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Entrepreneurship skills framework for fostering the employability of industrial technology students

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ABSTRACT

The rising rate of youth unemployment and its attendant consequences on the general populace in Nigeria has assumed a frightening dimension. The academia and other relevant stakeholders have gradually come to realize that the possession of academic qualifications alone cannot guarantee a good quality job. Nigerian higher intuitions are now introducing entrepreneurship studies in their school curriculum without a clear framework. Research has shown that this does not guarantee total graduates unless we have an entrepreneurship skills framework that is functional and discipline-based. Noting that entrepreneurship is classified into two folds; entrepreneurship specific and entrepreneurship mindset, this study intends to develop an entrepreneurship skills framework that will promote the employability of the students of Electrical Technology in Colleges of Education in Nigeria. The survey research that employs the sequential exploratory mixed methods was used for the study. The population for this phase consists of entrepreneurs and academics in Nigeria. The use of the partial credit model in the Rasch analysis model guaranteed the consensus of the experts on each of the items being measured. The outcome of the study will contribute to the social-economic peace and sustainability in Nigeria and the body of knowledge in entrepreneurship regarding electrical technology.

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1. INTRODUCTION

One of the greatest challenges facing Nigeria in recent times is youth unemployment [1]–[3]. The rate of youth unemployment in Nigeria is 53.40%. Thus, Nigeria has the second-highest number of unemployed youths in the world [4]. The high number of electrical technology students who are unemployed after graduating from colleges of education is the main reason for conducting this study [5]. Electrical technology is an aspect of Industrial Technology Education offerings in tertiary institutions in Nigeria. The idea was made due to the increasing number of graduates who are walking about the streets and complaining about not finding jobs. It was found that the skills mismatch index for Education graduates was 0.6264 and for Engineering graduates, it was 2.4896 [4]. This has mostly caused a lot of poverty, inequality, and crime in the country.

The problem is widespread, but it is especially bad in African countries, especially Nigeria [3], [6]. The amount of money given to education has increased a lot since 2011. This has led to better government funding in making facilities and training better to improve graduates' employability. The Tertiary Education Trust Fund (TETFUND) is effectively managing this role. A school's quality depends on how likely its graduates are to get a job [7], [8]. The expectation was that getting a good education would help them get better jobs in both the public and private sectors of the economy. Yet, the employers keep complaining about the low quality of graduates, who are not suitable for jobs. The graduates do not have other extraneous skills apart from academic qualifications. It is now on record that the massive rail network currently going on all over Nigeria is in the hands of the Chinese who are not finding Nigerian youths employable. This again shows clear evidence of the skills mismatch occasioned by the outdated school curriculum.

Noting that entrepreneurship is the driver of the market economy, the school needs to focus on helping the students to move from college to workplace. This can only happen with a system that helps connect the skills taught in colleges of education to what employers need in the job market. If colleges only teach general entrepreneurship skills and do not focus on specific skills, it would not benefit anyone. This study wants to create a framework for entrepreneurship skills that focuses specifically on electrical technology. It aims to help graduates with electrical technology training meet the job requirements of employers. Recent research indicates that Nigerian higher institutions are considering adding entrepreneurship to the school curriculum. However, there is currently no clear and practical plan for how to implement this. Most organizations focus on creating and customizing products, providing beauty services, and similar things. Ignoring the important skills and mindset that are essential for graduates to be employable in entrepreneurship. The Entrepreneurship program is being used without paying attention to specific subjects. Researchers have demanded more studies about the generic and specific skills required by employees according to emerging professional demands [9]–[11]. Consequently, the main aim of this study is to develop an entrepreneurship skills plan that can be taught in Electrical Technology courses at Colleges of Education in Nigeria. This will somewhat meet the suggestion of [12] for the categorization of a typology of skills necessary for teaching entrepreneurship skills.

Furthermore, it is important to understand that having resources and government support alone cannot guarantee a country's quick economic growth [13]. It is the entrepreneurial abilities of the citizens that play a crucial role in this development. The study wants to help close the gap between what college graduates know and what employers need. This will benefit students, parents, schools, the government, and society. We will create a specific and focused set of skills for students studying Electrical Technology in Nigerian Colleges of Education to help them become better entrepreneurs.

This study is premised on the competency theories by several studies [14], [15]. The conceptual framework is equally based on the statement of the problem and research objectives. The problem is that students of electrical technology in colleges of education do not have the skills they require to get a job in the real world. We need to find a way to bridge this gap and help them gain the necessary skills for employment. The gap happened because there was no structure or plan to teach entrepreneurship skills to students of electrical technology in colleges of education. The research will categorize the variables into two groups, namely the amount of skills available and the amount of skills needed. The dependent variable is what we are measuring which in this case is the expected outcome. The two broad categories of independent variables are skills that are specifically related to being an entrepreneur and skills that have to do with having an entrepreneurial mindset. The skills that entrepreneurs have are just a small part of what makes them successful. There is a whole other side to being an entrepreneur that is not as easily seen, called the entrepreneurial mindset. This mindset includes things like why a person wants to be an entrepreneur, how they see themselves, and their characteristics. The ideas of personality skills, people skills, applied knowledge skills, and workplace skills that improve the qualities needed to get a job as a new graduate come from the Boyatzis and Spencer and Spencer models. The models are based on the idea that if colleges train students to be entrepreneurs, they will become self-sufficient and have a higher chance of finding a job, which will help reduce youth unemployment [16]–[25]. The colleges of education are the intervening factor that links the students with the world of work. It is the citadel where the skills are processed before the transition to the workplace. The framework presents a relationship between the input to the output as shown in Figure 1.

This concept refers to the basic skills required by electrical technology graduates to be proficient, employable and qualified to be self-reliant. Research has shown that among the skills expected of electrical technology students are electrical construction, troubleshooting, installation, testing and measurement among others [26]–[29]. Most of the studies made references to mindset skills such as the willingness to learn, problem-solving and customer service. This undoubtedly shows that both the specific and mindset skills are two sides of the same coin necessary for arriving at a good entrepreneurship framework. Mindset is concerned with the attitude and approach that an individual takes toward their work skills. This is also known as soft skills or behavioral skills by some researchers [11], [15], [30], [31]. Spencer and Spencer [15]

classified competencies into two categories based on the analogy of the iceberg. The knowledge and skills that are necessary for successful job performance are more visible at the tip. The hidden part which consists of individual motives, traits, and self-concept necessary for effective job performance is located at the bottom of the iceberg. Motives are the things that someone always thinks about or wants, which make them take action [15]. Motives are reasons that make us do things and prefer certain actions or goals over others.

Similarly, traits are the way our bodies look and how we always react when something happens or we learn something new. Self-concept refers to how individuals see and feel about themselves, including their beliefs, principles, or how they view themselves. According to Helena *et al*. [32], technical competencies are at the tip above the waterline, visible, and easier to assess. While the behavioral competencies are below the water line and consist of self-image, traits, and motives. Behavioral competencies are often difficult to develop [33]. In the same vein, some authors refer to the visible tip as professional competencies and the hidden part which consists of self-concept, traits, and motive as personal competencies [34]. The part of the iceberg that we can see, which includes knowledge and skills seen as qualifications, is important but it does not show the deepest level of competence. Knowledge helps people understand the information they have about certain topics. Skill refers to the capacity to do physical or mental activities.

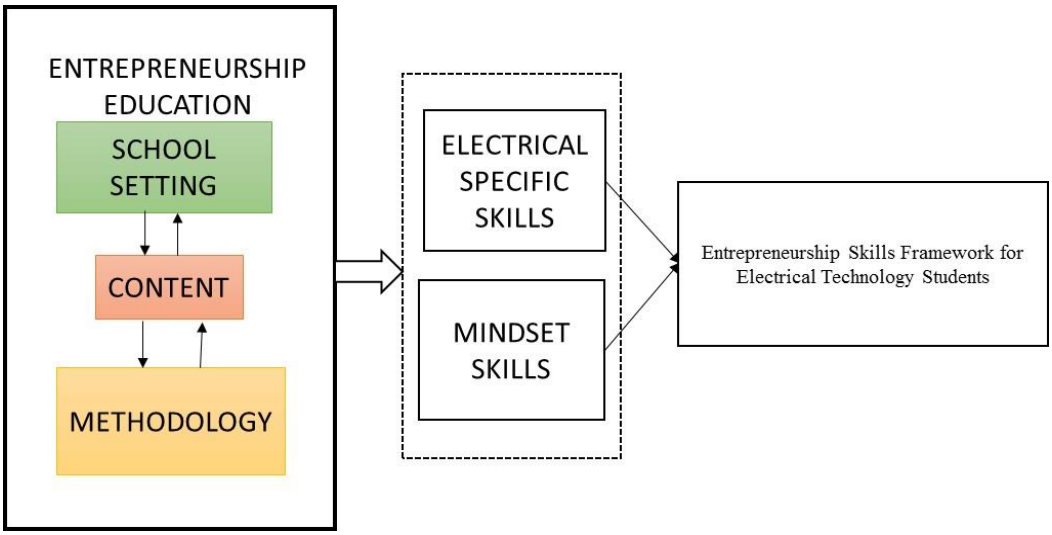

Figure 1. Conceptual framework for electrical technology

Intriguingly, Phibrick *et al*. [34] conducted a study on entrepreneurship skills development on employment generation strategy in Tertiary Institutions in Lagos State. This paper highlights the importance of entrepreneurship for creating wealth in Nigeria that can be sustained over time. The text says that in Nigeria if people learn how to start their businesses, it can help reduce unemployment and poverty. The rising number of poor people and jobless individuals in Nigeria has led the government at all levels to focus on promoting entrepreneurship and small businesses as a way to create jobs and address the ongoing issues of poverty and unemployment in the country. The research suggests that people who graduate from college should have basic entrepreneurship skills. This will help them find jobs, start their businesses, and succeed in the global business world. It will also help create more jobs and reduce poverty.

Nigeria has established around 14 social intervention programs, but these programs do not focus on teaching graduates how to develop their entrepreneurial skills and be ready for employment. The programs also did not encourage graduates to become employers themselves in Nigeria. Many governments in Nigeria have tried different ways to create jobs and help people, but most of them have not worked as well as hoped. This is because most of the programs that were implemented did not focus on improving the ability to get jobs and start their businesses, and did not teach graduates the skills needed to be entrepreneurs. They found that Nigeria is stuck in a bad situation because people do not know enough, are not skilled enough, and are not supported enough to start their businesses. Entrepreneurship education means teaching students the things they need to know, the abilities they need to have, and the drive they need to succeed in starting their businesses in different situations [35]. Learning about entrepreneurship helps people become entrepreneurs who can use their creativity and skills to start businesses and avoid being poor or feeling unhappy at work.

Chukwurah and Akpo [35] showed that Nigeria, like many other poor countries, has many problems and difficult situations. These problems include being very poor, not having jobs, conflicts, and disease. Some programs teach entrepreneurship in vocational and technical education instead of focusing on developing a mindset for entrepreneurship, which is about encouraging people to start businesses and perform well in different areas. There has not been enough information about teaching people how to start their businesses and secure employment. There are not many good plans for teaching about starting and running a business. Chukwurah and Akpo [35] therefore, recommends the enrichment of the curriculum to include more vocational and technical training. It also suggests that creating a program where new graduates can learn skills and gain experience would be beneficial. It suggested that the government should create a program where students can learn from successful local entrepreneurs. The program should have clear education plans. Consequently, this study focuses on the education program for electrical technology students that needs improvement.

Equally, Nwosu and Chukwudi [36] noticed that starting and running new businesses are the main ways new jobs are created in the economy. New businesses create the most new jobs in the economy. The research found that learning about entrepreneurship helps employees do better at work because they understand how small businesses work and the issues their boss faces. The discovery emphasized that it is important to teach entrepreneurship at every stage of education, starting from a young age in elementary school and continuing to develop skills for people who are already entrepreneurs. The study also found that there is a lack of teachers and instructors who have practical experience in teaching about starting businesses or being entrepreneurs. Most entrepreneurship teachers usually come from traditional fields like economics or business management. Besides the fact that instructors are not well qualified, another challenge to providing high-quality entrepreneurship education in Nigerian Universities is the lack of awareness and understanding about entrepreneurship.

Olojuolawe *et al*. [27] conducted a study on the soft skills needed by electrical technology students for 21st-century jobs. The study revealed that there was a skill mismatch in program offered by the Colleges of Education in Nigeria. Aside from the huge waste of government investment in technical education, it has led to the failure of technical education to arrest the rising rate of youth unemployment in Nigeria. Therefore, the school must wake up to its responsibility by developing and imparting knowledge that will make the students job-ready. The study identified entrepreneurship as one of the constructs needed to boost the employability of electrical technology students.

Equally, Nduka-Ozo [37] examined the implication of counseling on Nigerian youths in curriculum and entrepreneurship skills acquisition. The study revealed that entrepreneurship enables students to explore opportunities both within and outside their localities. The paper stressed the fact that entrepreneurship provides students with analytical skills in problem-solving, negotiations, conflict resolution, marketing, leadership, interpersonal relations and financial management. The paper suggested deemphasizing paper or academic qualification. This is one of the few studies that is geared towards giving a direction to entrepreneurship implementation in tertiary institutions. However, the identified constructs seemed to be broad, unverifiable and subjective because it was an opinion that was not based on any fact. Also, it was not discipline-specific [38]. Similarly, in the EntreComp document, entrepreneurship is defined as a tool for improving the entrepreneurial capacities of European citizens and organizations [30], [39]. It makes a recommendation for 15 valued competence areas which include; vision, creativity, spotting opportunities, self-awareness and self-efficacy, planning and management among others. This is similar to the broad areas itemized by other researchers. The major contention is that it was not directed at any specific discipline.

Similarly, Agwu *et al*. [40] conducted a study on the impact of entrepreneurship education on new ventures and concluded that entrepreneurial skills would lead to the development of new ventures creation. He thought that taking action could greatly decrease violence, poverty, and segregation among the people of Nigeria. The research found that Nigeria's education system is missing an important factor that could help reduce the high unemployment rate in the country. The study found that even though entrepreneurship studies have been added to the curriculum of Nigerian universities and the government has been overseeing this, there are still some differences between teaching students about entrepreneurship and them starting their businesses. This could be because there is no set of skills for starting a business that is being taught in schools. So, we need to create a plan to help electrical technology students in Nigerian Colleges of Education improve their job prospects by teaching them entrepreneurship skills.

In a similar vein, Binuyo *et al*. [41] showed that different aspects of coming up with new ideas to solve social problems had a good and important impact on university graduates in Nigeria. This means that these aspects helped the graduates to develop useful skills. Not being able to learn the required skills can make graduates unsuitable for jobs and incapable of running a business well. It has been noticed that many universities in Nigeria focus on producing graduates each year, without considering the quality of skills that these graduates have attained. As a result, the graduates are not able to properly learn the skills needed for their jobs. This makes them incompetent and unable to contribute effectively to the progress of a

company, even though they may be qualified in their profession or technically skilled. Even though, the study recommended curriculum reform, it fails to show the pathway to achieving a pragmatic and functional entrepreneurial study in Nigerian tertiary institutions.

To achieve an objective and validly conducted study, the survey research that employs the exploratory sequential mixed method was used for this study. The philosophical paradigm for the research was pragmatism. This is because it offers a workable approach to solving problems. Pragmatism is a paradigm for social research and is especially related to mixed-method research [42]. Pragmatism emphasizes practicality. It is a doctrine of truth; the meaning of an event cannot be given in advance of experience. Its focus is on the consequences and meaning of an action or event in a social situation. The essence of this study is to suggest workable solutions to minimizing or averting the joblessness of electrical technology students. The sample was selected from among the critical stakeholders (entrepreneurs and academics) in the six geo-political zones of Nigeria. The thematic and Rasch analysis model (Winsteps 3.74.0) were used at the different phases of the research. The study has both theoretical and practical implications for the benefit of academia, employers, and society at large.

The main aim of the study is to develop a framework to help Electrical Technology students in Nigerian Colleges of Education develop entrepreneurial skills that will make them more employable. Specifically, the study intends to explore the constructs of entrepreneurship skills required by students Electrical Technology in Colleges of Education and develop entrepreneurship skills framework for teaching Electrical Technology students in Colleges of Education in Nigeria. Two research questions were used to monitor the study: i) what are the construct and sub-construct of entrepreneurship skills required to guarantee the employability of the students studying electrical technology in colleges of education; and ii) what is the entrepreneurship skills framework required by electrical technology students.

2. RESEARCH METHOD

The research design that uses exploratory sequential mixed-method was used for this study. The findings from the first method, which involved observing and describing data, helped shape the second method, which involved measuring and quantifying data. This design is used for many different reasons. It is used when there are no tools available, the facts are not known, or there is no guiding structure or theory [43]. This design is useful when a researcher needs to make and test a tool but does not have access to one, or when a researcher needs to measure and study an important factor but does not know what it is. Also, it is used when a researcher wants to apply their findings to different groups of people. The mixed method is commonly used to thoroughly study an event and how often it occurs [44].

This research was carried out in Nigeria. It covers all the six regions of Nigeria; South West, South-South, South East, North Central, North East and North West. The zones were considered for the study to ensure national spread and objectivity. The colleges of education with technical program forms the population for the study. The sample consisted of those with electrical bias. Table 1 describes the names, ownership, and locations of the Colleges of Education for the study in Nigeria.

Table 1. List of colleges of education in each state

S/n	Name	Town	State	Ownership	Number of respondents
1	Federal College of Education	Gombe	Gombe	Federal	04
2	College of Education	Ikere	Ekiti	State	14
3	Federal College of Education	Akoka	Lagos	Federal	26
4	College of Education	Ilesha	Osun	State	12
5	Emmanuel Alayande College of Education	Oyo	Oyo	State	19
6	Peaceland College of Education	Enugu	Enugu	Private	13
7	Federal College of Education	Asaba	Delta	Federal	14
8	Kogi State College of Education	Ankpa	Kogi	State	15
9	State College of Education	Lafiagi	Kwara	State	10
10	Federal College of Education	Pankshin	Plateau	Federal	12
11	Kaduna State College of Education	Kanfanchan	Kaduna	State	11
	Total				150

The purposive sampling technique was used to select the participants for the qualitative aspect of this research. Purposive sampling is employed where sample size, may or may not be fixed before data collection depending on the resources and time available, as well as the study's objectives [45], [46]. Purposive sample sizes are frequently decided on the premise of theoretical saturation. This is the point in data collection when additional data does not convey any new input to the research questions [47].

Furthermore, Lincoln *et al*. [45] indicated that qualitative researchers can reach a saturation point with as few as 12 participants and probably not more than 20. Maigari [48] used five participants through in-depth interviews for his research on problem-based learning. Equally, Creswell [49] recommended 10 or fewer participants for a qualitative aspect of mixed-method research. However, Mack *et al*. [46] asserted that time, resources, and the study objective play a significant role in determining the sample size in a purposive study.

Therefore, the qualitative aspect of this research involves some critical stakeholders who are senior technocrats in the electrical technology industries, and senior members of academic staff in the colleges of education. The sample size for the qualitative study involves 16 participants which included 6 entrepreneurs and 10 academics. The industry sample was obtained from Denkki Wires and Cables, Akure, Ondo State, and Colman Wires and Cables, Ijebu-Ode, Ogun State. This study aims to check if the entrepreneurship skills framework is valid for electrical technology students in colleges of education. It will use the Rasch analysis model to do this. So, we used the recommended sample size for the Rasch measurement model. The researcher chose a statistical method called ±½ logit with a high level of certainty (99% confidence). The required number of participants for the study should be between 108 and 243. To get reliable results, it is recommended to have at least 150 people and 20 questions when using Rasch analysis [46], [50]–[52]. It is recommended to have a sample size of between 16 and 36 to get a ±1 logit of 95% accuracy. However, a sample size of around 30 is usually sufficient for most purposes [53]. For this research, the number of participants in the initial study was 40. This is done to predict the difference between the items because of using a smaller group of samples.

The population of the study involved students in public and private Colleges of Education in Nigeria. The target population was the colleges of education with vocational and technical education and the sample was drawn from the electrical technology students in the colleges. It must be noted that not all the colleges have programs in technical education and by extension, electrical technology. There are 205 Colleges of Education in Nigeria with 32 of them running program in vocational and technical education. The cluster sampling technique was used to obtain a sample of 150 respondents from the population.

2.1. Questionnaire for entrepreneurship skills framework

The questionnaire for the entrepreneurship skills framework study (QESFW) consists of two sections (sections A and B). Section A contains the respondents' demographic information. Section B consists of the constructs and sub-construct of entrepreneurship skills deemed necessary for students of Electrical Technology in Nigerian Colleges of Education to be employable. The instrument is structured in a numerical measurement scale of 'most important to 'lowest important. Each construct has its items ranked from 1 to 4. This measure was taken based on the recommendation of an expert, to obtain a valid analysis [54]. It also reduces respondents' frustration levels and increases response rate and quality [55]. The instrument was a product of the qualitative analysis and the expert review. 126 items are contained in the instrument. The preliminary instrument was developed based on the result of the need assessment, document analysis and the interview conducted among the stakeholders and pilot tested at the University of Nigeria, Nsukka. The description of the scaling is shown in Table 2.

Table 2. Distribution of items in QESFW instrument

Section	Description	Item number	Item serial number
A	Demographic factor	6	1
B	Electrical specific skills	48	2-3
C	Mindset skills	72	3-5

2.2. Validity of entrepreneurship skills framework questionnaire

The instrument for quantitative data collection was subjected to face, content, and construct validity. The face and construct validity involves the determination of whether the instruments conform and cover the objectives and research questions as contained in the study. This was achieved through the assistance of educational research experts at the BOUESTI and industry-based experts in Nigeria.

To make sure the items in the instrument are reliable and valid, we used the Fleiss Kappa Inter-rater reliability test. We asked three experts in the industry and Technical Education to see if they agreed with the items in the instrument. The evaluation process had specific steps that were followed: i) generation of item pool; ii) mapping out items based on the two constructs and 120 sub-constructs; iii) selection of three experts; and iv) the answers given by the three experts were checked using a tool in Excel to find out how much they agreed with each other, shown as a percentage. Experts agree with each other on average 62.22%. This implies a substantial agreement by the experts. The Kappa interpretation table and the experts' agreement is shown in Tables 3 and 4, respectively.

The mean agreement of 62.22% is valid because it is not influenced by missing data. The agreement is described as a fixed number of experts assigned to numerical ratings of items. Then, Kappa will give a measure of how their rating is consistent. The 62.22% indicates a substantial agreement by the experts for each of the constructs in the instrument.

Table 3. Kappa interpretation

Kappa value		
<.00	Poor	Less than chance agreement
.01 to .20	Slight	Slight agreement
.21 to .40	Fair	Fair agreement
.41 to .60	Moderate	Moderate agreement
.61 to .80	Substantial	Substantial agreement
.81 to .99	Almost perfect	Almost perfect agreement

Table 4. Kappa measures

Raters	Rater 1	Rater 2	Rater 3
Total count of 0 in a different column	69	69	86
Total number of items (ratings)	120	120	120
Proportion agreement	.5750	.5750	.7166
Percent agreement	57.50	57.50	71.66
The measure of agreement Kappa (mean of agreement)		62.22%	

3. DATA ANALYSIS AND FINDINGS

The process of developing the framework involves the combination of the theoretical variables and sub-constructs derived from literature and those derived from the interview. This was to further strengthen the constructs and sub-constructs. Consequently, the list of items considered to engender the entrepreneurship skills of the students of electrical technology in colleges of education is shown in Table 5.

Table 5. Interim entrepreneurship skills framework

Entrepreneurial electrical-specific skills	Electrical mindset kills
Electrical versatility	Leadership
Windings	Managerial and marketing skills
Troubleshooting	Communication
Electrical power	Integrity
Electrical installation	Innovation
Electrical/electronic servicing and repair	Problem-solving
Electrical merchandise	People Management
Electrical design and drafting	Professionalism
Electrical machine operation	Collaboration
	Negotiation
	Human Relations
	Technology
	Critical thinking
	Conflict resolution
	Workshop management
	Personal attributes
	Financial management
	Self-management

To find the right item, we need to do some initial testing and measurements to make sure it is reliable and accurate. The summary statistics give an overall overview of the data we have collected on the responses from both items and people. The person separation for the constructs is a value of 2.01 and the reliability is 0.80. The item separation value was 2.73 and the reliability value was 0.88. The Cronbach alpha (KR-20) Person raw score "test" reliability is 0.86. Separation is used to figure out how hard an item is. The measures can explain 99.8% of the differences. In simpler terms, the unexplained difference in the first comparison is 0.1% and the value of this difference is 3.0. With the initial requirements completed and fulfilled, we are now ready to examine the main components of entrepreneurship, which include specific skills and mindset abilities.

However, since the focus of the study is framework, what is important in this situation is the value of the item. When trying to understand someone better, the way they behave and how trustworthy

they are play a significant role [56]–[59]. As a result, the measurement of both the entrepreneurship-specific item and the mindset item is suitable for the Rasch analysis model. This is shown in Table 6 and Table 7, respectively.

3.1. Entrepreneurship-specific data

The entrepreneurship specific skills item has a difference of 6.90 and a reliability of .98 This is a great way to start the study because it provides a good indication of how well Rasch measurement fits. Thus, the group of people being studied is large enough to show the order of how easy or difficult each item in the tool is and to show that the tool can tell the difference between the different levels of difficulty [57], [58]. That is, among the most important items and the lowest important item as it is concerned with this study [57]–[59]. The item separation of 6.90 affirms the sample size is large enough to confirm the item difficulty hierarchy. Table 6 explains the measured item using the Rasch measurement model.

Table 6. Summary of 7 measured item

	Total score	Count	Measure	Model error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean	19.0	9.0	.00	2.18	.32	-.6	.14	-.8
S.D.	6.9	.0	16.14	.77	.42	.5	.19	.5
Max.	29.0	9.0	17.93	3.26	.99	.2	.45	.0
Min.	11.0	9.0	-25.84	1.14	.02	-1.0	.01	-1.2

Real RMSE=2.32; True SD=15.98; Separation=6.90; Item reliability=.98
Model RMSE=2.32; True SD=15.98; Separation=6.90; Item reliability=.98; S.E. of item mean=6.59

3.2. Mind-set data

The level of difficulty for the mindset skills is 9.82, and the reliability of the items is .99. This means that the group of samples is big enough and the tool was able to differentiate between the different levels of item difficulty. This means that out of all the things we are studying, some are important, and some are not very important. Table 7 provides the summary of the measured item after treatment.

Table 7. Summary of 17 measured item

	Total score	Count	Measure	Model error	Infit		Outfit	
					MNSQ	ZSTD	MNSQ	ZSTD
Mean	25.6	11.0	.00	.97	.91	-0.2	.96	.1
S.D.	11.7	.0	10.92	.24	.61	1.2	1.01	.8
Max.	42.0	11.0	12.59	1.82	2.09	2.0	4.01	1.8
Min.	12.0	11.0	-14.46	.80	.06	-1.8	.03	-1.0

Real RMSE=1.11; True SD=10.86; Separation=9.82; Item reliability=.99
Model RMSE=1.00; True SD=10.87; Separation=10.88; Item reliability=.99; S.E. of item mean=2.73

The fit statistics analysis was performed to determine the suitability of items. Item VEW2, ELP3, and ELM1 have their mean below 0 and are thus found to be fit for electrical specific construct. Item VEW1, ELP1, ELL3, and ICT1 are badly fit items because the PCM mean for each is above 0. Similarly, after treatment, only item LEA1, CMM3, PEM4, COL1, COL3, HUR1, TEC1, TEC3, and CRT1 have their mean to be >0 for mind-set skills. The badly fit items are MMS1, CMM1, CMM2, INN1, INN4, PRS1, PRF3, TEC4, CRT3, WOM1, WOM4, PEA1, and FIM1. These items do not fit the model and must be excluded from the proposed framework [51], [53], [60], [61]. The model for the framework is shown in Table 8.

4. RESULTS AND DISCUSSION

Entrepreneurship-specific skills are the hard skills required by electrical technology students to be employable. Some researchers referred to it as technical skills. Technical skills are the direct set of knowledge, behaviors, and ability that is related to the functioning of the students as electricians. The study conducted by Arsad *et al*. [52] confirmed a lack of 87% practical gap among Nigerian graduates. The quality of an educational institution can be measured by its output in terms of employability and entrepreneurship [62]–[65]. This is synonymous with the assertions that teaching in Nigerian higher Institutions is generally theoretical and does not translate to employability [66], [67]. This opinion was expressed by most of the participants in this current study. The result of the study conducted by Dean [68] emphasized the need for technical skills as a criterion for selecting technical managers in an organization. Equally, Akhmetshin *et al*. [69] in their study stressed the importance of technical skills in the competitive work environment.

Table 8. Infit and misfit value for model

Electrical specific construct	Model value	Mindset construct	Model value
VEW2	-.02	LEA1	-.14
ELP3	-.49	CMM3	-.24
ELM1	-.18	PEM4	-.12
VEW1	.22	COL1	-.14
ELP1	.10	COL3	-.14
ELL3	.10	HUR1	-.63
ICT1	.13	TEC1	-.14
		TEC3	-.44
		CRT1	-.36
		MMS1	.00
		CMM1	.00
		CMM2	.00
		INN1	.47
		INN4	.14
		PRS1	.47
		PRF3	.26
		TEC4	.00
		CRT3	.43
		WOM1	.00
		WOM4	.14
		PEA1	.00
		FIM1	.43

Technical skills are attributes gained using expertise in performing physical tasks [70]. Electrical technologists are expected to be proficient in the handling and use of tools and machines that are required for the performance of electrical tasks. This corroborated the findings of Phelps [71] that stressed the importance of technical competencies for electrical installation maintenance. There are many types of technical abilities. The findings of the study conducted by Cai [72] identify 10 technical skills for electrical jobs. Among the identified skills are critical thinking, circuit design, instrumentation, and electrical measurement, active learning, interpersonal communication, organizing skills, complex problem solving, mathematics and physics, and innovative skills. The structure of these skills aligned with the suggestion of Akhmetshin *et al.* [69] that technical skills are no longer enough to secure jobs in the fast-changing world of work. Some of the responses of interview participants are:

> "*Experience matters. Teaching in the classroom doesn't align with the world of work…practical. In-depth knowledge in generator repair, service and maintenance, diesel engine repair, service and maintenance, and gas line servicing*." (Entrepreneur 1)
> "*The world is now talking about green energy; gas is important*." (Entrepreneur 2)
> "*Rewinding of electric motors, installation of electric machines and fittings, house wiring. Very, very essential. It acquits them with the field of electrical technology.*" (Entrepreneur 5); (PE1 PE2 PE5: 03/04/2022)
> "*They are technicians. They must be able to detect faults and rectify them*." (PE2 PE3: 03/05/2022)

The study revealed that most of the interview participants agreed that the possession of skills related to electrical construction is important for electrical technology students to be competently trained for the world of work. The quality of student's proficiency in the practical aspect of the trade is very important to their selection for employment and the actual performance of the job. For example, initial proficiency in Electrical Technology saves the employer the cost of retraining as envisaged by [73]. The importance of practical might have resulted in -.02 expectation of high ability in cross-cutting and circuit optimization, and the display of self-confidence in the handling of tools and machines under versatility in electrical works recorded during Rasch analysis.

> "*They are technicians. They must be able to detect faults and rectify them, knowledge of home appliances and possible faults is important. There is room for workshop practice in the timetable. Rewind electric motors. As I said, they are exposed to workshop practice*." (PA1 PA2 PA3: 12/05/2022)
> "*They are exposed to different types of repairs and maintenance*" (PA1: 12/05/2022)

In addition, the study shows that the ability to detect and rectify electrical faults is very important for electrical technology students. Document analysis indicates that the curriculum of electrical technology mostly contained hard skills [74]. This is largely connected to the observation raised by Steinberg and Gitomer [75] that over-reliance on hard skills is one of the factors responsible for unemployment among electrical technology graduates in Nigeria. However, electrical troubleshooting is concerned with repair and maintenance. The ability to understand the working principles of some basic electrical appliances, machines, and general troubleshooting procedures is important for the job search and sustainability of an electrical technology graduate. This principle is consistent with the general path analysis provided by Onoh and Onyebuenyi [76] which stressed the importance of a troubleshooting model around which a functional flow of the interface could be built. The construct recorded a fit of -.49 under electrical power during analysis and consequently fit for the final model. This possibly might be because it overlaps other constructs like construction and installation skills. Both construction and installation in electricity demand a high level of proficiency which encompasses the ability to detect and rectify electrical faults.

Electrical installation is very central to electrical technology works. All the participants shared the same view concerning this. Similarly, the result of the study conducted by Phelps [71] on the competency needs of electrical installation and maintenance works trade teachers in skills acquisition centers of Yobe States indicates that electrical installation teachers should be retrained in the teaching module of electrical technology. In addition, stressed the importance of electrical installation and maintenance work skills like planning the layout, and installation of wiring, testing electrical work for safety, competence in the handling of tools, and effective use of materials, an inspection of electrical installation, interpretation and use wiring diagrams as essential for electrical technology [77].

> "*Rewinding of electric motors, installation of electric machines and fittings…house wiring. The world is now talking about green energy; gas is important*." (Academics 1&2 and Entrepreneurs 3&5). (PE3 PE5: 26/05/2022).

This is largely not emphasized by the existing curriculum [78]–[86].

The result of the interview conducted with some entrepreneurs of labor and academics revealed that testing and measurement are key to electrical technology works. According to Petroleum and Chemical Industry Committee [78] in the national occupational standards, it helps to maintain accuracy and precision. Furthermore, Heinemann [79] noted that testing and measurement are essential to avoid overheating and fire outbreaks. An example is a heating cable, a heating device, installation, and snow melting. The ability to troubleshoot electrical appliances which is directly related to the use of both digital and analogue electrical measuring instruments formed part of the item hierarchy. Being close to the top level of the hierarchy shows its difficulty level.

> "*There is no two-way to it. Electricity is a silent killer.*" (Employer 1)
> "*Use of an Ammeter, Multi-meter, Ohmmeter and the rest.*" (Academic 2)
> "*The best electrician is one who knows how to use measuring instruments*." (Academic 4); (EP1EP2:26/5/2022)

Based on the frequent power failures in Nigeria and some African countries, the need for an alternative source of power supply is necessary. The majority of the participants agreed that electrical technology students should know the direct current (D.C) supply. This might be connected to the fact that most companies, industries, and organizations in Nigeria run their operations on alternative power sources because the supply from the National grid is not stable. Both [71] and [77] stress the importance of D.C in their respective studies. For example, Phelps [71] stressed the need for the inclusion of the study of D.C in the curriculum of electrical technology students with a mean ($\bar{x}$) of 3.07.

Furthermore, the study also shows that safety concern is very important to electrical technology. This might be connected to the fact that electricity is a silent killer. The majority of the participants gave support for the inclusion of safety in the electrical technology curriculum at the college of education level. Similarly, document analysis gave important attention to electrical safety. For example, the report on the National Occupation Health and Safety and Working Practices stresses the importance of safety in the aspect of hazard prevention to ensure the safety of the workers and the general public. Furthermore, safe working practices using appropriate equipment and materials help to prevent injuries and damage to work areas. Unfortunately, the construct did not fit the model. This, however, does not imply that it is undesirable, because the majority of the participants highlighted its importance and it is already embedded into the existing curriculum.

Equally, another aspect of skill considered to be important to be added to the curriculum is electrical transformer. The current study shows that transformers are very important for the performance of electrical

work in the aspect of voltage transformation [80]–[83]. Some of the interview participants agreed that competency in the handling of a transformer is essential for the performance of electrical work. The usefulness of the transformer in voltage handling was stressed (Employer 1). Transformer helps in changing a high electrical value to a manageable value, and equally, increasing a low value to a high value (Employer 2). The study findings equally show that the transformer is already enshrined in the College curriculum, and this was confirmed by participants.

"*Very well. We are talking about voltage handling."* (Academics 5)
"*The transformer is covered by the syllabus.*" (Academics 2&4)
"*We do teach theory and practical*." PA2 PA4 PA5 PA8: 22/06/2022)

Though all the constructs were found to be useful and important to electrical technology students to advance their employability, some of them were found to constitute noise and misfit during treatment because they recorded a mean that was greater than zero (>0). Thus, they could not form part of the framework. Consequently, the findings show that only three sub-constructs of entrepreneurship-specific skills made the model and suitable for inclusion in the final framework. This goes ahead to support the view of researchers that technical skills are no longer the most ideal for workers to survive in the globally competitive work environment [84]–[87]. Therefore, there is a need to look at the findings on the entrepreneurship mindset skills required by electrical technology students.

Studies have shown that hard skills alone are no longer sufficient for survival in the 21st-century world of work [88]. Despite the difference between employers and academics concerning the soft skills needed for employment, the majority of the studies agreed that the importance of non-technical skills cannot be underestimated [29], [89]–[91]. According to the study conducted by Coward [87], non-technical skills are a better predictor of success than technical skills even though, not all soft skills are important for a particular discipline. Similarly, Cacho *et al*. [62] showed that the lack of soft skills is responsible for the massive unemployment among Nigerian University graduates. Therefore, the combination of electrical-specific skills and electrical mindset skills will be very useful in engendering a purposeful entrepreneurship skills framework for the employability of the students of electrical technology in the changing world of work.

The result of the study by Jackson [92] on the relevance of education in the ever-changing world. This means that people should constantly attend formal education to gain knowledge and skills that can help them adapt to the uncertain and evolving conditions in society. Consequently, the qualitative findings of this study consist of 18 constructs which included leadership skills, managerial and marketing skills, communication, integrity, innovation, problem-solving, people management, professionalism, collaboration, and negotiation among others.

The criticism from the industry is that higher education's efforts are not enough to guarantee the employability of students due to the evidence of a documented gap in certain skills like decision-making, leadership, critical thinking, conflict management and teamwork [89], [93]. The employer expects the graduates to be able to display great skills and qualities that incorporate group work, critical thinking and good leadership capabilities. Technical education should reinforce academic standards that teach essential skills such as honesty, integrity, responsibility, and leadership that will promote their success in life [84], [94], [95]. This is similar to the position of [37] that entrepreneurship must be capable of equipping the students with analytical skills in problem-solving, negotiation, conflict resolution, marketing and financial management.

The importance of personality traits to engineers and technicians are to solve problems and do the job correctly [96]. Rizal and Yahya [97] supported the assertion in his study and maintained that curiosity, flexibility, communication, creativity, and work ethics are five important personality skills expected to be displayed by electrical technology graduates to be fit for work. For example, it may not be difficult for an electrical technology graduate to communicate technical skills, but he may find it difficult to remember what he did yesterday. This is the reason why the development of electrical technology students is important. For the current study, the participants were able to identify integrity and professionalism, as a major construct of personality that is important for the employability of electrical technology students.

Electrical technology graduates do not work in isolation when employed. They carry out their assignment cooperatively with others. Therefore, the possession of people skills is very important. The finding of the study conducted by Finch *et al*. [98] confirmed that the challenge being faced by employers is how to set up a high-potential team for technical workers. In their study, Lloyd [99] stressed the importance of teamwork skills and interpersonal skills in the workplace. The findings of this study identified communication, teamwork, and negotiation as an essential construct. The findings of the interview with the research participants equally agreed that workplace skills are important for electrical technology students. Some of the participants support the idea of having communication, teamwork, and negotiation.

"*They need it not only to interact but also to interpret drawings and diagrams*." (Entrepreneur)
"*It involves writing and reading skills*." (Academics)
"*Interviews are conducted in English, and you must understand what you are being asked*." (PE1 PE3 PE5: 23/06/2022)

According to Bandy [100], employees' knowledge, expertise, and skills are important to achieve success on the job. Electrical technology graduates are expected to exceed expectations in the performance of their jobs. It is expected that they should be able to use their expertise to solve specific problems. Equally, the majority of the interview participants expressed support for the inclusion of applied knowledge in the framework for electrical technology students. It was reasoned that the principles of applied knowledge would enable the students to translate their theoretical experiences to solve some practice-related issues. Similarly, Bello *et al*. [101] noted that teaching students to be knowledgeable; the importance of applied knowledge skills is healthy and beneficial to the public because it fosters capability. Therefore, applied knowledge is important for the success of electrical technology students both in college and in employment. The findings of the study identified innovation, technology, and critical thinking as part of the constructs for entrepreneurship in colleges of education.

The study conducted by Solesvik *et al*. [102] noted the sophistication of the world of work. This has made it important for every worker to possess the skills that will make them adaptable to the work environment. In the study, he strongly canvassed the importance of information communication technology (ICT) in the curriculum of technical education. A number of the participants stressed the importance of ICT during the interview process:

"*Reduce book knowledge…the industry should be the supplier of the tools and equipment… there should be ICT facilities everywhere…internet access…training for the personnel. It can be done periodically in terms of workshops and seminars… Our practical is obsolete…new technologies are desirable…there should be programming with software… Haa! Of course, yes. The world is changing and nothing is static… ICT is very essential…they need it*." (PE1 PE2 PE3 PE4).
"*Absolutely yes. Is it a skill for the job…? They must be able to analyze issues critically and proffer solutions. …jobs require dealing with machines and human beings, conflict is expected and they must have the capacity to manage the situation*." (PA1 PA2 PA8).

Based on the study on graduates' employability carried out by several researchers [103]–[105], entrepreneurial skills were considered to be a very important tool for job searches and gaining success by graduates. For example, Ranwala [106] emphasized the importance of an entrepreneurial mindset for students to aid their job-gaining chances rather than focusing on entrepreneurial-specific skills. Sousa [107] noted that the possession of academic qualifications at present is not enough to guarantee graduate employability. Consequently, the importance of entrepreneurship skills affords the students the advantage to recognize commercial, and job opportunities, self-esteem, knowledge and skills, and acting on them [39], [108]. Similarly, the qualitative findings during interviews gave support for entrepreneurial skills as a way of enhancing the employability of electrical technology students. Among the entrepreneurial-specific skills identified by the findings of this study are innovativeness, professionalism, collaboration, human relations, conflict resolution, integrity, problem-solving, managerial and marketing. These form part of the views of the research participants:

"*Listen attentively to what others are saying, be impartial. Maintain open communication*." (PA2 PA5 PA6: 06/06/2022).
"*It helps their job search. It links them with the organization's profiles. They can now have a career plan, they are at least acquainted with the process and application of basic tools and machines. Facilitate cost control. Requires further exposure but, they are having a good experience. Ability to manage all financial resources*." (Entrepreneurs 1 and 5).

The major contribution of this study is its ability to produce a valid framework of entrepreneurship skills for electrical technology in colleges of education. This became a reality through a rigorous deployment of the Fleiss Kappa calculator and Rasch analysis model to arrive at a narrow framework for the study. This has made this study distinct and different from the existing broad ones. This seems to have met the previous research [20], [109] that a study on narrow and discipline-difference employability skills should be conducted to take care of the weaknesses of the broad frameworks. The framework consists of specific skills required by electrical technology students to be employable and fit for the labor market. The framework emanated from the themes of document analysis and the interviews with entrepreneurs and academics. Specifically, only the constructs that fit the Rasch analysis were considered for inclusion in the proposed

framework. Towards this end, the sub-constructs that fit the model from the three main constructs of versatility, electrical merchandise and electrical power are: i) circuit optimization for versatility; ii) bill of quantity preparation of electrical merchandise; and iii) troubleshooting derived from electrical power. The remaining sub-constructs have their values above the mean value of the model (+). The implication of this is that they did not have the consensus of the respondents. Thus, they are infits [58]. Therefore, item VEW1 (.22), ELP1 (.10), ELL3 (.10), and ICT1 (.13) are not fit for the final framework.

Also, 13 sub-constructs of the mindset skills had their mean below the threshold of zero. Therefore, the constructs are not suitable for being included in the suggested framework. The items that fit well for the mindset skills required by the electrical technology students comprise planning and design, oral communication, dealing with changing situations, teamwork, professional ethics in a relationship, logic in communication, electrical symbols and uses, electrical repair and maintenance, data analysis, review and interpretation. These are items with a mean of less than zero. The emergence of constructs such as adaptability, and teamwork in the framework will go a long way in addressing the fear of researchers like [10], [110] who observed the need to further define the discipline-specific skills and the generic needs of the employee based on the emerging professional competency. Similarly, the overall framework fits into the recommendations of researchers like Olojuolawe *et al*. [20] who recommended high-level skills rebuilding by higher institutions especially, in Nigeria. The results of the study which is being proposed for inclusion into the curriculum of electrical technology in colleges of education is shown in Figure 2.

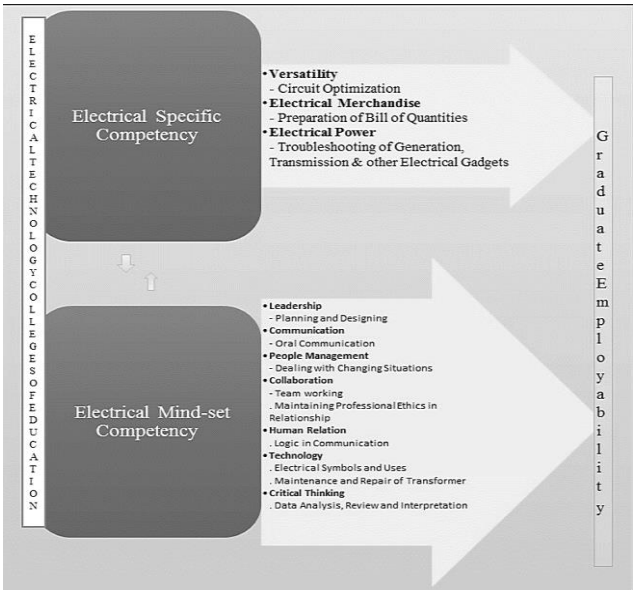

Figure 2. Entrepreneurship skills framework for fostering electrical technology employability

5. CONCLUSION

The emphasis of this study is to encourage discipline-based skills and discourage the over-bloated and crowded school curriculum that is in vogue today in Nigeria under the guise of entrepreneurship. This study has been able to provide a narrowed entrepreneurship skills framework for teaching students studying Electrical Technology in Nigerian Colleges of Education the skills that they need to become successful entrepreneurs and increase their chances of finding a job. It sees sense in the development of the students' entrepreneurship skills based on their disciplines. The professionalism of the students would be better nurtured and grown by this approach. Entrepreneurship centers should be established for interested students and candidates from within and outside the schools instead of diverting electrical technology students to another department of entrepreneurship studies when they are yet to master the skills needed to be professionally qualified and employable for the electrical labor market. Of course, a unit of entrepreneurship studies could exist for willing individuals outside the regular college programs. Research has shown that those saddled with the responsibility of teaching entrepreneurship to students in these departments across various colleges are business educators who do not have any knowledge of hard skills. In effect, what is being imparted to the students is equally the theories the government is working to either avert or minimize.

The students were tagged unemployable because they did not meet the requirements of the labor market. The study has been able to show that a combination of entrepreneurship-specific skills and mindset skills will promote the chances of getting jobs for electrical technology students in colleges of education in Nigeria. The era of depending solely on academic qualifications is no longer fashionable and does not suit the current reality of the world market. The objective of the national commission for colleges of education on technical education is to ensure that the students are either employable or self-reliant. This can only be met in the current competitive global world when they are roundly trained in their chosen careers to compete with their peers from any part of the world. The issue of starting a business and finding a job is a complex idea. In simpler terms, future studies should focus on the differences between subjects to break away from the overall plan. This is to help students learn about the unique aspects of their field of study and what employers are looking for specifically.

The study will have a significant implication for the students through a workload and failure rate reduction without compromising standards. Similarly, the study will be beneficial to the employer of labor and society at large. Overall, would have both theoretical and practical implications for researchers, higher institution administrators, graduates, employers of labor, and society. The study will extend the body of knowledge in entrepreneurship skills generation and avail researchers of the new method of construct generation for model and framework development. Efforts should be made to improve the cooperation between colleges and employers. This will fill the skills gap between the colleges and employers. Future studies should focus on how the proposed framework can be infused into the curriculum and implemented.

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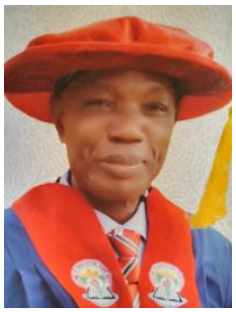

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