Bichi Journal of Technology Education (BIJOTE)
ISSN: (PRINT): 2006-9715; (ONLINE: 2735-9514) *Volume 8, Issue 1 (December, 2025), PP. 90 – 97*

TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING – THE KEY TO SUSTAINABLE TECHNOLOGICAL DEVELOPMENT

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Abstract
Technical and Vocational Education and Training (TVET) has been identified as one of the most effective human resource developments that needs to be embraced for rapid industrialization and sustainable technological development of any nation. TVET has been an integral part of national development in many societies because of its impact on productivity and economic development. This paper discusses the dearth of skilled technical manpower in Nigeria and its effect on the technological development of the nation. It advocates for a comprehensive revitalization of TVET in Nigeria to promote workforce partnership needed to develop innovative approaches or replicate models that operationally demonstrate has demand technological the society needs. Efforts and ways by both by the government and individuals to train and produce the required manpower for the achievement of the missing link in Nigeria's development policy were also suggested by the authors.

Keywords: TVET, Sustainable Development, Economic Development, Industrialization, Technological Development.

Introduction.

The role of Technical and Vocational Education and Training (TVET) in any country is to prepare people for skill work. It's a form of education, training or retraining which is geared towards the improvement of the individual and as a means of enabling him/her to acquire specific appreciation of the pattern of behavior, attitudes, skills, knowledge values and culture needed to become more productive, efficient in a given specific skill, Bichi, *et al.* (2023).

TVET refers to those aspects of educational processes involving, in addition to general education, the study of technologies and related sciences, as well as the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life (FRN, 2013). Maajumdar *et al.* (2016) asserted that, in the present day, TVET is increasingly recognized as an effective means of empowering young people to engage in productive and sustainable livelihood. TVET develops individuals' capability and capacity to design, produce and use technology products and systems, as well as to assess the appropriateness of technological action.

Therefore, TVET is the education of those who need it, those who want it and those who practically want to progress by it (Okoye and Okwelle, 2013). Just as technological advancement in addition to national consciousness is the master driver of development of any nation, similarly, TVET is the road on which technology drives (Rilwanu, 2017). Therefore, technological advancement which is the tool to improving national development will be hampered where adequate attention is not given to TVET; the path way (Dike, 2016). According to Afeez (2020) TVET as a programmed of study, whether formal or in formal, transfers quality skills into people for a country's technological, economic, social and cultural developments.

According to the UNESCO International Centre for TVET (UNESCO-UNEVOC, 2019), "Technical and Vocational Education and Training is involved with the acquisition of skills, competencies, and knowledge for the world of work. TVET is an incredibly diverse sub-sector of education and training. It comprises formal, nonformal, and informal learning. It develops skills and knowledge from basic to advanced levels and shapes people's attitudes. It takes place across a wide range of institutional settings, including schools, public and private vocational institutes, tertiary education institutions, community projects, at home, and in the workplace in both the formal and informal economies." TVET harnesses and improves skills for innovation, working, lifelong learning, and living, as well as for a contribution to human, socio-economic, environmental, and technological aspects of development.

Similarly, TVET is structured as a set of approaches to learning, both to prepare students for the world-of-work, for well-being later in adult life. Additionally, TVET can contribute significantly to skills development and also to human resource strategies and policies that are targeted to serve the different needs of the national and international labor markets. In particular, as the experience of numerous countries shows, successful TVET can serve as an effective function in skills development, both traditionally and in new trades and industries. It can also build societal, group, and individual re-adjustment after catastrophe and conflicts and strengthens resilience and social capital (Igberaharha, 2021).

TVET is education that prepares people for specific trades, craft, technical or a professional position in engineering, accountancy, nursing, medicine, architecture, pharmacy, law etc. Craft vocations are usually based on manual or practical activities, traditionally non-academic related to a specific trade, occupation, or vocation. It is sometimes referred to as vocational education as the trainee directly develops expertise in a particular group of techniques Uwaifo, V.O. (2005), Uwaifo, V.O. (2005) and Okorie, J.U. (2001).

Technical and Vocational education and Training may be classified as teaching procedural knowledge. This can be contrasted with declarative knowledge as used in education in a usually broader scientific field, which might concentrate on theory and abstract conceptual knowledge, characteristic of tertiary education. TVET can be at the secondary, post-secondary level, further education levels and can interact with the apprenticeship system. Increasingly technical education can be recognized in terms of recognition of prior learning and partial academic credit towards tertiary (e.g. at a university) as credit; however, it is rarely considered in its own form to fall under traditional definition of higher education.

TVET is related to age-old apprenticeship system of learning. Apprenticeships are designed for many levels of work, from manual trades to high knowledge work. However, as the labor market becomes more specialized and economies demand higher levels of skills, government and businesses are increasingly investing in the future of technical education though publicly funded training organization and subsidized apprenticeship or traineeship initiatives for business. At postsecondary level, technical education is typically provided by an institute of technology, polytechnics, university or by a local community college.

TVET has diversified over the 20th century and now exists in industries such as retail tourism, information technology, funeral service and cottage interties Alwasilah, (2009) and Ozoemena, (2013). Technical and vocational education and Training (TVET) has been an integral part of national development strategies in many societies because of its impact

on productivity and economic development. Despite its contributions, the leaders of Nigeria have not given this aspect of education the attention it deserves. This is one of the reasons for the Nations underdevelopment.

This paper discusses Technical and Vocational Education and training (TVET) as "the key to sustainable technological development".

1. Technical Education and Technological and National Development

a. technical education "is a planned programmed of courses and learning that begins with exploration of career potions, supports basic academic and life skills, and enables achievement of high academic standards leadership, preparation for industry defined work, and advanced and continuing education;

b. Technical and vocational education and training (TVET) prepare learners for careers that are based in manual or practical activities, traditionally non-academic and totally related to a specific occupation of vocation in other words, "it is an education designed to develop occupational skills".

c. Vocational and technical education gives individuals the skills to live and work is a productive citizen in a global society.

2. Simple History of Technical and Vocational Education and Training in Nigeria from the Precolonial era, 18s till Date

Pre- Colonial Era

The history of technical and vocational education and training in Nigeria can be traced to the precolonial era when vocational education occurred in the traditional system where parents, family members, and associates provide opportunities for their children, friends, and colleagues to learn some self-reliance and self-sustaining skills in the informal system through basket and mat weaving, sculpturing, blacksmithing, carving, plantation and arable crop farming, fishing, animal rearing, hair making, dressmaking, bead making, leatherwork, pottery, brick making, and learning of trade in these products.

Colonial Era

The severe missionary activity in Southern Nigeria facilitated the enactment of the education ordinance in Nigeria in 1887 and the establishment of the Hope Waddell Training Institute in (1895) marking it the first technical institution in Nigeria to train technical and vocational specialists such as tailors, carpenters, traders, teachers of trades and specialized crafts.

The slow start of technical and vocational education institutions in Nigeria necessitated an agreement between British and African governments in 1925 for the governments to fund and establish more technical education for the acquisition of skills, resulting in the establishment of the Yaba High College in January 1934 to provide technical and vocational education and training in subjects like agriculture, forestry, veterinary medicines, survey, civil engineering, auto mechanical engineering, and the training of science teachers for the teaching Technical and vocational education and training in Nigeria.

Similarly, the University College, Ibadan, was established in 1948 to provide Technical and vocational education and training programs in art and vocational outfits in the informal setting to produce mechanics, electricians, and auto-body repair to service the vehicles of the missionaries, and many technical and vocational education and training colleges were recommended for expansion in 1952 and 1953 across the country to provide relevant vocational and technical skills for individuals.

Post Colonial Era

In 1960, the Ashby Commission Report led to the opening of the first generational Universities in

Nigeria, which are the University of Nigeria, Nsukka, in the East, Lagos in the West, Ahmadu Bello University, Maiduguri, in the North, University of Benin in the South, University of Ife, West, university of Jos in the North,

University of Nigeria, port Harcourt has faculty of education, technical and vocational education and training for acquisition of appropriate skill to relevant in the world of work and for national development.

The Nigerian Technical and vocational education institution has passed through many stages of reformation and transformation from the 6:5:3:5 system of education to the 6:3:3:4 and the 9:3:4 system of education.

The 1981 National Policy on Education places more emphasis on technical education and vocational training with the following objectives: That TVET is an integral part of general education, that TVET is lifelong learning and preparation for responsible citizens, that TVET is an instrument for promoting environmental sound and sustainable development, that TVET can help decrease the rate of poverty, and that TVET is a means for preparing for the occupational field and effective participation in the world of work.

The 6:3:3:4 educational system consists of (6 years) of primary school for students to acquire skills in home science, agriculture, fine art (local craft), and introductory technology, (3 Years) in junior primary school where acquired skills in home economics, business study, agriculture, fine art (local craft) basic technology, and sciences, (3 Years) in senior secondary school where student are made to acquire science and vocational subjects, and (4 years) in post-secondary school.

In 2005 the 6:3:3:4 education system was structured into the 9:3:4 education system. (9 years) is structured as a lower basic education curriculum (primaries 1-3), middle basic education curriculum (primaries 4-6), and upper basic (JSS 1-3), (3 Years) in senior secondary school where students can acquire science and vocational subjects' skills, and (4years) post-secondary school (i.e., collect of education, polytechnics, Universities) where an advance course in science and technical and vocational education are taught.

In 1976, the National Board for Technical Education was established to set minimum requirements for the nature of skills to be offered in technical colleges and the mandate to award certificates. Today, there are about 170 universities in Nigeria, 43 federal universities, and 79 private Universities, as well as federal, and state polytechnics, colleges of education, and agriculture offering courses in technical and vocational education and training in Nigeria, awarding certificates in technologies and vocations.

3. Technical and Vocational Education and Training (TVET) and Sustainable Development

The development of any nation hinges on the socials and economic contributions of her citizens

Education; vocational and technical training play a major role at promoting community and national development. Oguntuyi, (2013). TVET promotes and facilitates the acquisition of applied skills and basic scientific knowledge. It is planned programmed of course and learning experiences that begin with the exploration of career options, supports basic academic and life skills and enables the achievement of high academic standards, leadership, preparation for industry and continuing education. Ozoemena (2013). It cannot be over emphasized that technical education is the engine of economic growth. No nation can fight a war without the army. In the same vein, Nigeria cannot develop without well-equipped technical and vocational institutions. Unfortunately, Nigeria does not seem to give vocational and technical education the attention it deserves. Technical Education has been described as the "missing link" in Nigeria development policy. Dike, (2005). Because of poor training and ineffective institutions, Nigeria suffers from low productivity in all aspects of economic and technological endeavors. This appears to be one of the reasons for rising rate of unemployment and poverty in the society.

The growing problem of unemployment in the country has contributed largely in the worsening problem of poverty among the populace. This is because the youths and graduates from tertiary institutions are not equipped with adequate skills that will enable them to exploit the natural resources that abound in Nigeria. Scholars like Olaitan, (1996), posits that unemployment leads to frustration and disillusionment which may result in crime or drug abuse in a futile attempt to escape from humiliation and insults associated with poverty and lack. The problem of unemployment, he further stated has worsened as millions of school leavers and graduates of tertiary institutions are not gainfully employed. The reason is that they lack the necessary skills that would enable them to be self-employed and effectively function in

today's world of work. However, Okorie, (2001) in stressing the importance of technical education asserts that technical and vocational education in a comprehensive term refer to those aspects of education process in evolving the acquisition of practical skills, attitude, understanding and knowledge relating to occupations in various sectors of economic and social life.

TVET if given the required attentions needed, it can alone transform the nation into one of the leading countries in ICT and economic development because of much benefits embodied in it. Some of these benefits include:

a. Creation of employment opportunities: The issue of unemployment will remain a problem to Nigeria for many years if people are not trained/ educated on how to be self-employed. Technical and Vocational education and training (TVET) education is the only sure tool of fighting the rate of unemployment in the country. This can be achieved through educating the people on how to use their brain, body and hands to engage themselves in different productive activities to earn good money and live fulfilled life.

b. Income/revenue generation: TVET has its ways of boastings the economy of the nation through empowering the people technically in one field or the other. For instance, if a man has been trained to manufacture/produce car parts at the end of the day, he will pay his tax to the government and also have some left for his livelihood and maintenance of his household.

c. Enhancing people's standard of living/poverty reduction: TVET improves people lives and living standard through training the youths in useful skills, engaging them in productive works, generation of income and reduction of security votes by the government, creation of employment opportunities thereby increasing the economic and social standards of the citizens.

UNESCO (2014) d. Nation's self-independence: If the concept of TVET is properly employed with all its relevance benefits in no distant time Nigeria will not only be independent economically and technologically but will also be among the leading country in ICT and export of goods and services in the world and several ugly and embarrassing situations will be addressed.

4. Challenges of Technical and Vocational Education and Training (TVET) in Nigeria

It is obvious despite the numerous benefits that come with TVET in national development; we are still having problems in bringing it to lime light as a result of poor policies and corrupt leaders. As a developing nation, if we can channel our efforts in addressing this issue then we can believe that the sky will be our limit. The challenges militating the training of TVET personnel, technicians and technologists are many but a few of the major ones are highlighted below.

a. **Poor funding:** The funding of technical and vocational education programmed is very poor and inadequate. The success and developmental advancement in technical and vocational education which have been actualized over the years has been frustrated as a result of poor funding UNESCO (2014). Financial sustainability facilitates the development of knowledge which requires innovative measures so as to ensure that the public vocational and technical education colleges/institutions are not deprived of the much-needed resources for their future expansion Amoor, (2008).

b. **Acute shortage of vocational technical teachers:**

Many of the trained technical teachers because of the neglect on them as regards remuneration and incentives have moved from schools to the industries and sometimes to developed countries where they get better pay for their services. Some teachers and students who leave the country to acquire more knowledge and skills at the end of their training refuse to return to the country because of poor attention to technical teachers by the government and the public. Also, some skilled professionals abandon the practice of technical education in favor of other more lucrative economic activities and political appointments which are not related to their training.

c. **Inconsistent Government Policy on Technical and Vocational Education:**

Inconsistency in the formulation and implementation of technical and vocational education policies has been a major setback to the advancement of technical and vocational education. Lack of follow-up and continuity in government and her ministers or commissioners of education as a result of selfishness and corruption has been one of the key factors facing technical education and national development.

d. Lack of Adequate Training Facilities and Equipment:

Most technical colleges in Nigeria do not have laboratories or workshop space let alone useable equipment and facilities. Where they exist, they are grossly in adequate and obsolete, as the laboratories only have the items or equipment that were provided when the colleges were established. Most technical colleges cannot boast of adequate functional workshops and laboratories even when the teachers may be ready to teach the students in spite of the poor remuneration. There are some cases where technical equipment/machines were supplied but no workshop to install the equipment. This certainly will lead to frustration on the part of the technical college teachers, students and parents.

e. Staff Training, Re-training and Retention:

Most technical teachers have poor training background owning to the problem encountered during the training process. Most technical teachers in our technical colleges have never since their practice gone for re-training program in order to keep abreast with the ever-dynamic technical innovations associated with the ever-ending needs of the society. The training of technical teachers is ordinarily a continuous exercise to ensure consistent improvement in the quality of their output. This training can be acquired locally or otherwise. Usually, local training is cheaper but more strenuous because of inadequate facilities and literature overseas training requires a lot of foreign exchange but the enabling environment help to achieve success in record time. However, overtimes it has always been difficult to get the trainees back to Nigeria after the completion of their study.

f. The Curriculum of Technical Education:

The curriculum of a subject with practical content is generally organized into an average of 67% for the theoretical classes and 33% for laboratory or workshop. Students also use the laboratory to develop case examples on their own time. Again, Olunlogo, (2002) noted that one of the issues confronting the design of appropriate curriculum for technical education is preparing students for the shift from florist to Information and Communication Technology (ICT) paradigm in technical practice. The curriculum for technical education in Nigeria has remained under the focus of the colonial masters, i.e., foreign model which has evolved under ideal condition (staff, equipment, infrastructure, training opportunities, etc., that are not easily duplicated in development countries. The low pace of industrialization and technological growth in Nigeria can be attributed to the widening gap between science and technology as a result of the inability of technical education program to adequately utilize the scientific-ideas to promote technology. **g. Mal-administration:**

Most of the problems encountered in the field of vocational and technical education programs in general are grossly caused by poor planning, administration and management, noted that by far, the greatest obstacle to a rapid acquisition of technology in poor countries could be traced to the types and quality of management system prevalent in these countries, whereas in developed counties all managers of private and public sectors are technically trained. Technical managers in developing countries are essentially managers who have grown without any technical background and training. It is quite evident that in Nigeria those who know little or nothing about ethics of vocational and technical education programs are meant to man such establishment. For instance, most times you may find ministers and commissioners of education as lawyers, accountants, priests, medical doctors, engineers, etc. This has a lot of negative tendencies to our development program/initiatives.

Other problems associated with vocational and technical education in Nigeria may include; gross neglect, lack of well-equipped library for research work/project, poor professional, personal and public images lack of adequate motivation,

decline in student's enrolment, lack of use of modern technology/information technology for teaching and learning, use of poorly qualified technical staff, unemployment, lack of entrepreneurship education, lack of adequate security/security needs, etc.

5. Revitalizing of Technical Education This is procurable via:

a. Mandatory Continuing Professional Development (MCPD):

There is provision in the National Policy on Education (NPE) 4th Edition NPE (2004) relating to the Mandatory Continuing Professional Development (MCPD). An individual shall be able to choose between continuing full- time study, combining work with study or embarking on full time employment without excluding the prospect of resuming studies later on.

Professional development avails teachers the opportunity to develop, update and demonstrate their profound competence against set standards. This is absolutely essential for the strength, vibrancy, updating and future of the teacher profession.

b. Adequate Funding:

The political will and national co-operation in terms of funding is fundamental and non-negotiable to revitalization of technical education in Nigeria which is the major obstacle of the development of technology, industrial and economic growth of Nigeria. Effective teaching and learning of technical and vocational education require adequate funding to build more new classrooms, laboratories/workshops, provide facilities and equipment/machines/ tools.

c. Use of Information Technology for Teaching and Learning:

Information technology (IT) is affecting education in revolutionary ways and the momentum is irreversible. Information and Communication Technology have to be incorporated as part of teaching and learning tools in technical and vocational institutions to harness the advantages of educational delivery. The visual library as a platform for sharing knowledge is aimed at rejuvenating Nigerian schools through the provision of current textbooks, journals and other information sources using digital technology.

d. Retraining of Technical Education Teachers:

The generality of the people is becoming aware of the economic value/benefit of technical education as the avenue for turning the economy and technology around. According to Dike, (2003), the Federal Government's recognition of vocational and technical education as a powerful tool for technological development has created public awareness of the indispensability of this aspect of education. This is seen through the establishment and expansion of more institutions of vocational and technical education to provide needed manpower in the sector. The technological teachers training programmed (TTTP) introduced by the Federal

Ministry of Education is a deliberate attempt to brighten the future of technical and vocational college teachers by sponsoring them to higher heights of the ladder in their profession. Seminars, conferences, workshops, etc. should be organized for technical teachers periodically so as to be acquainted with the ever-changing technological innovations.

e. Campaign towards Vocational and Technical Training:

Vocational and technical education has been neglected for a long time because of the negative perception of those who should project and nurture it to maturity. The negative attitude of many people, parents and students to vocational and technical education should be hanged by all and sundry. The government, educationist, teachers and students alike should carry out a campaign or orientation program towards enlightening the general public/citizens on the need for their children to be vocationally and technically oriented in light of the prevailing economic circumstances of the nation. Unemployment and poverty level are on the increase. Technical education will aim to cater for all and sundry, through their manipulative skills acquired.

f. Professional Diploma in Education:

All teachers in educational institutions shall be professionally trained. A one-year professional diploma in education has been suggested for all teachers in educational institutions. Former Technical Registration Council of Nigeria (TRCN) now National Board for Technical Education (NBTE) has been mandated to structure the diploma program to equip technical teachers without teaching qualifications for effective performance of their duties. This will facilitate the extension of the best professional development programs to the teachers.

g. Encouragement of Research, Inventions and Innovation:

Everyone who cherish genuine growth and sustainable development, government, private and corporate organizations, non-governmental organizations and individuals should as a matter of due responsibility encourage and finance research activities/programs, skills acquisition, inventions, innovations and mass production of invented products. This will help the development of interest in technical and vocational education which is the engine for skills acquisition, creativity, research, invention innovation and entrepreneurship that promote technological and economic activities for sustainable development of the nation.

h. Incentives to Teachers and Students of Technical and Vocational Education:

Technical college teachers are most often subjected to deplorable conditions. Hardly are they found in furnished offices, instead they are put in large staff rooms, a times with students' type of lockers or desks and chairs, whereas their counterparts in other sectors could have executive air-conditioned offices, private secretary or even messengers, cars and reserved parking spaces. They could belong to prestigious clubs and associations because of better salaries. Salaries of technical education teachers should be increased to certain level or equal to their counterparts in industries and other sectors to boast their moral. Also, other incentives such hazard allowance, overtime, workshop/seminar/conference sponsorship should be given to them for encouragement and support. Moreover, students of technical colleges should be given scholarship by the government and the philanthropists, free medical care; free safely wears, free textbooks and free access to e-library as an encouragement or incentives.

6. Conclusions

TVET holds the key to sustainable national development. TVET programmed in Nigeria has not attained the maximum performance of its potential roles of national economic and technological development. The neglect by the government, private and corporate organizations outlook of the society and other variables hinder its development and contribution to social and economic growth. Nigeria cannot develop without well-equipped technical and vocational institutions. In fact, according to Edgin, (2000), it is the missing link in Nigeria's development policy. Because of poor training and ineffective technical institutions, Nigeria suffers from low productivity.

However, the progress of any society lies in the productivity of its citizens. Higher productivity gives a nation advantage of economies of scale and lowers the costs of production and prices of goods and services. It is technical education that can give the technological skills required to keep pace with the speed of global transformation technological and economically. This cannot be achieved, except through a complete revitalization of technical education, in Nigeria, with the emergence of strong and vibrant activities that are developmental and technological oriented.

Nigeria should begin now to take very seriously investment in technical education and skill acquisition as no nation can compete effectively in the global market with poorly educated and skilled manpower. The leading factors of production in the emerging global economy are said to be technology, knowledge, creativity and innovation.

7. Recommendation

In view of the problems highlighted in this paper, the authors hereby recommend that:

I. The Federal, State and Local Governments should compulsorily make vocational and technical education subject foundation programs institutions across the country. This is to enable all individuals the opportunity to understand and appreciate the important of this laudable program to the development of every individual and the nation.

ii. The curricula of TVET should meet the needs of modern industries and should be at par with international standards.

iii. Emphasis should be made on the practical aspect of technical and vocational education and Training which will help to produce productive members of the nation's labor force that will be self-reliant or employable in industry or company.

iv. Government should provide adequate facilities to technical college workshops and laboratories using current strategies identified to ensure acquisition of relevant skills, knowledge and experience that are relevant to the growth of the country.

v. non-governmental organizations (NGOs), industrialists, philanthropists, parents-teachers association (PTA) and community-based organizations (CBOs) should be sought for support in supplying/provision of relevant facilities, equipment's/machines as obtained in some nations.

vi. Enough funds should be made available by the government to technical education institutions from the TetFund for the procurement of tools, equipment, training materials and infrastructural facilities the allocation and release of such funds should be properly monitored and utilized to avoid leakage of funds.

vii. Quality and modernization focused technical education. Technical education structure requires sound management skills based on innovation, adaptability and effectiveness. Continuous professional development schemes and tools should be established throughout the system for re-training of staff in all facets of technical education. More modern learning aids such as computers, internet, website facilities, overhead projectors, firms on technological development/training, etc., should be provided in schools. E-learning and long-distance training, geared to technological advancement, professionalism in the globalization era should be developed to accelerate the upgrading of skills and transfer of knowledge among the staff and students.

viii. Finally, awareness of the importance of TVET should be increased, because the development and growth of technology and economic activities for the nation's advancement depends on technical education. The media should be used to disseminate information about the value of technical and vocational education to the public. This would definitely help in improving Nigerian's culture and attitude to TVET and national development.

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