56	3.36	.54	3.36

	graduates with high-order thinking skills should be included in the EET curriculum							
2	A robust pedagogy is necessary to guarantee that, students learn well through online learning.	3.36	.57	3.05	.75	3.22	.63	3.17
3	Inclusion of soft skills development such as communication, teamwork and problem-solving, essential in the work environment are needed in the EET curriculum.	3.28	.54	2.84	.97	2.96	.93	2.95
4	The EET curriculum should include problem-solving and critical thinking skills.	3.52	.59	3.09	.79	3.22	.73	3.21
5	Inquiry-based learning and differentiated instruction should be included as pedagogical approaches in the EET curriculum.	3.16	.75	3.03	.83	3.05	.79	3.06
6	Teachers should embrace Constructivist pedagogy to promotes cooperative learning for improvement of skills of EET curriculum.	3.44	.58	2.95	.97	3.01	.92	3.05
7	Inclusion of online learning resources, digital tools and educational technology skills to enhance teaching and learning experiences of graduates	3.16	.90	3.05	.91	3.08	.88	3.08
8	Self-supportive businesses such as proprietorship of private technical institute should be integrated into the curriculum	3.16	.85	3.07	.84	3.18	.77	3.13
	GRAND MEAN	**3.34**		**3.05**		**3.14**	**.75**	**3.13**

Source: Field Survey, 2025

Research question three is addressed by eight questionnaire items, as shown in Table 3. The rating is not different from the previous ratings of the research questions, with exception of item number 3 which was rated 2.84 and 2.96 by industry workers and self-employed graduates; also item 6 was rated 2.95 by industry workers. Apart from these three items, all the remaining items were rated 3.01 and above, including item 1 which was rated 3.60 by the lecturers. The grand mean of means stood at 3.13. This further demonstrates that the three groups of respondents are in harmony about the improvements needs of curriculum in pedagogical skills with respect to project-based learning approaches, problem-solving and critical thinking skills, inquiry-based learning and differentiated instruction, and inclusion of online learning resources, digital tools and educational technology skills to enhance teaching and learning experiences of graduates of pedagogical skills for effective graduate sustainable self-employment.

Research Question 4: What are the improvements needs of Educational Administration and Planning aspects of the curriculum for sustainable self-employment of Electrical and Electronics Technology Education graduates?

Table 4: Mean and Standard Deviation of responses of Respondents on Improvements needs in the Educational Administration and Planning Aspects of the Curriculum for Graduates Sustainable Self-employment.

S/N	ITEMS	X_L	SD_L	X_{IN}	SD_{IN}	X_{SE}	SD_{SE}	X_{MOM}
1	Adding the process of establishing and managing new organization in the area of EET should be included in the curriculum	3.36	.57	3.32	.58	3.26	.88	3.30
2	Inclusion of Modern system to monitor and evaluate the effectiveness of the learning process in the EET curriculum	3.28	.74	3.12	.67	3.32	.64	3.23
3	Aiding graduates with competency in planning how to keep abreast with best practices for sustainable self-employment	3.28	.61	2.86	.95	2.92	.95	2.95
4	Inclusion of Human resource and financial planning skills in the EET curriculum.	3.48	.82	2.99	.79	3.19	.73	3.15
5	Quality assurance services would provide the graduates of EET with the necessary skills expected for sustainable self-employment	3.60	.71	3.07	.93	3.27	.85	3.23
6	University-Industry collaboration enhance the skills of administration & planning of graduates.	3.20	.82	2.87	.98	2.88	.98	2.92
7	Inclusion of standardization and competency assessment skills of organization in the EET curriculum.	3.48	.51	3.00	1.01	3.20	.95	3.15
8	The current EET curriculum should include capacity building programmes that will enable teachers to teach effectively.	3.29	.75	3.12	.86	3.88	1.55	3.47
	GRAND MEAN	**3.37**		**3.04**		**3.24**	**.83**	**3.18**

Source: Field Survey, 2025

All respondent categories gave the eight questionnaire items shown in Table 4 good ratings. The lecturers, industry workers, and self-employed graduates all agree with all of the items in research question 8. Industry workers who worked in the industry and self-employed graduates who worked for themselves gave item 3 a rating of 2.86 and 2.92, and item 6, 2.87 and 2.88, but this did not indicate disagreement. The grand mean of means stood at 3.18. This indicates that based on the evaluation of responses to research question eight, every respondent concurred that the curriculum's aspect of educational administration and planning need to be improved in the area of modern system to monitor and evaluate the effectiveness of the learning process, human resource and financial planning skills, and standardization and competency assessment skills of organization in the EET curriculum in order to prepare graduates for sustainable self-employment.

Testing Hypotheses

The four (4) hypotheses were tested using one-way ANOVA at 0.05 level of significance. The results are presented as follows:

Ho_1: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of energy conversion and renewable energy areas of the curriculum of universities.

Table 5: One-way ANOVA on the Mean Ratings of Lecturers, Industrial Workers and Self-Employed Graduates on the Improvements Needs of energy Conversion and Renewable Energy Areas of the Curriculum of Universities for Graduates Sustainable Self-employment.

	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	4.002	2	2.001	3.052	0.235	Ho_5 Upheld
Within Groups	117.955	168	0.704			
Total	**121.957**	**170**				

Source: Field Survey, 2025

From Table 5 above, the *p value (p* =0. 235) at df 2,168 is greater than the significant value 0.05; this indicated that there is no significant difference in the mean ratings of the responses of lecturers, industrial workers and self-employed graduates on the improvements needs of energy conversion and renewable energy areas of the curriculum of universities for graduates' sustainable self-employment. The respondents agreed that Photo-Voltaic (PV) technology, hydro-panels technology general principles, and repairs in solar energy facilities should be included in the curriculum of electrical electronics technology education. Hence, fail to reject the hypothesis.

Ho_2: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of electrical machine components of the curriculum of universities.

Table 6: One-way ANOVA on the Mean Ratings of Lecturers, Industrial Workers and Self-Employed Graduates on the Improvements Needs of Electrical Machine Components of the Curriculum of Universities for Graduates Sustainable Self-employment.

	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	1.680	2	0.840	1.386	0.365	Ho_6 Upheld
Within Groups	104.613	171	0.538			
Total	**106.293**	**173**				

Source: Field Survey, 2025

From Table 6, the *p value (p* =0. 365) at df 2,171 is greater than the significant value 0.05; this indicated that there is no significant difference in the mean ratings of the responses of lecturers, industrial workers and self-employed graduates on the improvements needs of electrical machine components of the curriculum of universities especially in the area of digitalizing and modernizing electrical machine, energy extraction from AC generators for storage in batteries/capacitors, and skills in high temperature superconductors (HTS) for increased power density and efficiency for graduates' sustainable self-employment. Hence, fail to reject the hypothesis.

Ho_3: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of pedagogical skills of the curriculum of universities.

Table 7: One-way ANOVA on the Mean Ratings of Lecturers, Industrial Workers and Self-Employed Graduates on the Improvements Needs of Pedagogical Skills of the Curriculum of Universities for Graduates Sustainable Self-employment.

	Sum of Squares	Df	Mean Square	F	p-value	Decision
Between Groups	2.101	2	1.050	1.816	0.337	Ho_7 Upheld

	Within Groups	107.533	171	0.630			
	Total	**109.634**	**173**				

Source: Field Survey, 2025

From Table 7, the *p value (p* =0. 337) at df 2,171 is greater than the significant value 0.05; this indicated that there is no significant difference in the mean ratings of the responses of lecturers, industrial workers and self-employed graduates on the improvements needs of pedagogical skills of the curriculum; to include porojects-based learning approaches of pedagogical skills, robust pedagogy necessary to guarantee that, students learn well through online learning., and problem-solving and critical thinking skills for graduates' sustainable self-employment. Hence, fail to reject the hypothesis.

Ho4: There is no significant difference in the mean responses of lecturers, industrial workers and self-employed graduates on the improvements needs of administration and planning of education aspects of the curriculum of universities.

Table 8: One-way ANOVA on the Mean Ratings of Lecturers, Industrial Workers and Self-Employed Graduates on the Improvements Needs of Administration and Planning of Education Aspects of the Curriculum of Universities for Graduates Sustainable Self-employment.

	Sum of Squares	**Df**	**Mean Square**	**F**	**p-value**	**Decision**
Between Groups	2.914	2	1.457	2.039	0.269	Ho_8 Upheld
Within Groups	120.670	172	0.704			
Total	**123.584**	**174**				

Source: Field Survey, 2025

From Table 8, the *p value (p* =0. 269) at df 2,172 is greater than the significant value 0.05; this indicated that there is no significant difference in the mean ratings of the responses of lecturers, industrial workers and self-employed graduates on the improvements needs of Educational administration and planning aspects of the curriculum of universities; especially in the area of process of establishing and managing new organization in the area of EET, human resource and financial planning skills, university-industry collaboration to enhance the skills of administration & planning of graduates and standardization and competency assessment skills for graduates' sustainable self-employment. Hence, fail to reject the hypothesis.

FINDINGS OF THE STUDY

Based on the results of the analyses of data relating to the research questions posed and hypotheses tested, the findings of the study are as follows:

1. The lecturers, Industry workers and self-employed graduates agreed with all the items as the grand mean of the responses is 4.20 more than the 3.50 decision level for acceptance; and hypothesis one indicates that there is no significant difference in the mean responses of the lecturers, industry workers and self-employed graduates. Hence, H_{o1} is upheld.

2. The lecturers, Industry workers and self-employed graduates agreed with all the items as the grand mean of the responses is 4.41 above the 3.50 which the decision level for acceptance was based; and the hypothesis two indicates there is no significant difference in the mean response of the lecturers, industry workers and self-employed graduates. Therefore, H_{o2} is upheld.

3. The lecturers, Industry workers and self-employed graduates agreed with all the items as the grand mean of the responses is 4.37 above the 3.50 decision level for acceptance; and the hypothesis three indicates there

is no significant difference in the mean response of the lecturers, industry workers and self-employed graduates. Therefore, H_{o3} is upheld.

4. The lecturers, Industry workers and self-employed graduates agreed with all the items as the grand mean of the responses is 4.44 above the 3.50 decision level for acceptance; and the hypothesis four indicates there is no significant difference in the mean response of the lecturers, industry workers and self-employed graduates. Hence, H_{o4} is upheld.

Summary Of The Study

A study to determine the improvements needs of electrical and electronics technology education curriculum in universities in Northern Nigeria for sustainable self-employment was carried out with the aim of identifying the gaps in the areas. Four (4) research questions and four (4) hypotheses ware posed in the study.

Descriptive survey research design was adopted for this study. The population of the study is one hundred and eighty (180). The target population in this research were lecturers, self-employed graduates, and industry workers in the area of the study. The sample of the present study are twenty-five (25) lecturers, seventy-six (76) industry workers, and seventy-four (74) self-employed graduates. The instrument used in this study is questionnaire titled CINESS. The data collected was then analyzed using statistical techniques to summarize the findings and draw conclusions. Three experts validated the questionnaire in terms of content and organization. Moreover, a reliability coefficient of 0.76 was obtained using Cronbach Alpha.

All the three groups of respondents agreed with the items in all the research questions, and the respondents agreed that hypotheses I and 4 indicate no significant difference in the mean difference of agreements of the Lecturers, Industry workers and self-employed graduates, as findings from the study were clearly stated.

CONCLUSION AND OBSERVATIONS

A study to investigate the improvements needs of electrical and electronics technology education curriculum for sustainable self-employment of graduates of universities in Northern Nigeria was carried out. The study identified how some of the items can improve the learning of the contents of the four identified areas in electrical and electronics technology education. The three groups of the respondents (Lecturers, Industry workers, and Self-employed graduates) agreed with the items. Furthermore, the study identified that there is no significant difference in the mean ratings of Lecturers, Industry workers, and self-employed graduates in the identified areas of concern.

RECOMMENDATIONS

The following recommendations were outlined in the present study:

1. Photo-voltaic technology, hydro-panels technology, biogass technology, primary transducers for alternative technology, repairs of wind technologies and solar energy, and solar panel and battery maintenance technology should be infused into the EET curriculum for sustainable self-employment.

2. Digitizing and modernizing electrical machine, energy extraction from AC generators for storage in batteries, multi-level converters with silicon carbides devices, PMSM in electrical vehicles, wind turbines, wind tools technology, HTS for increased power density and efficiency, heavy duty industrial machine, and variable control motors and programmable logic control should be included in the EET curriculum for sustainable self-employment.

3. The EET curriculum for sustainable self-employment should incorporate project-based learning approaches of pedagogical skills, robust pedagogy, soft skills development, problem solving and critical thinking skills, inquiry-based learning and differentiated instruction, constructivist pedagogy to foster cooperative learning, online learning resources, digital tool skills, and self-supportive businesses.

4. Including processes for setting up and running schools, a contemporary system to track and assess the efficacy of the educational process, human resources and financial planning expertise, quality assurance services, university-industry cooperation to improve administrative skills, and capacity building programs in the EET curriculum for sustainable self-employment.

Ethical Approval

The ethical approval has been sought from all that are involved in the research work.

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