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UTILIZATION OF TVET FOR PROFFERING SOLUTIONS TO UNEMPLOYMENT CHALLENGES OF GRADUATES OF ENGINEERING PROFESSION

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ABSTRACT

TVET is an acronym for Technical and Vocational Education and Training. It is a kind of training and technical education that equips someone with the skills and knowledge to overcome unemployment challenges and achieve financial reliance in society. It is also used by the employed to create additional sources of income. TVET was unveiled in Seoul, Republic of Korea, in 1999. Theoretical knowledge alone in engineering programmes makes engineering graduates less than 35% employable. Many engineering graduates did not acquire practical, occupational, soft, and technical skills during their undergraduate study period. Ironically, engineering graduates and youths in Nigeria are not self-reliant, entrepreneurial, and economically self-sustained. The unemployment rate in Nigeria is affecting engineering graduates due to many industries and the manufacturing sector that have closed down resulting in job loss and an increase in the joblessness rate in the last decade, rising to 40% in 2022. The research investigated how the acquisition of practical, occupational, soft, and technical skills made graduates of engineering programmes self-employed, self-reliant, and economically sustained. The skills were acquired during and after the engineering training in school through TVET. The questionnaire was administered to 10 graduates of engineers, technologists, and technicians in four fields of engineering which are electrical and electronics, mechanical, civil, and computer engineering. The graduates were not using the certificates they acquired in college to work. 100% of the graduates utilized the skills acquired through TVET for self-employment and economic sustainability. TVET has exceptional lifelong skills that are beneficial for economic sustainability. TVET proffered viable solutions to the challenges of unemployment among graduates of the engineering professions. TVET achieved its goals in employing the unemployed in society through entrepreneurship skills and would require government attention for better results.

KEYWORDS: Challenges, Empowerment, Engineering, Skills, Solution, TVET, Unemployment

1.0 INTRODUCTION

TVET is a kind of educational training that offers skills and information that are useful and designed for the commercial and financial empowerment of both the working class and people without jobs [1]. TVET

uses informal, formal, and non-formal education and it is known to be an important means for societal fairness, scientific dependence, and developmental sustainability of society (Skills for Work and Life" (2019 [2] [3].

Technical, Vocational Education and Training was declared open in Seoul, Republic of Korea at the World Congress in 1999. The assembly acknowledged TVET programme to include Technical-Vocational Education (TVE) and Workforce Education (WE). The emergence of TVET led to the growth and advancement of the UNESCO-UNEVOC International Centre for TVET in Bonn, Germany in 1999 [1].

The bad fiscal and financial situations and worse employment rates in Nigeria contribute to the low probability that engineering graduates' programmes get jobs that is appropriate to their training, experiences, and qualifications. The problems of the engineering profession training amongst others are an unnecessary prospectus in engineering education for the present economic world and an unproductive quality assurance structure for the engineering educational training.

Therefore, it is worrisome considering the Federal Government's continuing failures to swiftly work on the socio-economic demands of Nigerians which has unpleasantly made public policy watchers, development professionals, and affairs commentators, the bunch that continue to repeat an issue which is graduates and youths' unemployment particularly graduates of engineering professions [4]. Unemployment is at a high rate among Nigerians, which has affected about 40 percent of the youths mostly engineering graduates due to several companies, manufacturing, and production sectors of the economy that are no longer in operation [4]. The problem of joblessness has made the youths and graduates restless, irritated, and discouraged as they gaze at a future that does not show any sign of hope for a better life.

The National Bureau of Statistics informed that Nigeria's joblessness rate rose from 27.1 percent in the second quarter of 2020, to 33 percent [4]. Besides, making it the second-highest in the world, investigation confirms that more than 60 percent of Nigeria's working-age populace is less than 34 years [4]. International Monetary Fund (IMF) stated that joblessness for individuals aged 15 to 24 is raised to 53.4 percent in the fourth quarter of 2020 and 37.2 percent for individuals aged 25 to 34 together with the unemployment rate for women which was 35.2 percent standing side by side with 31.8 percent for men [4]. The regaining of the economy with 200 million populations will

not be fast, due to the growth rate seen at 1.5 percent in the year 2022, and later 2021 1.9 percent reduction [4]. The sum of individuals searching for work will increase as the number of the populace continues to grow and overtake productivity growth. [4] reported that the productivity of government fiscal and financial efforts will only accomplish regaining the pre-pandemic levels in 2022. Nigeria is likely to be the third-most-populous country globally by 2050, with a population of over 300 million, archive to the United Nations report, this is an unfortunate comment by all implications as it is disturbing and frightening [4].

The engineering academic training, either degrees or diplomas, or substitute qualifications, graduates are projected to have learned the fundamental practical skills required to become a qualified engineer. These practical skills can differ based on the fields of study, duties, and responsibilities they are engaged in. Nevertheless, more than 70% of the graduates of engineering professions in the past five years in the nation lack modern skills. An additional problem is their non-challan defiance to getting relevant information and obtaining the essential and appropriate skills that are mandatory by the companies when they are looking for jobs. This challenge has caused an increasing rate of redundancy in the country.

Currently, the increasing rate of joblessness in the country needs two different but comparable actions. Firstly, there is the crucial need to move from noise-making and rhetoric state to search for solutions through solution-oriented study. Secondly, there should be ardent application of experts' guidance and resolutions to joblessness in the nation. This is the period to note the golden saying of Franklin D. Roosevelt, former United States of America President that "extraordinary circumstances call for extraordinary solutions."

TVET is poised to achieve critical objectives in society which include self-employment and economic sustainability. TVET is a programme of education and emerging vocation-related skills and mastery of basic education and systematic ideology. Training of youth for work and economic sustainability are key purposes and goals of TVET. TVET contains both primary occupational training done by young people before enlisting in the labour market and continuing vocational programme done by grown-ups simultaneously when at work or when they are economically not engaged. To keep up with self-reliance, TVET curricula normally cover entrepreneurship education, and associated with this, is the communal duplication and revamping of work-related and skill programme activities. [5] [6].

[7] reported that technology is a dominant reflection of human life. Technology denotes the utilization of products of ingenuity, discoveries, and scientific research for the utilization of man for the development of society.

TVET offers life-long learning for the economic sustainability and self-employment of engineering graduates who are not gainfully employed.

The simultaneous objective of this study is to make the engineering programmes students aware that TVET is a programme of training and advancing job-related skills and knowledge of basic education and disciplined philosophy for self-employment. TVET includes both preliminary occupational skill acquisition engaged in by young people before going into the employment markets.

Engineering is the profession and occupation that uses mathematical methods, scientific theories, and experimental evidence to propose and produce scientific results, protection, and human factors that ensure the environment is habitable for co-existence [8]. Engineering is an honourable profession and a well-respected field professionally, assigned to people of intelligence and changers of the communities. Engineers are game-changers who work to effect better changes anywhere they are placed to work [8]. Engineering is divided into diverse fields such as computer engineering, mechanical engineering, petroleum engineering, mining engineering, electrical engineering, civil engineering, biomedical engineering, and chemical engineering. There are many additional sub-fields of the engineering profession known all over the globe. Engineering can be denoted as a family that comprises four members namely Engineers, Technologists, Technicians, and Craftsmen. In the engineering family, the individual member has precise obligations for optimal proficiency. The members of the engineering family are stated thus:

Craftsmen: They are the least in the hierarchy of the engineering family [9]. Craftsmen are the oldest and first in the engineering membership for the reason that they have been in existence for a long earlier than current engineers. Secondary School Certificate or certificate which shows they are skilled in their attained proficiency is their highest qualification. Electricians, welders, plumbers, carpenters, masons, mechanics, and some others are typical examples of craftsmen.

Technicians: They supervise the work and duties of the craftsmen in the engineering profession work yards [9]. They are principal members of engineering members.

Technicians usually have higher qualifications than craftsmen. They possess either a Full Technological Certificate (FTC) or an Ordinary National Diploma (OND) from a technical college or polytechnic. The hierarchy of skills technicians acquire is normally higher than craftsmen skills.

Technologists: The third member in the engineering family membership ranking are the technologists from the bottommost of the engineering profession grading [9]. For example, in Nigeria, a technologist should acquire Higher National Diploma (HND) certificate from any engineering programme in a technical college or polytechnic. The curriculum of HND is intended for intermediate manpower education, skill acquisition, training, and skill development. In the field of practicing engineering, technicians are supervised by the technologist when they are given responsibilities. Technologists must possess a higher degree than HND or at least a Post-Graduate Diploma in engineering to be qualified and addressed as an engineer.

Engineers: The highest cadre in the hierarchy level of the engineering family is the engineer. An engineer is expected to attain an educational qualification of a university degree, Bachelor of Science (B Sc), Bachelor of Engineering (B Eng), or Bachelor of Technology (B Tech) in any of the engineering fields from a recognized University [9]. Through education and knowledge acquisition, engineers are trained to possess inventive minds for mathematical, analytical, and managerial skills, this makes the general public refer to engineers as "problem solvers"[10]. The engineer gets daily reports from the technologist directly [10]. Engineering graduates need to be kept abreast that the educational training acquired should give employable skills and knowledge to carry out their diverse roles and job assignments. The jobs and assignments carried out by memberships of the engineering family differ.

This study will proffer extraordinary solutions to the problem of joblessness and underemployment of graduates of engineering professions from universities and polytechnics by acquiring practical, occupational, soft, and technical skills through TVET. This research will also reveal how the acquisition of vocational knowledge can make engineering graduates and youths self-entrepreneurial, self-employed, and self-sustained, economically, financially, and socially self-reliant.

2.0 METHODOLOGY

i. Clarity and Detail of Questionnaire

The questionnaire included details of educational background and skill acquisition

history. The participants were asked to mention the practical, vocational, and technical skills they utilized for self-employment and economic sustainability since they were not gainfully employed amongst the 17 identified skills. The choices of the skills were close-ended survey questions. The responses were collected through the same channels.

ii. Objectives and Scope

The targeted graduates were not gainfully employed (not working with acquired certificates), hence the reason to investigate how TVET has assisted them to be self-employed and financially sustained in the era of the rising rate of unemployment in Nigeria. Graduates using only acquired TVET skills were included. The graduates were in the fields of Mechanical, Electrical and Electronics, Computer, and Civil engineering. The participants graduated from public tertiary institutions in Nigeria which included Universities and Polytechnics.

iii. Sample Size and Selection

10 graduates each among the engineers, technologists, and technicians from the four fields of Mechanical, Electrical and Electronics, Computer, and Civil engineering participated. The total sample size is 120 participants. There was no gender bias. There was no gender restriction. The graduates included engineers, technologists, and technicians from Universities and polytechnics and graduated between 2012 and 2022.

iv. Data Collection Process

Questionnaires were administered by distribution to graduates through the media, telephony survey, and face-to-face survey with diplomates and graduates from identified and selected institutions. The responses were received through channels. The responses were collated and computed.

v. Ethical Considerations

Consent from participants was not sought, though participants were assured of the non-inclusion of names in research publications by ethical practices. Participants' rights and privacy were protected.

vi. Choice of Fields

The graduates were in the fields of Mechanical, Electrical and Electronics, Computer, and Civil engineering. These four fields of engineering represented the hubs of the engineering fields and the most preferred among all. Coincidentally, these fields of engineering give students more opportunities to learn TVET skills while undergoing engineering training in schools.

vii. Data Analysis

The data analysis employed was cross-tabulation quantitative analysis. The data

was analysed into cross-tabulation structures that put the respondents into grouped tables based on their shared background information and survey responses of the utilization of the skills for self-employment. Tables were created from the analysis and the results were presented in tables and graphs.

3.0 RESULTS

Table I shows the responses of technicians of Mechanical Electrical and Electronics Engineering graduates. From Table 4 (40%) of the 10 technicians used plumbing services skills for self-employment followed by AutoCAD drawing skills while 10% used aluminium fabrication which was the least. Electronics and phone repair skills were used by 30% of the technicians each while financial business and sales of electrical skills were utilized by 10% of the technicians each.

Table I: Vocational Skills Utilized by Technicians of Mechanical and Electrical and Electronics Engineering Graduates

Electrical and Electronics Engineering			Mechanical Engineering		
S/N	Vocational Skills	Graduates	S/N	Vocational Skills	Graduates
1	ICT	2	1	Phone repairs	2
2	Financial and Business	1	2	AutoCAD drawing	3
3	Phone repairs	3	3	Plumbing services	4
4	Sales of electrical parts	1	4	Aluminium fabrication	1
5	Electronics repairs	3			

Table II shows the self-employability skills of technicians in Computer and Civil Engineering. 40% of Computer Engineering technicians used Computer repair skills followed by 30% used phone repair skills while 10% each used financial and business, sales of computer parts, and ICT skills. Tile laying skill was used by 40% of the technicians followed by mason skill used by 10% being the least.

Table II: Vocational Skills Utilized by Technicians of Computer and Civil Engineering Graduates

Computer Engineering			Civil Engineering		
S/N	Vocational Skills	Graduates	S/N	Vocational Skills	Graduates
1	Phone repairs	3	1	Tile laying	4
2	Computer repairs	4	2	Aluminium Fabrication	2
3	Financial and Business 1		3	Mason	1
4	Sales of computer parts	1	4	AutoCAD drawing	3
5	ICT	1	5		

Table III shows the involvement of respondents in skill utilization. 50% of the technologists used phone repair skills for self-employment followed by ICT skills used by 30% of technologists and 10% each used auto electrician and sales of electrical skills. 30% each of the technologists used welding fabrication and auto-mechanic skills while the least 10% used metal machining and plumbing work skills.

Table III: Vocational Skills Used by Technologists of Mechanical and Electrical and Electronics Engineering Graduates

Electrical and Electronics Engineering			Mechanical Engineering		
S/N	Vocational Skills	Graduates	S/N	Vocational Skills	Graduates
1	Auto electricians	1	1	AutoCAD drawing	2
2	ICT	3	2	Welding and Fabrication	3
3	Phone repairs	5	3	Metal machining	1
4	Sales of electrical parts	1	4	Auto mechanic	3
			5	Plumbing work	1

Represented in Table IV are 50% of the technologists in Civil Engineering engaging in AutoCAD drawing skills and 10% engaging in whiteboard-making skills for economic sustainability. 40% of technologists and graduates of Computer Engineering used computer and phone repair skills while 20% of the technologists used sales of computer parts skills for self-employment an alternative to the unemployment situation in Nigeria.

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

Civil Engineering			Computer Engineering		
S/N	Vocational Skills	Graduates	S/N	Vocational Skills	Graduates
1	Aluminium Fabrication	2	1	Computer repairs	4
2	Tiles laying	2	2	Sale of computer parts	2
3	AutoCAD drawing	5	3	Phone repairs	4
4	Whiteboard making	1			

Table V shows how respondents used vocational skills for self-employment. 50% of the Electrical and Electronics Engineering graduates used phone repair skills while 10% each used auto-electrician, financial and business, and sales of electrical parts skills for self-employment as an alternative to unemployment. 50% of Mechanical Engineering graduates used AutoCAD skills while 10% each used metal machining, welding and fabrication, and plumbing work skills for economic sustainability.

Table V: Vocational Skills Utilized by Engineers of Mechanical and Electrical and Electronics Engineering Graduates

Electrical and Electronics Engineering			Mechanical Engineering		
S/N	Vocational Skills	Graduates	S/N	Vocational Skills	Graduates
1	Electronics repairs	2	1	Metal machining	1
2	Auto-electrician	1	2	Welding and Fabrication	1
3	Financial and Business	1	3	AutoCAD drawing	5
4	Sales of electrical parts	1	4	Plumbing work	1
5	Phone repairs	5	5	Auto mechanic	2

Table VI shows the distribution of vocational skills used for self-employment. 50% of the Civil Engineering graduates used AutoCAD drawing skills, 20% each used tile laying and phone repairs, and 10% used financial and business skills. 40% each of the graduates used computer and phone repair skills for self-employment while 10% each of the graduates used financial business and ICT skills for self-employment.

Table VI: Vocational Skills Used by Engineers of Computer and Civil Engineering Graduates

Civil Engineering			Computer Engineering		
S/N	Vocational Skills	Graduates	S/N	Vocational Skills	Graduates
1	Tiles laying	2	1	Computer repairs	4
2	AutoCAD drawing	5	2	Financial and Business	1
3	Financial and Business 1		3	ICT	1
4	Phone repairs	2	4	Phone repairs	4

Table VII illustrates the cumulative vocational skills and the graduates in the four fields of engineering under investigation. 40 graduates comprising engineers, technologists, and technicians used 17 vocational, practical, and technical skills for self-employment.

Table VII: Summation of the Vocational Skills used by all the Engineering Graduates

S/N	Vocations/Skills	Technician	Technologist	Engineer	Total
1	ICT	1	3	1	5
2	Mason	-	1	-	1
3	Tiles laying	2	4	2	8
4	Phone Repair	11	8	11	30
5	Auto mechanic	2	-	2	4
6	Auto Electrician	1	-	1	2
7	Plumbing work	1	4	1	6
8	Metal machining	1	-	1	2
9	Computer Repair	4	4	4	12
10	Electronics Repair	2	3	2	7
11	AutoCAD	9	6	10	25
12	Whiteboard making	1	-	-	1
13	Aluminum Fabrication	-	3	-	3
14	Welding and fabrication	1	-	1	2
15	Finance and business	3	2	3	8
16	Sales of computer parts	-	1	-	1
17	Sales of electrical parts	1	1	1	3
	Total	40	40	40	120

Figure 1 shows the distribution of skills by percentage used by the technicians to engage themselves in self-employment and economic sustainability.

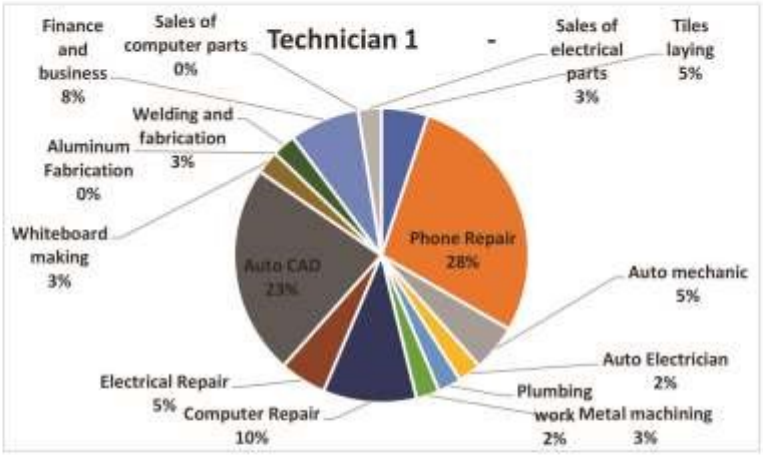

Figure 1: Skills used by all the Technicians for Self-employment and Economic Sustainability

Figure 2 shows the distribution of skills by percentage used by the technologists to engage themselves in self-employment and economic sustainability.

Figure 2: Skills used by all the Technologists for Self-employment and Economic Sustainability

Figure 3 shows the distribution of skills by the percentage used by the Engineers to engage themselves in self-employment and economic sustainability.

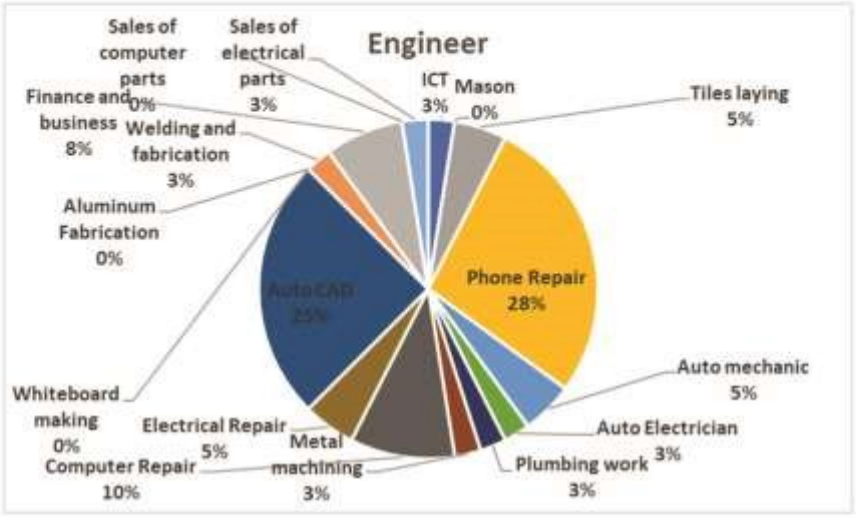

Figure 2: Skills used by all the Engineers for Self-employment and Economic Sustainability

4.0 DISCUSSION

The results of the investigation displayed ten jobless graduates were questioned, each for Engineers, Technologists, and Technicians, in Computer, Electrical and Electrical, Mechanical, and Civil engineering. In total, 40 jobless graduates participated in four fields of engineering (Mechanical, Computer, Civil, and Electrical and Electrical). The graduates also used additional soft skills to earn their livelihood and for economic reliance and sustainability due to the unemployment condition in Nigeria. A total of 17 technical and vocational skills were discovered in the investigation. These skills were used by unemployed engineering graduates. Quite a number of the skills were acquired in their universities and colleges during their undergraduate period in school when they were offering some courses (core and entrepreneurship courses). A total of 30 graduates among the Engineers, Technicians, and Technologists used phone repair skills as a means of making money. This fact is an indication that phone repair skills are profitable and lucrative in Nigeria's economy because phone device has a large market opportunity and it is used by a very large percentage of the population. 25 graduates used AutoCAD drawing skills. This is the second-highest number of engineering graduates. AutoCAD skills are common among Civil and Mechanical Engineering graduates and professionals due to their involvement in design and infrastructural projects. Engineers, Technicians, and Technologists use it often in project execution and project design. The skill of AutoCAD drawing is viable and

trending in the 21st century. It is applicable globally in the world of machine design, machine building, production engineering, and manufacturing technology. Computer repair skill was used mostly by Computer and Electrical Electronics Engineering graduates due to the training and electronic knowledge they acquired in their colleges and universities. Auto mechanic, plumbing work, metal machining, and welding and fabrication skills were utilized by Mechanical Engineering graduates only due to the distinctiveness of the practical and technical knowledge required to acquire the vocational skills. 3 Technicians and 2 Technologists used financial skills to make a living for themselves as a means of self-employment. According to [11] 60% of graduate employers normally employ from any degree discipline as long as the graduates possess the soft skills requirements for the job. Contrariwise different technical and vocational skills need diverse techniques, knowledge, and training [12]. However, skills are not just merely the methodical capacities you have acquired during training or vocational training centers but are the soft skills you possess. Organisational, verbal communication, teamwork, planning, and writing skills are examples of soft skills. These soft skills should be possessed by graduates to satisfy customers and clients satisfactorily. These soft skills are essential and can be developed by individuals personally, they are not acquired from universities or colleges. Nonetheless, [13] reported that other job skills that can be learned by jobless graduates for economic sustainability and self-employment are financial management, tailoring, machine design, hair and beauty, machine, digital technology, and information and communication technology amongst others. [10] reported that when the leadership in the government and organised public sector are mindful of the importance of TVET, the results will be a strategic training programme for building an industrious workforce that can advance the course of the nation positively. Government can make TVET replace the present educational programme that places a premium on academic and certificate qualification only [12] [14].

5.0 CONCLUSION

Phone repairs skill was mostly used by the graduates in the survey. AutoCAD drawing skill is a technical skill. TVET can efficiently decrease graduates' joblessness through employable skills for self-employment, economic sustainability, and self-reliance. Graduates could get some money by using technical and vocational skills to give essential and valuable services to society and they were sustained economically. Technical skills were more

profitable and in higher demand than vocational skills. Some engineering graduates do not pursue a career in the engineering profession after graduation from colleges and universities. The competencies and skills that are developed by engineering graduates under training are useful in numerous diverse kinds of vocations in many business areas which include consultancy, public services, and financial management. TVET was utilized to train jobless engineering graduates on appropriate skills to proffer solutions to the challenges of joblessness. Vocational skills as well as technical skills are unswervingly useful in the occupation while soft skills help in better application and the use of vocational and technical skills. These skills assist in achieving good customer relations.

Therefore, there is a need to advance the course of TVET for the acquisition of skills and entrepreneurship programme in Polytechnics, Technical Colleges, and Colleges of Technology. Technical and Vocational Education and Training, entrepreneurship, and skill acquisition programmes should be integrated into the university's programme and similar academics across the nation. This will solve the problems of development and training of professionals, technical skills acquisition, inadequate industrial-academic applications, unemployment, and a sustainable economy in Nigeria. Consequently, engineering graduates are trained on vocational skills that are both related and not related to the engineering profession during their programme. Hence, they possess the ability and knowledge to be self-reliant, self-employed, financially and economically sustained, proffering solutions to challenges of unemployment, and creating jobs for other citizens.

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