TECHNICAL AND VOCATION EDUCATION AND TRAINING - A PANACEA TO SELF-EMPLOYMENT AND ECONOMIC SUSTAINABILITY FOR UNEMPLOYED GRADUATES OF ENGINEERING PROFESSIONS

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Abstract

Technical and Vocational Education and Training (TVET) is a type of education and training that provides knowledge and skills for employment and economic empowerment of both the employed and the unemployed. TVET was officiated at the World Congress on TVET in 1999 in Seoul, Republic of Korea. The parliament accepted the term TVET to be extensive enough to integrate other terms which were utilized to illustrate related educational and teaching activities such as Technical-Vocational Education (TVE) and Workforce Education (WE). Technical Vocation Education and Training are most time lifelong skills that are useful for self-employment and economic sustainability of graduates of engineering professions. Technical, vocational, and soft skills are important for maximum utilization of TVET. The Engineering family comprises four members namely: craftsmen, technicians, technologists, and engineers. The collapse of the industries and manufacturing sector resulted in the loss of jobs and an increase in the unemployment rate for the past ten years, rising to 40% in 2022. This research work evaluated the effect of TVET on skills acquisition for self-employment, self-reliance, and economic sustainability. 10 unemployed graduates of technicians, technologists, and engineers were interviewed. The results showed that technical skills were used by engineering graduates more than vocational skills. Graduates used the skills acquired during training in schools to create jobs as an alternative to gainful employment. TVET assisted in skills acquisition entrepreneurship programme and would need government attention for better results in solving the unemployment problem.

Keywords: Engineering, Phone repair, Skills, Sustainability, Unemployment, Vocation

Introduction

Technical, Vocational Education and Training (TVET) is a type of education and training that provides knowledge and skills for employment and economic empowerment [1]. TVET uses formal, non-formal, and informal learning and it is acknowledged to be a crucial medium for social equity, technological reliance, and sustainable improvement [2] [3].

TVET was officiated at the World Congress on TVET in 1999 in Seoul, Republic of Korea. The parliament accepted the term TVET to be extensive enough to integrate other terms which were utilized to illustrate related educational and teaching activities such as Technical-Vocational Education (TVE) and Workforce Education (WE). The officiating of TVET resulted in the development of the UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training in Bonn, Germany in 1999 [1].

Technical and Vocational Education and Training (TVET) serves numerous purposes. Training of youth for work is a key purpose and goal of TVET. It is a structure of learning and developing vocation allied skills and mastery of fundamental understanding and methodical ideology. TVET includes both initial vocational training undertaken by youthful citizens preceding entering the labour market and ongoing vocational education undertaken by adults at the same time as in work or during periods when they are economically inactive. To sustain self-employment,
TVET curricula normally include entrepreneurship training and connected to this is the social replication and revolution of occupational and vocational practices [4] [5]

Technology is a dominant feature of human life [6]. Technology refers to the use of products of resourcefulness, inventions, and scientific research in the usefulness of man. Vocational education is a kind of education that leads to the acquisition of practical and applied skills that are essential to scientific and technological knowledge. The skills and knowledge acquired through Technical Vocation Education and Training are most time life-long skills that are useful for self-employment and economic sustainability of graduates of engineering professions in particular.
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undertaken by youthful citizens preceding entering the labour market and ongoing vocational education undertaken by adults at the same time as in work or during periods when they are economically inactive for economic sustenance and self-employment.

The engineering profession is a noble profession. Engineering is the discipline and profession that applies scientific theories, mathematical methods, and empirical evidence to design and create technological solutions, safety, and human factors that make the environment conducive to existence [7]. Engineering is a well-respected area of study apportioned for men of greatness and societal changes. Engineers are change-makers who make effort to effect positive changes wherever they are found [7]. Engineering is split into different branches such as chemical engineering, civil engineering, mechanical engineering, mining engineering, and electrical engineering. There are various other sub-branches of engineering recognisable around the world. Engineering can be referred to as a family that is made up of some members. The members of the engineering family are Craftsmen, Technicians, Technologists, and Engineers. In this family, each member has a specific function or function(s) to perform. Thus, engineering is a family that is made up of members for the division of labour [8]. The reason for the division is to make work easy and for maximum efficiency. The scope of the work and duties performed by each member of the family varies and are as follows:

Craftsmen: The craftsmen are the lowest in the engineering family [8]. They are the first and the oldest members of the engineering family because they existed before modern-day engineers. They possess Senior School Certificate or any certificate that proves that they are trained in their acquired skills. Examples of craftsmen in our society today are carpenters, mechanics, electricians, masons, plumbers, welders, and some others.

Technicians: The technicians are the principal members of the engineering family and are usually the direct supervisors of the craftsmen in the engineering workplaces [8]. The qualifications of technicians are usually higher than that of craftsmen. They either have an Ordinary National Diploma (OND) from a technical college or polytechnic, or a Full Technological Certificate (FTC). The level of skill a technician acquires is usually more than that of craftsmen.

Technologists: Technologists come third in the ranking of the engineering family from the bottom of the hierarchy [8]. In Nigeria for instance, a technologist is expected to obtain Higher National Diploma (HND) certificate from any engineering programme in Polytechnics or technical colleges. The curriculum of HND is designed for middle manpower development. In the engineering duties, they stand to supervise the technicians in the duties assigned to them. The technologist acts as an interface between the engineer and the technician. For a technologist to qualify to be addressed as an engineer, he must obtain a higher degree or at least a post-graduate Diploma in engineering to make up for the deficiency inherent in his previous qualification.
Engineers: The engineers are at the topmost level in the hierarchy of the engineering family. In terms of educational qualification, an engineer is expected to acquire a degree, Bachelor of Engineering (B.Eng) in any engineering field from a recognized University [8].

By training, engineers are equipped with creative minds for mathematical, analytical, and managerial skills, hence known as "problem solvers". The engineer is the head of any engineering firm and gets day-to-day reports directly from the technologist. The engineering family is a great one and each rank and member compliments each other. Therefore, the family is incomplete when any member is lacking. The academic qualifications of engineering students of all the cadre of engineering families make them employable in the industry to perform their different responsibilities. They are placed at different levels concerning their academic qualifications. The tasks and responsibilities given to the engineering family members are different and correspond to the training received in schools, colleges, and universities.

The poor economic conditions and poor employment rate in Nigeria have affected the rate of chances at which graduates of engineering professions get employment that is commensurate to their qualifications. These vital skills include technical skills, vocational skills, and soft skills. The challenges amongst others include an imbalanced curriculum in engineering training for the current economic world and an ineffective quality assurance programme for the engineering profession.

It is however worrying adjudging the Federal Government's persistent inabilities to promptly respond to the socioeconomic need of Nigerians which has adversely turned public affairs commentators, development

professionals, and public policy watchers into a bunch that keeps repeating one topic which is youth and graduate unemployment [9]. A high rate of joblessness among Nigerians results in about 40 percent of youths with unemployment status particularly engineering graduates due to many industries that are closed down.

The challenge of unemployment has made the youths to be discouraged, angry, and restless, as they look at a future that does not give them hope.
National Bureau of Statistics reported that Nigeria's unemployment rate has risen from 27.1 percent in the second quarter of 2020, to 33 percent [9]. Aside from making it the second-highest on Global List, analysis shows that more than 60 percent of Nigeria's working-age population is younger than 34 [9]. International Monetary Fund (IMF) reported that unemployment for people aged 15 to 24 stood at 53.4 percent in the fourth quarter and at 37.2 percent for people aged 25 to 34 in addition to the jobless rate for women which was 35.2 percent compared with 31.8 percent for men [9]. The recovery of the economy with 200 million people will be slow, with growth seen at 1.5 percent in the year 2022, and after 2021 1.9 percent contraction [9]. The number of people looking for jobs will keep rising as population growth continues to outpace output expansion. [9] stated that the output of government economic effort will only achieve recovery to the pre-pandemic levels in 2022. Nigeria is expected to be the world's third-most-populous country by 2050, with over 300 million people, according to the United Nations, this remains a sad commentary by all ramifications as it is both worrying and scary [9].

From engineering education, be it a diploma or a degree or an alternative qualification, a graduate is expected to have gained the basic technical skills needed to become a professional engineer. The technical skills can vary given the engineering discipline and job role being performed, however, 45% of the turn-out of engineering graduates in the last five years of the country need present-day skills. Another challenge is their non-challan attitude to knowing the needed and relevant skills required by the employers when they are seeking employment. This problem has contributed to the rising rate of unemployment. The level of acquisition of skills in engineering students is better and has gradually increased in the last ten years.

The present development of unemployment in Nigeria demands two separate but similar actions. First is the urgent shift from lamentation and rhetoric to finding solutions via solution-oriented research. The second has to do with the implementation of experts' advice and solutions to unemployment in Nigeria. This is indeed time to commit to mind the words of Franklin D. Roosevelt, former President of the United State of America that "extraordinary conditions call for extraordinary remedies."

This research work is a study on proffering extraordinary remedies and solutions to the challenges of unemployment and underemployment of engineering graduates from polytechnics and universities through the acquisition of technical, vocational, and soft skills through TVET. The study also evaluates how skills can make youths and engineering graduates to be self-employed, self-reliant, and socio-economically sustained. All hope is not lost as youths have a vital role to play, for the country to arrive at its destined destination by creating jobs for themselves and others.

2.0 Methodology

The method adopted in this research study are as follow:

Questionnaire Method

Questionnaires were administered through an investigative method on vocational skills used by unemployed graduates of polytechnic and universities in place of gainful employment with their certificates acquired in polytechnics and universities.

Research Method

The research was carried out on available, trending, and lucrative technical and vocational skills that can be adopted by unemployed engineering graduates for self-reliance, self-employment, and economic sustainability.

Engineering fields were identified and only four fields were used in the research study. Civil, Computer, Electrical, Electronics, and Mechanical Engineering fields were used in the investigation. A questionnaire investigation was carried out on ten Technicians, Technologists, and Engineers each in the four fields of engineering under consideration. Technicians, Technologists, and Engineers in the four engineering fields were asked about the skills they used for self-employment and economic sustainability in the absence of gainful employment. The skills used by

the Technicians, Technologists, and Engineers for economic sustainability in place of the skills acquired in polytechnics and universities during the engineering training were recorded.

3.0 Results

The results of the questionnaires used to investigate the technical and vocational skills of Technicians, Technologists, and Engineers in the fields of civil, computer, electrical, and mechanical engineering are presented in Tables. Tables 1 and 2 show the number of vocations used by Technicians and the number of graduates that used them in the four engineering fields under consideration.

Table 1: Vocations Skills Used by Technicians of Civil and Computer Engineering Graduates

Civil Engineering			Computer Engineering		
S/N	Vocational Skill Used	No of People	S/N	Vocational Skill Used	No of people
1	Bricklaying	1	1	Sale of computer parts	1
2	Tile laying	3	2	Phone repairs	4
3	Aluminium Fabrication	3	3	Computer repairs	3
4	Whiteboard making	1	4	ICT	1
5	AutoCAD drawing	2	5	Financial and business	1

Table 2: Vocations Skills Used by Technicians of Electrical and Mechanical Engineering Graduates

Electrical Engineering			Mechanical Engineering		
S/N	Vocational Skill Used	No of People	S/N	Vocational Skill Used	No of people
1	Sales of electrical parts	2	1	AutoCAD drawing	4
2	Phone repairs	3	2	Plumbing services	3
3	Electronics repairs	3	3	Aluminium fabrication	2
4	ICT	1	4	Printing	1
5	Financial and business	1	5		

Tables 3 and 4 show the number of vocations used by Technologists and the graduates that used them in the four engineering fields under consideration.

Table 3: Vocations Skills Used by Technologists of Civil and Computer Engineering Graduates

Civil Engineering			Computer Engineering		
S/N	Vocational Skill Used	No of People	S/N	Vocational Skill Used	No of people
1	AutoCAD drawing	4	1	Sale of computer parts	3
2	Whiteboard making	1	2	Phone repairs	4
3	Aluminium Fabrication	3	3	Computer repairs	3
4	Tiles laying	2			

Table 4: Vocations Skills Used by Technologists of Electrical and Mechanical Engineering Graduates

Electrical Engineering			Mechanical Engineering		
S/N	Vocational Skill Used	No of People	S/N	Vocational Skill Used	No of people
2	Sales of electrical parts	2	1	AutoCAD drawing	3
2	Phone repairs	5	2	Plumbing work	2
3	Auto electricians	1	3	Auto mechanic	2
4	ICT	2	4	Welding and Fabrication	2
			5	Metal machining	1

Tables 5 and 6 show the number of vocations used by Engineers and the graduates that used them in the four engineering fields under consideration.

Table 5: Vocations Skills Used by Engineers of Civil and Computer Engineering Graduates

Civil Engineering			Computer Engineering		
S/N	Vocational Skill Used	No of People	S/N	Vocational Skill Used	No of people
1	AutoCAD drawing	4	1	Sale of computer parts	1
2	Whiteboard making	1	2	Phone repairs	3
3	Phone repairs	1	3	Computer repairs	4
4	Tiles laying	2	4	ICT	2
5	Financial and business	2	5	Financial and business	2

Table 6: Vocations Skills Used by Engineers of Electrical and Mechanical Engineering Graduates

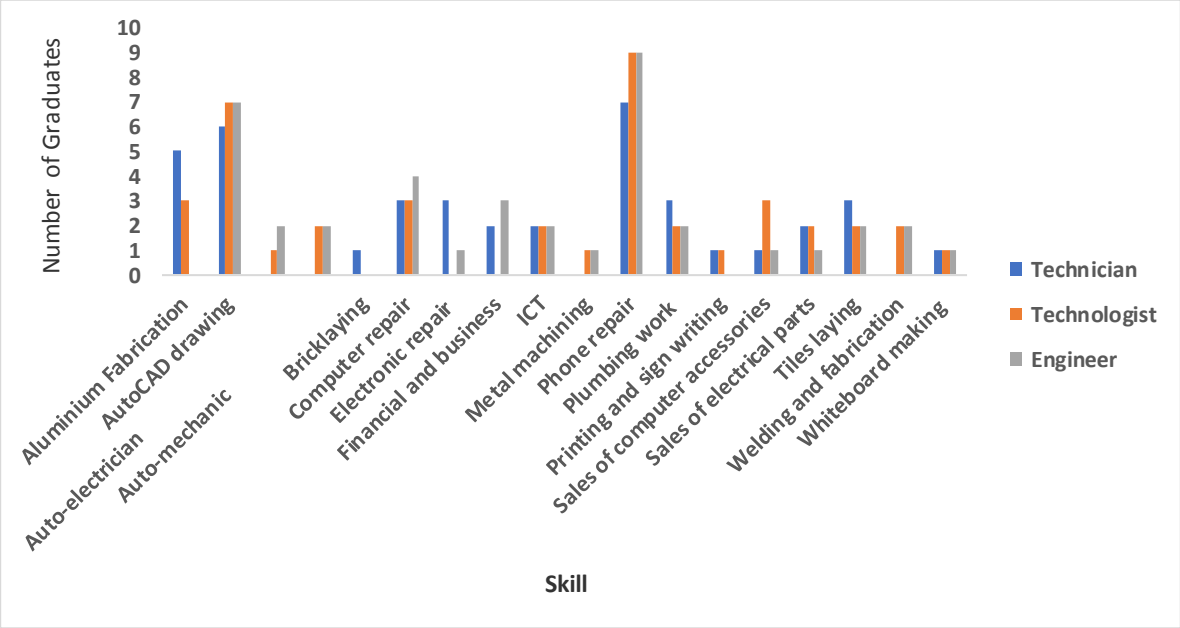
Electrical Engineering			Mechanical Engineering		
S/N	Skill Used	No of People	S/N	Skill Used	No of people
3	Sales of electrical parts	1	1	AutoCAD drawing	3
2	Phone repairs	5	2	Plumbing work	2
3	Auto-electrician	2	3	Auto mechanic	2
4	Electronics repairs	1	5	Welding and Fabrication	2
5	Financial and business	1	5	Metal machining	1

Table 7 shows the summary of number of vocations used by Technicians, Technologist, and Engineers and the number of graduates that used them.

Table 7: Summary of Number of Vocational Skills Used by All the Engineering Graduates

S/N	Skill	Technician	Technologist	Engineer	Total
1	Aluminum Fabrication	5	3	-	8
2	AutoCAD drawing	6	7	7	20
3	Auto electrician	-	1	2	3
4	Auto mechanic	-	2	2	4
5	Bricklaying	1	-	-	1
6	Computer repair	3	3	4	10
7	Electronic repair	3	-	1	4
8	Financial and business	2	-	3	5
9	ICT	2	2	2	6
10	Metal machining	-	1	1	2
11	Phone repair	7	9	9	25
12	Plumbing work	3	2	2	7
13	Printing and sign writing	1	1	-	2
14	Sales of computer accessories	1	3	1	5
15	Sales of electrical parts	2	2	1	5
16	Tiles laying	3	2	2	7
17	Welding and fabrication	-	2	2	4
18	Whiteboard making	1	1	1	3
	Total	40	40	40	120

Graph of Summary Showing Number of Graduates and the Vocational Skills Used



4.0 Discussion

The results obtained showed that ten unemployed graduates were interviewed each for Technicians, Technologists, and Engineers in Civil, Computer, Electrical, and Mechanical Engineering fields. 40 unemployed graduates were involved in all the engineering fields (Civil, Computer, Electrical, and Mechanical). All the people used some technical and vocational skills to earn a living and for economic sustainability as a result of the unemployment situation. 18 vocational skills were discovered to be used by the unemployed graduates. Some of the skills were acquired in colleges and universities during their training from some courses (core and entrepreneurship courses) they offered. Technicians, Technologists, and Engineers mostly used phone repair skills in all engineering fields. This rightly indicates that the skill is lucrative and profitable. AutoCAD drawing skill has the second-highest number of people. It was a skill that was predominant among Mechanical and Civil Engineering professionals. Technicians, Technologists, and Engineers used it. AutoCAD drawing skill is a trending skill in the present world of machine design. Computer repair skill was mostly used by Electrical and Computer Engineering professionals due to their electronics background knowledge during training in colleges and universities. Plumbing work, auto mechanic, welding and fabrication, and metal machining skills were used by Mechanical Engineering professionals only due to the peculiar technical knowledge requirement. 2 Technicians and 3 Engineers used financial skills to engage in self-employment. According to [10] 60% of graduate recruiters will recruit from any degree discipline. Different vocational and technical skills require different techniques and knowledge [11]. However, skills are not just about the technical abilities you have gained from your studies or vocational training centers but also the soft skills you have developed. Soft skills can include: teamwork, written and verbal communication, organising, and planning. Customers and clients look for evidence of these soft skills from a variety of areas of graduate's life and services rendered to customers. These soft are important and cannot be acquired from courses in colleges and universities but can be developed by individuals personally. However, other vocational skills that can be acquired by unemployed graduates for self-employment and economic sustainability include tailoring, hair and beauty, design, business management, financial management, and information technology amongst others. [10] and [11] stated that when the leaders and the public are aware of the contributions of TVET then there can be a strategic educational program for producing a productive workforce that can move the nation forward; rather than an educational program for academic qualification only.

5.0 Conclusion

Both phone repairs and AutoCAD drawing skills are technical skills. Technical, Vocational Education and Training can effectively reduce graduates' unemployment by providing vocational skills for self-reliance, self-employment, and economic sustainability. Graduates made money using skills to render valuable and essential services and were

economically sustained. Technical skills were more lucrative and demanding than vocational skills. Not all engineering graduates will seek chartered status or even pursue a career in the engineering sector. The skills and competencies you have developed through your studies are essential and useful to many different types of vocations in various industry sectors including finance, consultancy, and public services. TVET can be used to equip unemployed engineering graduates with relevant skills to reduce the rate of unemployment. Technical and vocational skills are directly used on the job while soft skills assist in better utilization and delivery of technical and vocational skills.

Hence, it is noteworthy to improve on the Technical, Vocational Education and Training for skill acquisition entrepreneurship programme in Polytechnics, Colleges of Technology, and Technical Colleges. TVET and skill acquisition entrepreneurship programme should be included in universities curriculum and related academies in Nigeria. The inclusion will address the training and development of professional and technical skills for engineering professionals, industrial applications and relevance, self-employment, and economic sustainability in Nigeria. When engineering graduates acquire vocational skills that are both related and not related to the engineering profession they will be self-employed, self-reliant, and sustained economically creating jobs for themselves and other citizens.

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