British Journal of Education
Vol. 9, Issue 10, pp.10-31, 2021
Online ISSN: 2054-636X (Online)
Print ISSN: 2054-6351(Print)

TECHNOLOGICAL EDUCATION AND PRODUCTIVITY FOR NATIONAL DEVELOPMENT: NATIONAL AND REGIONAL FAILURES

Osakpa, David U., PhD
Assemblies of God Seminary
Anyikang, Bekwarra, Cross River State, Nigeria

ABSTRACT: *This empirical paper examined technological education and productivity for national development: national and regional failures. Its purpose was to examine and analyze those variables and offer suggestions for an improvement of the situation. Seven research questions were posed to provide a focus for arguments in this paper. There was a review of literature based on those research questions. It was found that technological education had fared well in policies and curriculum designs not in technological productivity; Dales Cone of Experience, Lancaster-Bell Monitorial teaching method and KISTEC Model were identified as better methods for teaching technological education; productivity continued to be primary agricultural produce and not technological goods with the country remaining underdeveloped; Nigeria failed by not providing an enabling technological environment generally and the South East in particular by taking advantage of technological breakthroughs by the ex-Biafrans. The South East geopolitical zone has failed by its apathy towards developing its natural endowment (technology). The paper concluded that there was need for not only vertical and horizontal collaborative research in technological education and innovations but also the production of technological goods. Several recommendations were made one of which was that there should be an establishment of a National Agency for Technological Inventions and Production (NATIP) that should coordinate technological inventions and their production for national development.*

KEYWORDS: technological education, productivity, national development, national and regional failures

INTRODUCTION

This paper is not written to bemoan the backwardness and technological underdevelopment of Nigeria and hold Britain (the former colonial master) responsible for the prevailing situation in the country (Rodney, 1972; Agbo, 2012; Osakpa, Okonkwo, Adzei, Lebo, Ejiogu, Beshel, & Abeh, 2018). Rather, it is a soul-searching discourse to identify what Nigerians have done to keep themselves technologically underdeveloped (Igwe, 2010; Meredith, 2011) and neglected to do to extricate themselves from the vice grip of neo-colonialism, underdevelopment and unproductiveness (Garba, 1987; Guest, 2004). It places Nigerians in proper perspective to assess the predicament of the country (Ashimolowo, 2007; Clarke, 2008; Morris, 2011). For example, Tan & Gopinathan (1986) found that secondary schools need to re-examine the ways students

@ECRTD-UK https://www.eajournals.org/
https://doi.org/10.37745/bje.2013

think and do things: especially the need for flexibility, creativity and innovation that are relevant to acquisition of scientific and technological skills. This argument is supported by Ali, Ahmadi & Lukman (2015) who concluded that the new secondary school curriculum in Nigeria is "a total departure from the factory-model education of the past and an abandonment of the teacher-centered, paper and pencil schooling. Its emphasis is on acquisition of scientific, technological and entrepreneurship skills".

The challenge of technological education and productivity has stalked the country necessitating a number of curriculum reviews at the secondary school level. For this reason, the following curriculum reviews have taken place since independence: 1959 Ashby Commission on Education, 1969 National Curriculum Conference, National Policy on Education, 2014, etc, when Nigeria began to search for scientific and technological emancipation (Otonti, 1964; Olusanya 1980; Nwankwo, Chababaghi & Boyd, 2009; Appiah & Azeez, 2016 and Akinbami, Ifeanyi-Obi, Appiah & Kabo-Bah, 2016, etc). The question: Is Nigeria marooned in Robinson Crusoe's "island of technological backwardness and underdevelopment"? What could Nigerians do to put themselves together and get the act right? This is why this paper tackles the problem of technological education and productivity for national development from the national and regional failures perspective. A Chinese saying that "it does not matter how long one has done something wrongly; as soon as he finds a better way of doing it right, he should begin doing it right" is instructive. The harmful effects of technological dependency (technological imperialism) on all aspects of human existence make Nigeria's desire and efforts to end its technological dependence on developed countries a welcome development. However, there is need to ascertain the nature and degree of Nigeria's technological education and productivity for national development. This means, too, that there is need to understand the meaning of technological education and its application to productivity for national development in order to take a right perspective in this debate; especially, if one understands that technology does not only concern the production of technological equipment but also the acquisition of technological knowhow

.

It is against this backdrop that the ASUP 2nd National Conference with the theme: "Technological Education and Productivity for National Development" should be commended and all stakeholders participate. Moreover, a national conference on this problem has become pertinent and urgent because there has been so much debate about Nigeria's development especially in the Western world. Consequently, the following research questions were posed to guide the paper: 1) How good is technological education in Nigeria? 2) What better methods or strategies may students in Nigeria be taught technological education? 3) What is the productivity of technological education in Nigeria? 4) What is the, level of national development in Nigeria based on technological education? 5) In which ways has Nigeria failed technologically? 6) In which ways has the South East, touted as the technological base of Nigeria, failed itself and the country? 7) What are the suggestions for a reverse of the prevailing technological underdevelopment of Nigeria?

Definition of Key Variables

Siddiqui (2017) defines technological education as education for learning something about a specific work scientifically in detail and practical. He further defines technical education as a term applied to schools, institutions, and educational programs that specialize in the skilled trades, applied sciences, modern technologies. However, Dsouza (2018) defines technological education as a term related to education which covers the technical part of a subject or the course and is required to enhance the knowledge of students where they define the things with usage of different technical education instruments. Agrawal (2017) defines technological education as learning something about a specific work scientifically in detail and practical. Actually technical knowledge (product of technological education) has expanded like anything in every way there is a specialist for a special section like mechanical, civil, electronics, electric, computer and chemical; there is no end. *Technical Instruction Act 1889* explains that "The expression 'technical education' shall mean instruction in the principles of science and art applicable to industries, and in the application of special branches of science and art to specific industries or employments. Musgrave (2997) argues that it shall not include teaching the practice of any trade or industry or employment, but, save as foresaid, shall include instruction in the branches of science and art with respect to which grants are for the time being made by the Department of Science and Arts (DoSA), and any other form of instruction (including modern languages. commercial and agricultural subjects), which may for the time being be sanctioned by that Department by a minute laid before Parliament and made on the representation of a local authority that such a form of instruction is required by the circumstances of its district." Technological education is defined in this paper as those compendiums of skills, techniques and processes that people acquire and develop to enable them produce technological equipment as well as exercise technical knowhow in their maintenance and innovation for greater and more efficient functionality.

Sumanth (1990) documents that the term "productivity" was probably first used by a French mathematician in 1766. In 1883, another French man, Littre, defined productivity as the faculty to produce. Kendrick & Creamer (in Afzal, 2004): have proposed two definitions of productivity: Functional for partial and total for loose description of relationships usually in ratio form, between outputs and all of the associated inputs in real terms. In these definitions, authors have differentiated partial productivity from total productivity. Nevertheless, their focus is on the relationship between output and input. Mali (in Afzal, 2004) defined productivity as a measure of how well resources are brought together in organizations and utilized for accomplishing a set of results. Sumanth (1990) argues that productivity is a family of ratios of output to input. For example, the living standard of a country is measured by its productivity as measured by the goods and services produced by per unit of national resources. Sink (1985) argues that the concept of productivity is a relationship between outputs from a given system during or over a given period of time and inputs to that system during that same period. Lawlor (1985) has also given two concepts of productivity:

a) At its simplest meaning productivity is the relationship between goods produced and sold or services provided; the output and the resources consumed in doing it (Output/input= productivity).

b) Productivity is a comprehensive measure about how efficiently and effectively organizations satisfy the following five aims:
   i) Objective achievements
   ii) Efficiency of the process
   iii) Effectiveness- Comparability with other organizations
   iv) Trend- productivity measured over a period.

In this paper, productivity is defined as the utilization of human and non-human material inputs for a cost-effective production of qualitative stocks of technical and non-technical goods and services in excess of local consumption; the excess being released for export to other countries thus bringing in new income to the economy; thereby contributing to all aspects of national development.

National development is usually a numerical measure of the quality of life in a country. Indicators are used to indicate the progress of a country in meeting a range of economic, social and environmental goals. Since indicators represent data that have been collected by a variety of agencies using different methods, there may be inconsistencies among them. These definitions raise the following questions: (1) Is Nigeria ever likely to develop as long as it continues to depend on developed countries technologically? (2) Does Nigeria possess the potentials to end its technological dependence on developed countries? (3) How should Nigeria end its technological dependence on developed countries so as to attain national development? What has been the structure and functional effectiveness of technological education in Nigeria? What have been national and regional contributions to technological education and its application to the solution of productivity problems for national development?

In this paper, national failure is defined as the inability of a country's leaders to ensure the efficiency of its people, machines, factory, systems, etc., in converting inputs into useful outputs for the development of the country either out of fear, hatred or suppression of individuals or regions or subservience to foreign interests. National failure also involves a country's leaders' inability to identify, articulate, prioritize and implement educational, scientific, technological, industrial and sustainable development policies that guarantee qualitative production of technological and non-technical goods or services that put the economy on the path of growth and development. Regional failure is defined as the inability of people in a country's region to identify and utilize their naturally endowed human and material advantages due to fear, selfishness or some other ulterior motive to specialize and produce goods and services that contribute to national development as well as meet local consumption and for export.

@ECRTD-UK https://www.eajournals.org/
https://doi.org/10.37745/bje.2013

Theoretical Framework

Two theories and one model considered ideal for teaching technological education were reviewed for this paper and, consequently, answer the question: What better methods or strategies could students in Nigeria be taught technological education? They include Dale's Cone of Experience, Lancaster-Bell Monitorial Theory and KISTEC Model). These three theories were identified because they use several sense organs and involve the three domains of learning simultaneously: cognitive, affective and psychomotor. Technological education requires these criteria during the teaching and learning process because of their application of practical skills.

The first theory, *Dale's Cone of Experience* (Diagram 1), is **a** step-by-step method of learning and gaining experience which clearly reveals that the bands do not only constitute audiovisual teaching methods but also cognitive and psychomotor (practical skills acquisition experiences) that can be gainfully utilized in teaching technological education. The upper bands include audio-visuals: TV lessons, audio teaching clips, sketches, cartoons and maps. On the other hand; models, participative and non-participative observations, group discussions and class projects constitute cognitive development and practical skills training. These are specifically useful in teaching technological education for applications in industrial productions.

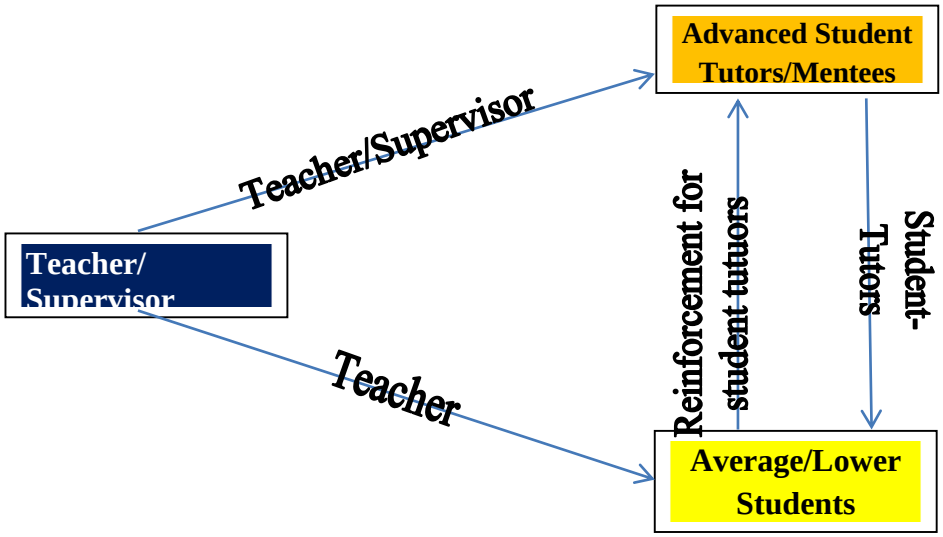
Diagram 1: Dale's Cone of Experience:

Source: Adkins, T (1906)

The second theory is on monitorial teaching method propounded by Lancaster in 1798. Bell improved it later and it became known as the *Lancaster-Bell Monitorial Theory*. They used slightly more advanced students to teach less knowledgeable ones thereby achieving student-teacher ratios of as small as 1:2 or 1:5. This teaching method used student-teachers or student-superintendents and so on until they reached one adult-teacher-supervisor who controlled the whole class. Newman (1998) explains that Lancaster-Bell used it as an ideal method of teaching or training students for skills acquisition. This concept argued that it was more effective to use advanced students to teach less-knowledgeable ones. This is identical with the African skills training method based on a person-to-person master-craftsman-neophyte method in which a trainee understudies his master-

craftsman in an informal manner until he (the trainee) acquires the skills and becomes an adept (Rodney, 2005). Osakpa, Okonkwo & Ejiogu (2017) developed a graphic illustration of this method of teaching for application in the new Federal Government senior secondary school curriculum. (Diagram 2).

Diagram 2: *Lancaster-Bell Monitorial Teaching Method*

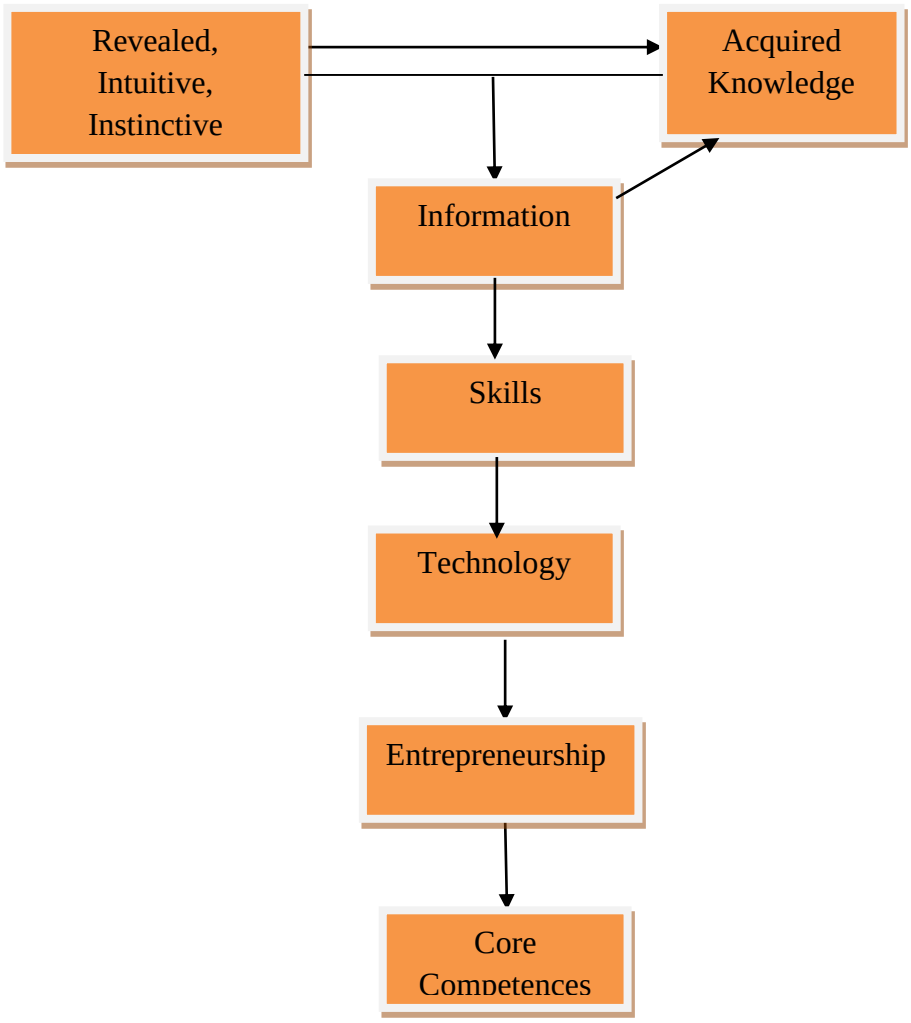


Source: Osakpa, D. U., Okonkwo, Dyke A. R. & Ejiogu, S. I. (2017).

The third theory is KISTEC Model developed by Osakpa, Okonkwo & Ejiogu (2017) for implementing the new Federal Government's *Senior Secondary School Curriculum, (2014)*. KISTEC means Knowledge, Information, Skills, Technology, Entrepreneurship and Core Competences (Diagram 3).

@ECRTD-UK https://www.eajournals.org/
https://doi.org/10.37745/bje.2013

Diagram 3: KISTEC Model



Source: Osakpa, D. U., Okonkwo, Dyke A. R. & Ejiogu, S. I. (2017)

This model illustrates the relationship between knowledge (revealed, intuitive or instinctive and acquired) information, skills acquisition, technology, entrepreneurship and core competences. The model demonstrates that knowledge leads to information which, in turn, leads to acquisition of skills. The skills enable students develop technology. With requisite skills and technology, they invent, innovate and establish businesses as entrepreneurs in accordance with their core competences.

Technological Education

Technology is defined as the scientific study of the practical for industrial arts that includes *Craft*. Craft means skill, art, ability in planning or construction; a calling requiring special skill and knowledge; especially a manual art, a handicraft. This indicates that there are two kinds of education and training: technological and technical to the broad classes of occupations e.g. (i) unskilled occupations, (ii) semi-skilled occupations, (iii) skilled craftsmen and technicians and (iv) professional and managerial occupations – scientists, technologists, managers and executives. In this regard, "Technical" education and training is largely concerned with (i-iii) while "Technological education and training" is concerned with group (iv). Clearly these are very crude mappings and distinctions as ultimately demand depends critically on the advancing nature of science and technology and its impact on industry and working practices. The increasing introduction of robotics, information and communication technologies into the workplace has fundamentally changed the nature of work. These changes have significantly impacted on the technical, technological education and training systems.

Nigeria has had mixed fortunes in technological education. Beginning with the Ashby Commission on the Future of Education in Nigeria, technological education has its ups and downs. The Civil War years revealed two striking opposing situations: while Nigeria relied on the developed countries during the war, Biafrans took the bull by the horns to establish a technological base for erstwhile republic. However, the 1969 National Curriculum provided an interesting focus for technological education in Nigeria; particularly Paragraphs 22 (b), (c), (e), (g) and (h); 25, 30 (f) of National Policy on Education (2014) that offers: diversified contents to cater for differences in talents, opportunities and future roles, provide trained manpower in the applied sciences, technology and commerce at sub-professional grades, inspire students to desire for self-improvement and achievement of excellence, raise a generation of people who can think for themselves, appreciate those values specified under the broad national goals and live as good citizens, provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.. This national curriculum has been strengthened by the New Federal Government Secondary School Curriculum. In addition, Nigeria has a good number of Polytechnics, Universities of Technology and Research Centers.

Value of Technology

The importance of technology in any country's development cannot be stressed too much. However, a few questions come to mind when one ponders over this issue: Why do developed countries protect their technology from being stolen or copied? They do this by taking out maintenance agreements at the time of selling their technological equipment to developing countries in addition to keeping unauthorized persons from the places of design and sites of their production. Why do other countries such as Brazil, Cuba, India, Iran, Israel, North Korea and Pakistan defend their technology despite arms twisting by technologically advanced countries? In this circumstance, is Nigeria capable, ready and willing to defend its technology? There is need for clear answers to these questions in order to take a correct perspective on the arguments

presented in this paper. One can understand the apathy of the South East region's lukewarm attitude in developing technology. Probably, the saying: "Once beaten, twice shy" holds out here. The seeming lack of appreciation of the technological feats of the region during the civil war appears to dampen its enthusiasm. It is, however, doubtful if *the South East has become afraid of baboons and decided to plant its maize in the house* (Ushie, 1995). Interestingly, there is no Law in Nigeria that restricts scientific and technological inventions or innovations. This paper suggests that the South East should borrow a song from Christendom that says:

> Take the whole world but give me Jesus
> Take the whole world but give me Jesus
> Take the whole world but give me Jesus
> I won't go back…I won't go back….
>
> The South East should replace this song with this version:
>
> North East and West take politics but give us technology
> Middle Belt, take agriculture but give us technology
> South West, take Law, Banking and Economy, give us technology
> South-South, take oil but give us technology
> We won't go back….we won't go back….

It is the opinion of these researchers that if the South East devotes its natural intellectual endowment to the development of technology, all other geo-political zones will come begging for relevance in a technologically developed Nigeria. For instance, imagine if all the tractors, harvesters, bulldozers, compactors, other earth moving equipment; land, sea and air transportation facilities in Nigeria were manufactured in the South East; if the computers and other law and banking software were made in the South East and should Nigeria decide on political correctness to build refineries and petrochemical companies in Benin Republic, Cameroon, Chad, Equatorial Guinea, Niger or any other country and buy these equipment and technology from the South East! Definitely, the South East should be the richest geopolitical zone in Nigeria. The fact is that the South East with technology holds the ace in Nigeria's national development.

Productivity

The issue of technological productivity (an outcome of technological education) requires an all-stakeholders' participation (Osakpa, Lebo, & Okonkwo, 2016; Okonkwo, Ejiogu, & Osakpa, 2018 and Osakpa, Okonkwo, Adzei-Kofi, Lebo, Ejiogu, Beshel & Abeh 2018). Okonkwo, Ejiogu & Osakpa, 2017 strongly argued that building intellectual capital for a country is the key to meaningful technological productivity. Therefore, there must be both vertical (universities-polytechnics-research institutes) and horizontal (educational institutions-industries) cooperation for effective, result-oriented, industrial and technological productivity. Incidentally, knowledge shared is knowledge growth; it does not diminish or get used up.

However, Nigeria has suffered from a number of factors that inhibit industrial productivity. Some of these factors include: a lack of well articulated industrial productivity policy, dependence on the production of local raw materials, inability to identify, harness, adopt or adapt potential local technological skills that could become unique Nigerian technology, contraction of the production capacity of established industries since the 1980s, weak consumption of locally-made goods, no vertical and horizontal cooperation between educational institutions and the industrial sector and educational institutions' inability to package technological inventions and innovations that sell among local and foreign investors. This is why the South East as a region should not shoot itself in the foot over its relevance to the Nigerian project. Rather, it should be determined to cultivate and amass intellectual and technological capital for the country. What is more: the groundnut pyramids, hides and skins of the North, the cocoa beans of the West, the agricultural produce of the Middle Belt, the palm produce, rubber lumps and crude oil of the South-South, have not been able to lift Nigeria to national development. Instead, Nigeria has been clamouring for technology that the South East is naturally endowed.

National Development

This section opens with the question: What is the level of national development in Nigeria? National development is usually a numerical measure of the quality of life in a country. The following indicators are used to describe progress of a country in meeting a range of economic, social, and environmental goals: education, health, employment and unemployment rates and gender equality. Since indicators represent data that have been collected by a variety of agencies using different collection methods, there may be inconsistencies among them. So, where is Nigeria on the national development ladder? Based on the above indicators, it is at the bottom. This means the groundnut pyramids that gave identity to the North, cocoa beans and Cocoa House to the West, palm produce, rubber lumps and crude oil to the South-South and assorted food crops to the Middle Belt. What of the South East? The South East needs to come together and produce a piece of technological equipment that will give it identity as other geopolitical zones in Nigeria.

National Failure

National failure is defined as a country's leaders' inability to identify, articulate, prioritize and implement educational, scientific, technological, industrial and development policies as well as inability, unpreparedness and unwillingness to defend a country's technology that guarantee qualitative production of technological and non-technical goods or services for national development. It boggles the minds of right thinking people why, unlike the Americans and the British; who scrambled for German and Japanese scientists, engineers and technologists after World War II (Peacock, 1987), the Nigerian government could not absorb and integrate their brothers who achieved extra-ordinary scientific and technological feats in Biafra and use their intellectual and technological capital to establish a technological production base for the country. *By this singular act, Nigeria threw away its baby with the bath water and suffered double tragedies: pangs of the civil war and the loss of her God-sent baby; Technology*. This was why

Forsyth (1977) against the jeers and sneers of his kith and kin, detractors, foes and entreaties of friends, shouted his voice hoarse on *The Making of an African Legend* which Nigeria, Africa and the world ignored. It is also a surprise that 50 years after those technological feats, 33 years after Ghahia & Ubani (1987)'s *Lessons from Biafra: War-Time Talents yet to be tapped for Today's Needs* and 18 years after Agbo, Ayonote & Ezeoke (2002)'s *No Victory for the Unvanquished*; successive Nigerian governments have kept mute over their brother-ex-Biafran scientists, engineers and technologists. Unfortunately, Government has allowed them melt into the faceless sea of humanity and, consequently, a monumental loss of Nigeria's intellectual and technological capital.

As if this was not bad enough, the national government went further to institutionalize a culture of inferiority and mediocrity for technological education by:

1. Specifying differential entry levels for B.Sc. /BA holders (GL 08) and HND holders (GL 07).
2. Career progression to GL 17 for B.Sc. /BA holders and GL 14 for HND holders.
3. HND holders who want to go for a first degree are admitted into Year 2 of the relevant B.Sc./BTech/BA degree programmes.
4. Alternatively, the HND holders with Distinction or Upper Credit passes are required to undergo a one-year PGD bridge programme before proceeding to a Masters degree in a relevant field of study.
5. For academic staff, the highest a lecturer in the Polytechnic system can go is a Chief Lecturer; an equivalent of Senior Lecturer in the University system whereas University lecturers have three more notches (Principal Lecturer, Reader or Associate Professor and Professor) before terminating their career growth.
6. Finally, no polytechnic, college of technology or institute of technology has been challenged with a specific national technological responsibility or project such as the US Government tasking the MIT (Massachusetts Institute of Technology) on its NASA programme.

It is disheartening to note, too, that Nigerian leaders continue to embrace developed countries' junk technological development programmes and policies. Imagine what Nigeria should be now if there was political will to absorb and integrate the ex-Biafran scientists, engineers and technologists into the services of the Defence Industries Corporation (DIC), Kaduna! This is also why Ezeani's (2013) *In Biafra, Africa Died* is an antithesis. Rather, the book's title should be: *In Biafra, Africa Came Alive*. There is, however, consolation that the accounts of Forsyth (1977) make Nigerians, Africans and the Blackman in general, hold their heads high and not in shame, dejection and frustration. This argument supports Abdulrahman (2008)'s conclusion that Nigeria should pursue development which emphasizes "objectives towards people-centered development … this notion of development involves investing in human capabilities". What is more: Nigeria is one of the richest countries in the world with intellectually and technologically creative people. What is required is to cultivate and amass the needed creative skills, intellectual and technological

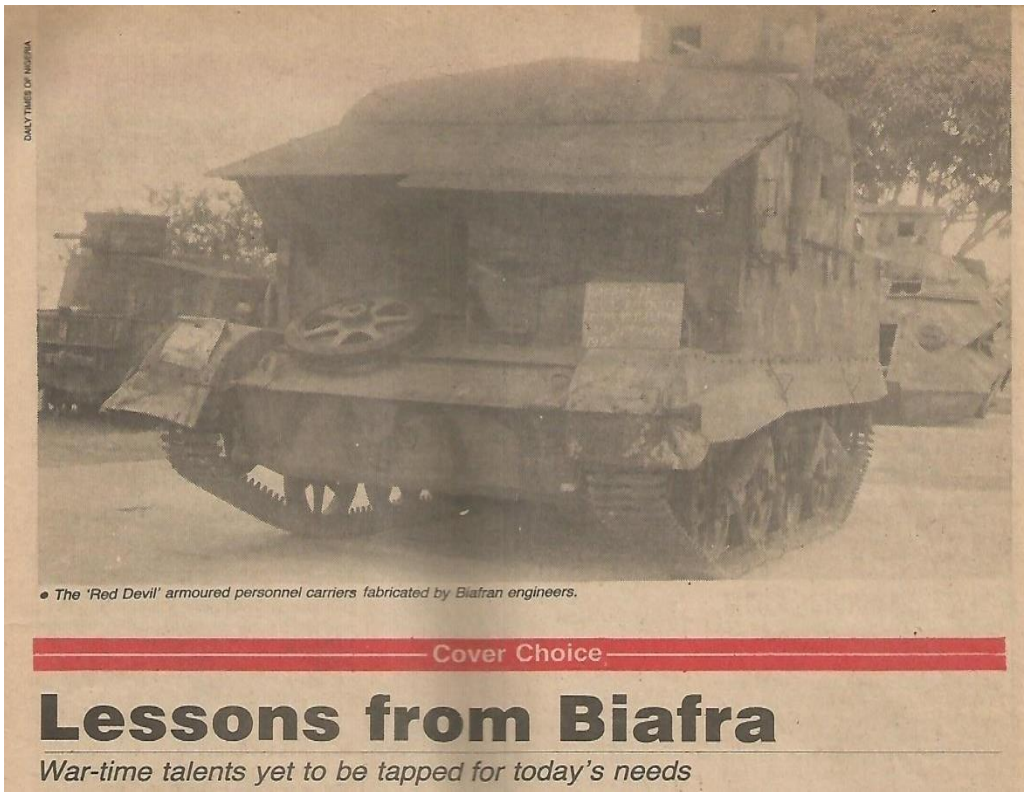
@ECRTD-UK https://www.eajournals.org/
https://doi.org/10.37745/bje.2013

capital that finds expression in qualitative productivity for national development. Another aspect of national failure is the non-immortalization of Nigerian scientists, inventors and technological innovators by naming their inventions and innovations after them.

Regional Failure

The South East geopolitical zone does not only possess intellectual and technological potentials to break the technological backwardness of Nigeria (Forsyth, 1977) but also has demonstrated it is the technological region of the country (Bogoro, 2105). The breathtaking technological feats of Nigerians in the South East geopolitical zone during the civil war are eloquent testimonies and the bases of arguments in this paper that Nigerians and the Blackman in general, are not intellectually or technologically inferior to other races. Within thirty (30) months of the war, Nigerians (who were in Biafra) were able to manufacture their own rifles of varying degrees of sophistication, rockets, Ogbunigwe (monster bombs) popularly known as Ojukwu Bucket, armoured personnel carrier (the Red Devil:(Plates 1), Biafran Tank (Plate 2) and fighter-bomber aircraft (the Minicons) fitted with two Beetle car engines; (Plate 3); shocker battery (sea mine), extracted and refined petrol, produced refined salt, produced sulphur and built the a sophisticated bunker (the famous Ojukwu Bunker)!

Plate 1



British Journal of Education
Vol. 9, Issue 10, pp.10-31, 2021
Online ISSN: 2054-636X (Online)
Print ISSN: 2054-6351(Print)

Armoured Personnel Carrier Fabricated by PRODA and Awka Blacksmiths

Plate 2

Biafran Tank Fabricated by PRODA and Awka Blacksmiths

@ECRTD-UK https://www.eajournals.org/
https://doi.org/10.37745/bje.2013

British Journal of Education
Vol. 9, Issue 10, pp.10-31, 2021
Online ISSN: 2054-636X (Online)
Print ISSN: 2054-6351(Print)

Plate 3

In his first *Post-Biafra War Speech* at the *Lagos Law School*, Ojukwu (1994) enthused: "… Biafrans were outgunned, blockaded and starved, yet they achieved within a short period, in war time, what Nigeria, even in time of peace, could not achieve for decades". He went on:

> These were the three years when we had the opportunity to demonstrate what Nigeria would (could, sic) have been even before 1970. In the three years of war, necessity gave birth to invention. ..We built bombs … rockets… designed and built our own delivery systems.… guided our rockets, far, and… accurately…maintained engines, machines, and technical equipment…extracted and refined petrol in their back gardens …built and maintained airports…under heavy bombardment. We spoke to the world through a telecommunication system engineered by local ingenuity…we built armoured cars and tanks…modified aircraft from trainer to fighters…passenger to bombers. In three years of freedom, we had broken the technological barrier….we became the most civilized; the most technologically advanced black people on earth (Ezeani, 2013).

Could these technological feats be achieved by intellectually and technologically inferior, lazy and unimaginative people (Agbo, 2012)? In fact, these scientific and technological achievements prompted an anonymous Soviet Union Government Official to remark: "…a country that is not yet two months old that can manufacture Ogbunigwe (monster bombs) and rockets must be feared…." (Back page of Ezezni, 2013). Certainly, this was a huge flash of Nigerian inventive ingenuity reminiscent of Ashimolowo (2007), exposition on Volney (1787), Rawlinson (1885), Reclus (1893),*The History of the Nation, Vol. 18* (1906), Jastrow (1914), *Encyclopedia Britannica,*

Vol. A (1959),Weatherwax (1962), Custance (1975), Gurowski (2005) and Sowell (1994) as clear indications that there exists a robust but latent intellectual and technological capital in Nigeria.

In an interview granted Agbo, Ayonote & Ezeoke (2002), Engr Efobi explained that Biafra was technology-driven because of the creative spirit of the Igbo. He explained further that while Biafran soldiers were fighting at the war fronts, Biafran scientists, engineers and technologists had a freehand to implement their dreams and visions. The old saying that necessity is the mother of inventions played out perfectly well in Biafra because they did not only need arms and ammunitions but also other industrial goods: fuel, salt, sulphur, etc. All these were produced within the enclave. In an answer to a question on why Nigeria cannot borrow from what the Biafrans did, Engr Efobi lamented that at the end of the war, "all the drawings (of all their inventions) were collected and Willy Achukwu led a delegation to Bisala at Enugu to give him (Bisala) the scientific fall out of the war; that is, the drawings of all the things we produced during the war. Probably the only ones that were not there were the armoured vehicles which were produced in Port Harcourt. What Bisala did was to put all these drawings down and set them on fire! He insulted the hell out of us and said we were the ones who prolonged the war to three years." He continued with his lament: "For the black race, we saw it as what the black people… inherited out of the Nigerian-Biafran war…. I agree completely that more could have been done, especially in the area of armament…. The motivating force is no longer there…. We lost a lot because if after we took the drawings to Bisala, he contacted higher authorities in Lagos and they say, bring all of them together to do it for Nigeria as they did it for Ojukwu, we would have been glad to do that. I can assure you that by now, we would be competing with those launching satellites into space…. I don't believe that the Indians… are brainier than us; neither do I believe that Americans are smarter than us".

Besides these, there is a host of other inventions and technological innovations by universities, polytechnics and researches centers that are covered by dust in the laboratories, workshops and research centers. No wonder, Bogoro (2015) emphasized that FUTO (Federal University of Technology, Owerri) was deliberately located in the South East, the heartland of Nigeria's innovations and technological breakthroughs especially at a time the country was aggressively pursuing research and development (R & D) in shaping the competiveness of our tertiary institutions: Universities of Technology and Polytechnics. He concluded that FUTO is not just a University of Technology but has, indeed, earned its name through ground-breaking research outputs, commercialized and commercializable research breakthroughs and penetration of the Nigerian economy with many industry-relevant patents. Unfortunately, the South East geopolitical zone has failed itself and Nigeria in this regard. This is the difference between Germany, Japan and the South East in Nigeria. Unlike Germany and Japan that arose from the ashes of World War II to become leading industrial nations of the West, the South East has not taken a cue from these countries. Though Germany and its allies lost the war, they did not want to lose their technology. Rather, they harnessed their technological ingenuity for national development. The South East has every opportunity to become a leading geopolitical zone in Nigeria if it utilizes technology to advantage.

Examples of Regional Centers of Technology

There are many countries where technologically-endowed regions do not only contribute to national development but also have become the richest and most prosperous. For instance, technological regions and towns in some sampled countries include (Table 1).

Table 1:
Countries and Technological Regions

Countries	Technological Regions
United States of America	Washington, D.C., Austin, Silicon Valley, Nashville, Boston, San Diego, San Francisco, New York
Britain	Manchester, Leeds,: Brighton and Bristol
China	Beijing, Shanghai, Shenzhen
Russia	Yekaterinburg, Kazan, Novosibirsk, Samara, Krasnoyarsk, Kaliningrad, Rostov-on-Don, Nizhny Novgorod, Perm, Saratov, Tomsk, Vladivostok, Omsk, Volgograd, Izhevsk, Barnaul, Orenburg, Togliatti
Brazil	Araraquara, São Carlos, State of São Paulo; **Israel**: Tel Aviv, Ra'anana, Petah Tikva, Herzliya, Netanya, Rehovot , Rishon, Le Zion
Iran	Tehran, Esfahan, Mashhad, Tabriz, Rasht, Hamadan, Abadan, Shiraz, Ahvaz.
Israel	Tel Aviv, Ra'anana, Petah Tikva, Herzliya, Netanya, Rehovot , Rishon, Le Zion
North Korea	Silla, Baekje, Taebong Goguryeo
South Africa	Johannesburg, Cape Town, Durban
France	Brest, Normandy (region), Nice, Lorraine (region)
Germany	Munich, Erlangen, Stuttgart Dresden and Paris
Japan	Fukuoka, Kyoto, Tsukuba, Tokyo, Shibuya, Tomofumi Watanabe

Source: www.google.com

Incidentally, these regions are the richest in their countries; courtesy, the national government's provision of an enabling environment for technology to thrive and grow. Why not the South East geopolitical zone in Nigeria?

METHODOLOGY

Qualitative design was used for the study. This was adopted because the researchers wanted to arouse the consciousness of researchers and educators on technological education and productivity for national development: national and regional failures. According to Defranco & Laplante

(2017), the primary aim of qualitative design is to explore the underlying reasons, opinions and motivations for conducting a particular study. In addition, it is used to answer trends in thoughts, opinions and delves deeper into the problem. Rosenthal & DiMatteo (2001) supports by arguing that it is a scientific way of making observations to gather non-numerical data; the description of phenomena; not necessarily their counts or measures. This is the focus of this research paper.

FINDINGS AND CONCLUSIONS

The findings are based on the research questions posed at the beginning. Therefore, the position of technological education in Nigeria is still tenuous although there have been policies formulated backed by the establishment of secondary technical schools, trade centers, polytechnics and universities of technology. An apparent challenge technological education faces is the method(s) of teaching this aspect of education. Two theories and one model considered as better methods of teaching technological education were reviewed. With regard to productivity (an outcome of technological education), evidence indicates that Nigeria still lags behind in the production of technological goods and services. That is why it relies on developed countries for such goods and services. In the case of national development, there is no gainsaying the fact that Nigeria is still underdeveloped. All critical technological goods and services are imported from other countries. Nigeria has failed itself technologically when it overlooked the technological exploits of the ex-Biafrans. No deliberate efforts were made to utilize the technological capital built by the ex-Biafrans after the civil war (Gahia & Ubani, 1987). In the same way, the South East geopolitical zone has failed itself and Nigeria by its apparent apathy over developing technology, its natural endowment, unlike countries like the USA, Brazil, Britain, Russia, China, Israel, North Korea, Iran and South Africa.

Suggestions for Improvement/Recommendations

This paper concludes and recommends that Nigeria should cultivate and amass intellectual capital and working with major technological partners in locally fabricating technical equipment for industrialization because the country will never develop technologically as long as it depends on developed countries. Other suggestions include: (1) Nigerian educational institutions should prepare products that meet present and future technological demands for knowledge-based skills. (2) Cooperation with major technological partners in locally fabricating technological equipment for industrial productivity (3) Identification of major markets for consumption of finished and/or processed agricultural goods. (4) Appointment of foreign companies to handle Nigeria's export trade in conjunction with local Export Bureaus. (6) Establishment of a Nigerian Technological Research Center where Nigerian scientists, engineers and technologists (at home and in the Diaspora) conduct joint researches and experiments rather than scramble to carry out sponsored research programmes for developed countries' research foundations.(7) Firm agreements on co-patent ownership and payment of intellectual royalties to Nigerian researchers. (8) Establishment of a National Agency for Technological Inventions Production (NATIP) to coordinate and sponsor

technological inventions in Nigeria. (9) Establishment of a mutually beneficial research cooperation framework with scientists, engineers and technologists from other parts of the world.

In conclusion, this paper submits that although technological education has fared relatively well in policies and curriculum designs, it has performed woefully in productivity for national development because of the colossal failures of the national government to provide an enabling environment for the South East on the one hand and the apathy of the South East on the other hand because it continues to lick its civil war wounds 54 years on irrespective of the fact that with technology, the South East has every opportunity to become the richest, most prosperous and leading geopolitical zone in Nigeria. On this note, ladies and gentlemen, we rest our argument.

References

Abdulrahman, D. A. Colonialism, development paths, globalization and social inequality: the sources of social conflicts in Nigeria. In Oni, D., Gupta, S., Omoniyi, T., Adgbija & Awonusi, S. (2008, Eds). *Nigeria and globalization: discourses on identity politics and social conflict*; Lagos: Center for Black and African Arts and Civilization (CBAAC).

Agbo, A. O. (2012). *Africa: the glory, the curse, the remedy – biblical perspectives of the African predicament*; Enugu: Snaap Press Nigeria Ltd.

Agrawal (2017). *Definition of Technological Education*, Utakal University.

Ali, A., Ahmadi, M. & Lukman, A. A. (2015). Issues and Prospects of Effective Implementation of New Secondary School Curriculum in Nigeria; *Journal of Education and Practice, Vol.6, No.34*, www.iiste.org

Ashimolowo, M. (2007). *What is wrong with being black? Celebrating our heritage, confronting our challenges*; Shippensburg: Destiny Image & Publishers, Inc.

Awe, K. O., Olawale, S. & Bola, T. (2016). Strategic corporate ventures for competitiveness and sustainable development in Nigeria; *International Journal of Operational Research in Management, Social Sciences and Education, Vol. 2, No. 1*; pp.75-82.

Bogoro, S. E. (2015). Enhancing the relevance of research and industry partnership in Nigeria: a case for new strategies; *Convocation Lecture*; Owerri: Federal University of Technology (FUTO).

Chukwumezie, F. U., Osakpa, D. U. & Okonkwo, Dyke A. R. (2016). Business management strategies, capital formation and sustainable development in the 21st century and beyond; *Education and Science Journal of Policy Review and Curriculum Development, Vol. 6, No. 1*; pp. 32-43.

Clarke, D. (2008). *Africa: Crude Continent–The Struggle for Africa's Oil Prize*; Glasgow: Bell & Bain Ltd.

Custance, A. C. (1975). *Noah's Three Sons: Human History in Three Dimensions*; Grand Rapid: Zondervan.

Defranco, J. F. & Laplante, P. A. (2017). A content analysis process for qualitative software engineering research; *Journal of Innovations in Systems and Software Engineering; Vol.13 Issue 2-3*; (129-141)

Dsouza, J. (2018). *Definition of Technical Education*; Atico Export; Technical Educational Equipment Manufacturers in India

dos Santos, T. "The Structure of Dependence" in Seligson, M. A. and Passe-Smith, J. T. (1993). *Development Under-Development: The Political Economy of Inequality*; London: Lynne Rienner Publishers, Inc.

Encyclopedia Britannica (1959). Volume A; 1018.

Esteves, A. M., Coyne, B. & Moreno, A. (2013). Local content initiatives: enhancing the sub-national benefits of the oil, gas and mining sectors; *Briefing*: Natural Resource Governance Institute.

Ezeani, E. (2013). *In Biafra, Africa Died*; London: Veritas Lumen Publishers.

Fari, S. A. (2013). Research collaboration among academics in selected Universities in Nigeria and South Africa; *The Information Technologist; Vol. 12, No. 1*; pp. 32-47.

Forsyth, F. (1977). *The making of an African legend: the Biafra story*; Suffolk: Richard Clay; The Chaucer Press Ltd.

Garba, Maj. Gen. J. (1987). *Diplomatic Soldiering: The Conduct of Nigerian Foreign Policy, 1975-1979;* Ibadan: Spectrum Books Limited.

Ghahia, C. and Ubani, M. (1987). "Lessons from Biafra: War-Time Talents yet to be tapped for Today's Needs"; *The Nigerian Guardian, Vol. 2, No. 28*; Lagos: Express Printing and Packaging Limited.

Guest, R. (2005). *The shackled continent*; London: Pan Books.

Gurowski, A. (2005). *Slavery in History*; University of Michigan Library: Scholarly Publishing Office.

Igwe, S. C. (2010). *How Africans underdeveloped Africa*; Port Harcourt: Professional Printers and Publishers.

Jastrow, M. (1914). *Hebrew and Babylonian Traditions*; New York: C. Scribner's Sons.

Lancaster-Bell Monitorial Theory; *http://www.edtrust.org/issues/pre-k-12/closing-the-gaps* (Retrieved: 17/8/17).

Lawlor, A. (1985). *Productivity improvement manual.* Aldershot, United Kingdom, Gower, pp.306.

Mensah, M. S. B., Enu-Kwesi, F & Boohene, R. (2017). Challenges of Research Collaboration in Ghana's Knowledge-based Economy; *Journal of the Knowledge Economy*, pp.1-19. https://link.springer.com/article/10.1007/s13132-017-0450-8

Meredith, M. (2011).*The State of Africa: A History of the Continent since Independence*; London: Simon & Schuster UK Ltd.

Morris, I. (2011). *Why the West Rules – For Now: The patterns of history and what they reveal about the future*; London: Profile Books.

Morrison, P. S., Dobbie, G. & McDonald, F. J. (2013). Research collaboration among university scientists; *Journal of Higher Education Research and Development; Vol. 22, Issue 3*; pp.275-296

Musgrave, P. W. (2997). *Definition of Technological Education*; the Department of Science and Arts (DoSA); pp. 105-111.

National Policy on Education (2014)

Ngwenya, B. (2014). *Universities, Tertiary Institutions and their Role in PPP Initiatives*; Bulawayo: Sunday News Online.

Obanor, A. I. & Kwasi-Effah, C. C. (2013). Assessment of universities-industries collaboration and technology transfer in schools of engineering and sciences in Nigeria. *Nigerian Journal of Technology (NIJOTECH) Vol. 32. No. 2.*, pp. 286 – 293

Ojukwu, Dim C. O. (1994). First *Post-Biafra War Speech*; Lagos: Nigerian Law School.

Okonkwo, Dyke A. R., Ejiogu, S. I. & Osakpa, D. U. (2017). Ending Africa's dependency on developed countries: the intellectual capital-knowledge economy option; *International Journal of Innovative Research in Education, Technology and Social Strategies, Vo. 4, No. 2*; (76-89).

Okonkwo, Dyke A. R., Ejiogu, S. I. & Osakpa, D. U. (2018). Improving Tertiary Institutions' Internally Generated Revenue through Business Partnerships with Private Sector Establishments: A Case Study of Selected Tertiary Institutions in Nigeria; *International Journal of Innovative Research & Development, Volume 7 Issue 1*; ISSN 2278-0211.

Olusanya, G. O. "The Nationalist Movement in Nigeria" ed. Ikime, O., *Groundwork of Nigerian History*; Ibadan: Heinemann Educational Books (Nigeria) Limited, 1980).

Onoh, C. C., review of In *Biafra Africa Died: The Diplomatic Plot* by Emefiena Ezeani, (London: Veritas Lumen Publishers, 2013).

Opolot-Okurut, C., & Bbuye, J.(2014). School-University Collaboration Initiative: Benefits and Challenges in Uganda; *American Journal of Educational Research 2, 10*; pp.843-849.

Osakpa, D. U., Lebo, M. P. & Okonkwo, Dyke A. R. (2016). Managing Nigerian Universities for Optimal Performance: Adoption of Strategies of Companies That Excel in The United States of America as Analyzed in *Built to Last*; *Abuja International Journal of Education and Management Sciences, Vol. 2 No. 1, September, 2016*; 61-71. Abuja: Diamond International Educational Centre.

Osakpa, D. U., Okonkwo, Dyke A. R., Adzei, Kofi S. A., Lebo, M. P., Ejiogu, Stella I., Beshel, J. A. & Abeh, D. A. (2018). Africa's Path to Growth and Sustainable Development: African Universities' Collaborative Research in Technological Innovations, Utilization of Local Content Materials and Consumption of Locally-Made Goods; *International Journal of Innovative Research & Development; Vol. 7, Issue 9*, September.

Peacock, H. L. (1982). *A history of modern Europe (1789-1981);* London: Heinemann Educational Books.

Raheem, I. D., Isah, K. O. & Adedeji, A. A. (2018). Inclusive growth, human capital development and natural resource rent in Sub-Saharan Africa: Economic Change and Restructuring, *Springer, Vol. 51(1),* pp. 29-48, Handle: *ePEc:kap:ecopln:v:51:y:2018:i:1:d:10.1007_s10644-016-9193-y* DOI: 10.1007/s10644-016-9193-y

Rawlinson, G. (1885). *Seven Great Monarchies of the Ancient Eastern World, Vol. 1*; New York: John B. Alden.

Reclus, E. (1893). *The Earth and its Inhabitants, Vol. 1*; New York: D. Appleton and Co.

Richard (2016). Definition of Technological Education; Biographies & Pen Portraits.

Rodney, W. (1972). *How Europe underdeveloped Africa;* Washington, D. C.: Howard University Press.

Rosenthal, R. & DiMatteo, M. R. (2001). Meta-Analysis: Recent Developments in Quantitative Methods for Literature Reviews; *Annual Review of Psychology 52(1):*59-82; DOI: 10.1146/annurev.psych.52.1.59

Sanni, M., Oluwatope, O., Adeyeye, A. Egbetokun, A. A. (2016). Evaluation of the Quality of Science, Technology and Innovation Advice Available to Lawmakers in Nigeria; Palgrave Communications, Vol. 2, 2016

Shodjai, F. (1994). *Science and Technology Policy in Developing Countries with Special Emphasis on Latin America--An Annotated Bibliography*: Washington, D.C.: Centre for Policy Research on Science and Technology; Simon Fraser University. shodjai@sfu.ca

Siddiqui, M. A. (2017). *Definition of Technological Education*; Ambalika Institute of Management and Technology, India.

Siyanbola, W. O., Egbetokun, A. A., Oluseyi, I., Olamade, O. O/. Aderemi, O. H. &, Sanni, M. (2012). Indigenous Technologies and Innovation in Nigeria: Opportunities for SMEs; *American Journal of Industrial and Business Management, 2012, 2*, 64-75; http://dx.doi.org/10.4236/ajibm.2012.22009

Siyanbola, W.O, Adeyeye, A., **,**Olaopa, O. & Hassan, O. (2016). Science, technology and innovation indicators in policy-making: the Nigerian experience; *Palgrave Communications, Volume 2, Article number: 16015*

Siyanbola, W.O, Adeyeye, A., **,**Olaopa, O. **&** Hassan, O. (2016). Science, technology and innovation indicators in policy-making: the Nigerian experience; *Palgrave Communications, Volume 2, Article number: 16015*

Sowell, T. (1994). *Race and Culture: A World View*; New York: Basic Books.

Tan, J. and Gopinathan, S. (1986). *Education Reforms in Singapore: Towards Greater Creativity*; Singapore: Times Academic Press.

Technical Instruction Act (1889).

The History of Nations, Vol. 18 (1906).

Udeozor, R. K. & Mbagwu, L. I. (2012). Role of creativity, innovation and strategic planning in enhancing entrepreneurship in Nigerian organizations. *Abuja International Journal of Education and Management Sciences, Vol. 1, No. 2*; pp.313-329.

Ushie, J. A. (1995). *Lambs at the Shrine*; Ibadan: Kraft Books.

Volney, C. F., *Report of 1787, Vol. 1*.
Weatherwax, J. W. (1962). *The Ancient Africa: The African Contributions*; Los Angeles: J. Henry & M.L.D. Bryant Foundation.