ACQUISITION OF SKILLS IN SCIENCE, TECHNICAL AND VOCATIONAL EDUCATION(STVE) FOR A KNOWLEDGE-BASED ECONOMY IN NIGERIA: STATUS, CONSTRAINTS AND THE WAY FORWARD

Marcellinus Chibueze ANAEKWE

National Open University of Nigeria, NIGERIA

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Abstract. One of the primary goals of Science, Technical and Vocational Education (STVE), is the acquisition of a range of cognitive, affective and psychomotor skills and processes to result to direct involvement in techno-scientific activities, procedures or applications in the laboratory, workshop or the field for the welfare of humanity. Towards attaining this goal, the Federal Government of Nigeria, adopted a system of education that is skill-based. Within the Basic Education structure, the curriculum has ample provision for Basic Science and Technology (BST), Information Technology, and Prevocational Studies. The Post-Basic Education level, provide ample experiences in entrepreneurial, technical and vocational job-specific skills for self-reliance and socio-economic development. The Tertiary Education level, provides high quality career counseling and life-long learning programmes that prepares students for the knowledge-based economy, skills for self-reliance and the world of work. However, at various times and at different levels of the education system, policy pronouncements and implementation appears to sing discordant tunes, as a number of dysfunctional elements present some incongruent tunes in-between. This

paper thus, discussed the status of STVE in Nigeria, pointing out obvious constraints and the way forward. This is with a view to making prospective school leavers and graduates acquire saleable skills and competitive favourably with their counterparts in the global community.

Keywords: skill acquisition, Science, Technical and Vocational Education, status, constraints

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Introduction

In September 2015, World Leaders at the United Nations Special summit adopted what has been described as "the most inclusive development agenda the world has ever seen" – the 2030 Agenda for Sustainable Development. This summit gave rise to what is most popularly known today as the Sustainable Development Goals (SDGs) consisting of seventeen (17) ambitious goals and 169 targets. These goals provide the impetus for countries to tackle confronting challenges, including those in the world of work. Goal number eight (8) specifies: *full and productive employment and decent work for all.* This goal is of critical importance to Nigeria, given that while education serves partly as a means to acquisition of appropriate skills especially for young people, the fields of Science, Technical and Vocational Education are skill-based fields that are tangential to employment generation and indispensable in order to keep up with the changing employment needs of the society.

One of the primary essence of education is to enable the learner to contribute meaningfully and adjust effectively in the society. Granted that the needs of the society are dynamic, it now becomes imperative that the skill-input continuum should equally change, so as to produce the desired outcome in terms of inculcating appropriate skills and competencies to the learner. By implication, the subject matter content, the methodology and assessment techniques are also bound to change so as to enable the learner adapt to the future changing environment that is globalized and competitive. The education system is considered

to be functional to the extent it is capable of providing for the expected dividends of education especially as regards to providing avenues for productive employment afterwards. Hence, this paper is aimed at exploring the constraints of acquiring appropriate skills in STVE for a knowledge-based economy in Nigeria. It also made suggestions on possible ways of remedying the situation.

Why emphasis on Science, Technical and Vocational Education (STVE)

Science is fundamental in exploring the environment effectively and utilization appropriate skills to improve the well-being of man in the society. Hence, one of the goals of science education is the acquisition of a range of cognitive, affective and psychomotor skills and processes to result to direct involvement in science activities, procedures or applications in the laboratory or the field (FME, 2016). TVE on the other hand, refers to those aspects of educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. TVE is meant to give training and impart necessary skills to individuals for self-reliance economically. By implication, TVE reinforces the goals of science education. Trainees of STVE on successful completion of senior secondary (science), technical or vocational education are expected to: (i) secure employment either at the end of the course or after completing one or more modules of employable skill; (ii) set up their own small or medium scale business or become self-employed and be able to employ others; (iii) pursue further education in science, technical or vocational fields at Colleges of education (Technical), Polytechnics or Universities.

STVE therefore, predisposes man to square up theoretical and practical knowledge to function effectively in the world of work. Considering the theoretical and practical knowledge dimensions inherent in STVE, one can conclude that it is not only a powerful source of employment generation but also a source

of economic power of a nation. For instance, the categorization of the countries of the world today, into first, second and third world-nations, is purely based on the extent of STVE-potentials which such countries have garnered and are capable of utilizing for their socio-economic and technological development.

Economically, there is a link between the level of public understanding of STVE and the nation's wealth. Consider the ranking of nations based on GDP or Purchasing Power Parity (PPP) of their currencies, there is no doubt that nations with high GDP or currency PPP has high public understanding of STVE, the reverse is the case for the countries with low GDP.

Technologically, there is an understanding that STVE is useful practically in the technological progress in a society. The extent of availability and utilization STVE-prowess by the citizenry could easily be translated to technological progress of the nation (Anaekwe, 2019). These attributes and many others, make STVE a veritable force for economic viability and global competitiveness. Little wonder nations of the world that are desirous of developing their economy places much emphases on skill development and acquisition.

Structure of education system in Nigeria and provisions for Science, Technical and Vocational Education (STVE)

Presently, the Federal Government of Nigeria operates the 9-3-4 system of education whereby the first nine years of formal education starting with children aged between 5 and 6 years, is referred to as Basic Education. Basic Education is compartmentalized into three levels, namely: (A)Lower Basic: 3 years Primary Education for children aged 7-9 years; (B) Middle Basic:3 years Primary Education for children aged 10-12 years; (C)Upper Basic: 3 years Junior Secondary Education for children aged 13-15yrs.

Within the Basic Education structure, the curriculum has ample provision for Basic Science and Technology (BST), Information Technology, and Prevocational Studies (Home Economics, Agriculture, Business Studies), among other core subjects.

The three years following successful completion of 9 years Basic Education, is referred to as the Post Basic Education and Career Development(PBECD). This segment includes: (i) Senior Secondary Education; (ii) Higher School; (iii) Continuing Education given in Technical Colleges, Vocational Enterprises Institutions(VEIs) to either Basic Education Graduates who are not proceeding to senior secondary schools or senior secondary graduates who are not proceeding to tertiary level as a means of preparing them for the world of work, wealth creation and entrepreneurship.

The specific objectives of PBECD, which was also captured in the specific goals of TVE, among others include: (a) offer diversified curriculum to cater for the differences in talents, disposition, opportunities and future roles; (b) provide trained manpower in the applied sciences, technology and Business particularly, at craft, advance craft and technical levels; (c) provide entrepreneurial, technical and vocational job-specific skills for self-reliance and for agricultural, industrial, commercial and economic development (FME, 2016; FRN, 2013).

Within the PBECD segment, the curriculum is comprehensive and encompasses the fields of Sciences, Technology, Humanities, Business Studies and Trade/Entrepreneurship subjects. This broad-field curriculum approach is meant to provide a wide spectrum of opportunities for school leavers to be gainfully employed at small and medium scale levels, if one is not proceeding to tertiary education level. The PBECD has ample provision for a number of skill areas in Science, Technical and Vocational fields for effective career development and gainful employment, as provided later on in this paper.

The 4 years following successful completion of PBECD segment, referred to as Tertiary Education, is the education given in institutions such as Universities, Polytechnics, Monotechnics and Colleges of Education. Tertiary education contributes to national development through high level manpower training. It also provides high quality career counseling and life-long learning

programmes that prepares students with the knowledge and skills for self-reliance and the world of work. As part of quality assurance mechanism in skill development and acquisition, students of STVE at tertiary institutions, undergo the Industrial Work Experience Scheme (SIWES), which is usually coordinated by the Industrial Training Fund (ITF) ad supervised by staff from parent tertiary institution.

By going through the philosophy and goals of education in Nigeria, one would not be in doubt as to provisions for Skills development and acquisition in the Nigerian education system. One of the general goals of education in Nigeria is:

> [t]he development of appropriate skills, mental, physical and social abilities and competencies to empower the individual to live in, and contribute positively to the society (FRN, 2013).

Flowing from the afore-mentioned general goal are some specific goals including: (i) promote functional education for skill acquisition, job creation and poverty reduction; (ii) collaborate with development partners, the private sector, non-governmental organizations and local communities to support and fund education; (iii) promote information technology capability at all levels.

The document went further to identify some strategies towards attaining the stated goals via instructional delivery. These include: (a) inculcating the value of acquisition of functional skills and competencies necessary for self-reliance; (b) respect for the worth and dignity of labour; (c) adopting practical, activity-based, experiential and IT-supported teaching techniques; (d) ensuring that educational activities are geared towards self-development and self-fulfillment.

A thorough scrutiny of the on-going presentation on Nigerian education structure, goals and strategies meant to be accomplished and implemented re-

spectively, through the Nigerian education system would attest to the noble intentions of the government in laying a sound foundation for the Nigerian economy by creating opportunities for bequeathing relevant skills to her citizenry. Government recognized the critical role acquisition of functional skills would play in instilling the value of self –reliance on the individual. To this end it was also recommended that teaching techniques would be such as to be activity-based and IT-supported. However, policy documentation and implementation appeared to be incongruent as a number of dysfunctional elements present some discordant tunes in-between.

To fully appreciate the mismatch between policy documentation and implementation, one may reflect on the Issues raised by the following questions: (A) to what extent is the Nigerian education system disposed to promotion of skill acquisition, job creation and poverty reduction; (B) how much of handiwork and local-crafts are emphasized in the primary and secondary schools today; (C) at tertiary institutions, to what extent are students provided opportunities and enabling environment to acquire some salable skills through their entrepreneurial and core courses; (D) to what extent are students committed to SIWES programmes as internship scheme meant to prepare them for the world of work; (E) how committed are institution and Industrial-based Supervisors in dutifully guiding the students on SIWES programme; (F) how equipped are our laboratories and workshops, in addition to the corresponding human-power provision; (G) to what extent are the Development Partners, Private sector, NGOs and Local Communities participate in Funding education in Nigeria; (H) to what extent is Information Technology-capability being promoted at all levels of the Nigerian education System.

Your guess is as good as mine as to the authentic responses to these questions. Suffice it to say that, in this era of globalization and competitiveness, the greatest weapon for the survival of any nation today is the level of sophistication of appropriate skills at the disposal of any nation.

Concept of knowledge-based Economy and global competitiveness

The knowledge based economy according to OECD**(N.D),** is an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors. The knowledge economy is a system of consumption and production that is based on intellectual capital. In the knowledge economy, products and services that are based on intellectual expertise advance technical and scientific fields, encouraging innovation in the economy as a whole.

A successful knowledge economy is characterized by close links between science and technology, greater importance placed on innovation for economic growth and competitiveness, increased significance of education, and lifelong learning and greater investment in intangibles such as Research and Development (R&D), software, and education generally. There are three main driving forces for knowledge-based economy.

The three main driving forces of modern knowledge economy are: (i) knowledge (conditionally: intellectual capital); (ii) changes (creating uncertainty and risk, reducing predictability) and (iii) globalization (unification of production, trade, finance, means of communication and information technology, scientific research).

A number of differences distinguish between knowledge economy and traditional economy. These include: (1) The economics is not of scarcity, but rather of abundance. Unlike most resources that deplete when used, information and knowledge can be shared, and actually grow through application; (2) The effect of geographical displacement is diminished. Using appropriate technology and methods, virtual market places and virtual organizations can be created, that offer benefits of speed and agility, round the clock operation and of global reach; (3) Laws, barriers and taxes are difficult to apply on solely a national

basis. Knowledge and information 'leak' to where demand is highest and barriers are lowest; (4) Knowledge enhanced products and services can command price premiums over comparable products with low embedded knowledge or knowledge intensity; (5) Pricing and value depends heavily on context. Thus, the same information or knowledge can have vastly different value to different people at different times.

Competitiveness as a noun simply refers to an attribute of possessing a strong desire to be more successful than others or the quality of being as good as or better than others of a comparable nature. The World Economic Forum defined competitiveness as a set of institutions, policies and factors that determine the level of productivity of a nation[1)] The WEF was established in 1971 and is based in Geneva, Switzerland. The WEF, publishes biannually, the Global Competitiveness Report (GCR), which provides a comprehensive assessment of economic competitiveness among various nations of the world, as reflected by the Global Competitiveness Index (GCI), assigned to each nation. The GCI is derived using a weighted average of several different variables, and runs on a scale of one to seven. The latest version of the GCR is for 2017-2018. Tables 1 and 2 present the top and bottom 15 economies respectively out of the 137 nations considered.

It is evident that whereas the first and second world nations that have made huge commitment to, and progress in STVET features in Table 1, the third world countries including our dear country, Nigeria occupied Table 2, most probably because of their weak disposition and commitment to STVET.

China is a country with a population much larger than Nigeria and had managed to remain competitive in the knowledge economy as shown in the competitive ranking due to their reliance of skill acquisition. They have relied heavily on STVET to the extent that they have had high returns on investment which proficient labour force provides. UNESCO[2)] reported that in China, one-third of all secondary school students are enrolled in vocational schools. Today, China exports skilled and semi-skilled labour force to different countries of the

world. This is a lesson for Nigeria in order to remain competitive in the present knowledge-based economy.

Table 1. Global competitiveness index 2017-2018 ranking top 15 economies

S/No	Economy	Score/7	Rank/137
1	Switzerland	5.86	1
2	United States	5.85	2
3	Singapore	5.71	3
4	Netherlands	5.66	4
5	Germany	5.65	5
6	Hong Kong	5.53	6
7	Sweden	5.52	7
8	United Kingdom	5.51	8
9	Japan	5.49	9
10	Finland	5.49	10
11	Norway	5.40	11
12	Denmark	5.39	12
13	New Zealand	5.37	13
14	Canada	5.35	14
15	Taiwan,China	5.33	15

Table 2. Global competitiveness index 2017-2018 ranking bottom 15 economies

S/No	Economy	Score/7	Rank/137
123	Mali	3.33	125
124	Zimbabwe	3.32	126
125	Nigeria	3.30	127
126	Congo	3.27	129
127	Venezuela	3.23	130
128	Haiti	3.22	n/a
129	Burundi	3.21	135
130	Sierra Leone	3.20	130
131	Lesotho	3.20	132
132	Malawi	3.11	134
133	Mauritania	3.09	137
134	Liberia	3.06	131
135	Chad	2.99	136
136	Mozambique	2.89	137
137	Yemen	2.87	138

Status of STVE in Nigeria

Generally, there appear to be a misconception about the real meaning and purpose of TVE in the Nigerian society. From inception, TVE was viewed with utter disdain as the pre-occupation of people who could only make use of their hands and not the brain. Candidates patronizing such programmes were perceived to be the weak ones who could not measure up with the requirements of the Grammar School or beyond. This erroneous impression has continued to deal deadly blow to the education programme in Nigeria where the quest for university education and white-collar job appears to be highly rated in spite of the obvious importance of STVE and self-sustaining jobs in the labour market.

STVE is designed to offer people the opportunity of improving themselves in their general proficiency, especially in relation to their present or future occupation. Okoye & Arimuno (2016) opined that changes in any nation's economy is required to prepare young people for the jobs of the future of which STVE have crucial roles to play. Evidence abound to show that TVE are very much still neglected in the aspect of adequate funding, personnel, modern facilities, staff motivation which consequently are robbing the country of the economic development to be contributed by graduates of TVE.

To avert the rising incidence of unemployment in Nigerian society, there is an urgent need for attention to be redirected towards self-reliant and sustainable means of livelihood which STVE provides. Skill acquisition is known to be next to wealth creation and poverty reduction. The much emphasis placed on University education in Nigeria has always reduced the economic opportunities of those who are more work-oriented than academics. Of course, Nigeria has not yet achieved the 60:40 ratios in enrolment of science and technology versus Arts/Humanities disciplines. Indeed, not everybody needs a University education. If everybody becomes a University graduate, one wonders who would employ them. According to Okoye & Arimuno (2016), many of the so – called "expatriate engineers" receiving huge sum of money in dollars for road construction in Nigeria are graduates of vocational colleges but in Nigeria, the issue

of STVE is not given the required attention. Again, educational institutions in Nigeria lack the tools and machines to train students to acquire the skills needed by employers of labour. The constraints of STVE are quite enormous.

Constraints of STVE in Nigeria

The educational programmes of STVE in Nigeria is fraught with a number of constraints, (Okoye & Arimuno, 2016; Buseri et al., 2016), including but not limited to: (1) *Inadequate funding of Technical and Vocational Education:* Inadequate funding of vocational institutions has resulted to the turning out of half-baked graduates because there is no fund to build and maintain workshops, laboratories or even purchase modern equipment; (2) *Paucity of trained manpower*: Consequent upon inadequate funding, staffing of Vocational technical education is generally inadequate. Experienced and skillful teachers may not be employed. Those that are employed, because of poor remuneration do not stay long in the teaching profession, but drift to some other more lucrative jobs especially in the industries and abroad. Consequently, inexperienced and unqualified technical teachers are employed thereby lowering academic standard; (3) *Inadequate facilities***:** Most technical education departments in Nigerian educational system do not have functional laboratories or workshops let alone useable equipment and where they exist, they are grossly inadequate, as the workshops only have items that were already obsolete; (4) *Brain Drain:* This refers to the movement of STVE personnel particularly, which are very much needed for the socio-economic and technological development of Nigeria from one tertiary institution to the other, especially out of the country, or to other professions where they feel will offer them better conditions of service. According to Okoye & Arimuno (2016) about 500 lecturers from Nigerian tertiary institutions have continued to migrate each year, particularly to Europe, America and other African countries; (5) *Staff training and retention:* Training of academic staff is a continuous exercise to ensure consistent improvement in the quality of their products. Usually, local training within the country is cheaper than overseas

training but more strenuous because of inadequate facilities. Overseas training requires a lot of foreign exchange but the enabling environment exist to achieve success in a record time. However, overtime, it has always been difficult to get the beneficiaries back to their respective countries after the completion of their study. Because of better conditions of service, it is usually difficult to retain quality staff within; (6) *Curriculum of technical education:* Curriculum of TVE in Nigeria needs an overhaul with re-orientation towards Information and Communication Technology (ICT) paradigm. STVE programme is practical-oriented rather than theoretical-based. As such, requisite facilities and personnel must be provided to produce the expected result. In this regard, Ojimba (2012) identified six problems associated with the current curricula in Nigeria. They are: (a) The curricula are based on foreign model which has evolved under ideal conditions (staff, equipment, infrastructure, training opportunities, etc.) that are not easily duplicated in developing countries; (b) There is a basic lack of textbooks in the area and most of the available textbooks have foreign background and often illustrated with examples from outside the local environment; (c) There is usually a shortage of highly competent indigenous teaching and support staff with sufficient practical experience of technology; (d) The curricula are adjudged to be too academic and overloaded with intellectual content in pure science and mathematics at the expense of basic engineering and technology; (e) Inadequate provision of humanities, social sciences, business management concepts and entrepreneurial skills development. Because of the inadequate preparations of the students for the industry, some employers retrain the graduates to make them productive in their organizations; (f) The teaching approach generally, follows the conventional method of transferring knowledge across through the lecturer reading out to the students, who would then take down notes; (7) *Nigerian value system:* In Nigeria today too much emphasis is placed on University qualifications not minding whether the holder possesses the required skills and competencies. In the public service, graduates of STVET are often discriminated against and their career prospect limited. For this reason,

secondary school leavers and parents have preference for University education. In advanced countries, those with technical degrees are highly regarded and their value system places much premium on the candidate's skills and competencies rather than the chain of academic degrees possessed; (8) *Lackadaisical attitude to Gown-Town relationship:* There is apparent apathy between educational institutions and Cooperating Industries geared towards enhancing the skill acquisition of the STVE graduates. The SIWES programme as practiced presently, seem not to be receiving the desired attention from both the candidates and their supervisors. SIWES programme requires serious commitment from all stakeholders for optimal benefit to the nation; (9) *Disdain for TVE in educational institutions and places of employment:* There had been disdain for TVE in the society. Parents and students alike had been misinformed and hold negative perception about the value of TVE to national development. In the public sector, the disparity between University and Polytechnic graduates in places of employment has not equally leveraged on the image; (10) *Lack of political will:* There is lack of political will on the part of government to implement its policy statements regarding STVE in Nigeria as contained in FME (2016) and FRN(2013). Education generally, including STVE has been grossly neglected in Nigeria. The nation may remain a technologically backward and dependent nation if this negative trend is not reversed. Indeed, government seems unwilling to invest in skill development in educational institutions.

The way forward

The most primary step towards turning around the fortunes of STVE in Nigeria is for the Government to have the political will to faithfully implement the noble policy statements that had been well articulated in relevant documents (FRN, 2013; FME, 2016). Specifically: (i) Appropriate funding should be allocated to the education sector, particularly, STVE to provide and up-grade needed facilities like workshops, laboratories, demonstration farms, modern

equipment; recruit, train and retrain personnel including qualified and innovative artisans to teach practical and skill acquisition in schools; (ii) There is the need for our technical institutions to establish good relationship and linkages with similar institutions abroad as this will promote cross – fertilization of ideas and enhance technology transfer. By doing this the technical institutions will have access to new developments, exchange programmes and other numerous benefits available at those institutions whose technical programmes are well developed; (iii) When there is collaboration between technical institutions and industries, the relationship will enable the parties appreciate and understand their needs and proffer the right solutions for the benefits of the society: (iv) The curriculum taught in our vocational education institutions should be reviewed to meet the demands of the labour market; (v) There is need to start the teaching of industry-based increase employment opportunities for school leavers of vocational and technical institutions. It will also provide ample opportunities for school dropouts; (vi) The government should urgently remove the dichotomy that exists between University and technical institution. Polytechnic institutions should be made to award degrees. This will not only attract more qualified students to vocational/technical education but will also encourage exchange of qualified lecturers/instructors between the two systems, thereby engendering healthy competition; (vii) It is important to monitor and regulate the informal sector that produces most of our artisans. Such training outfits can be licensed to certify trainees at the end of the apprenticeship period on behalf of the government. Through this way, unprofessional practices would be regulated; (viii) The Department/School of TVE in teacher education institutions and Polytechnics, should ensure functionality of the programme through engaging in some skill-based activities and mentoring the trainees alike. This would enable the trainees acquire some employable skills that would prepare them to embark on such small and medium scale ventures upon graduation. Suffice it to say that the relevant educational departments could as well float such small scale ventures to remain relevant in the immediate community and gain public patronage.

Conclusion

To remain relevant and competitive in the present age of knowledge economy, the Nigerian education system, particularly the STVEneeds to be properly funded. The transition from traditional to digital modes of information gathering and dissemination has permeated and influenced positively the instructional delivery system. As such modern educational facilities regardless of their cost implication, must be made available for the training of STVE trainees. This will entail providing conducive learning environment and appropriate personnel that will deliver the expected goals. To this end, graduates with relevant skills rather than job-seekers will be produced. The field of STVE is well disposed to turning around the fortunes of Nigerian ailing economy but the Government should muster enough political-will to implement her policy statements.

NOTES

1. https://stats.oecd.org/glossary/detail.asp?ID=6864
2. https://www.oecd.org/china/Education-in-China-a-snapshot.pdf

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✉ Dr. Marcellinus Chibueze Anaekwe
Department of Science Education
National Open University of Nigeria, NIGERIA
E-Mail: manaekwe@noun.edu.ng

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