



Review Article

Entrepreneurship, Science and Technology Education for Self-Reliance and Economic Diversification

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Abstract: Science education which is the application of educational (learning) theories in the endless search for knowledge, resulting in the development of the cognitive, affective and psychomotor domains through some systematic processes involving careful observation, deduction and testing by empirical means is a sure tool for the promotion of development of any state. This is because the application of its knowledge will enable its beneficiaries to solve the ever occurring challenges of life in society. One of the fundamental principles in National Policy on Education is to engender knowledge, effort, skill and well-being of citizens for national development. Entrepreneurship, Science and Technology Education in Nigeria incorporates industrial development, provide institutional framework for economic efficiency and reduce technological dependence on developed nations. In spite of this, its proper development in the country appears elusive due to the government underfunding of the entire education sector resulting in the non-actualization of its science education dreams in the country. This paper highlights the concept of Entrepreneurship, science and technology education, self-reliance for sustainable development, strategies for enhancing science and technology, and recommendations for the enhancement of science and technology for self-actualization.

Keywords: Entrepreneurship, Entrepreneurship Education, Science and Technology Education, Sustainable Development, Self-Reliance

1. Introduction

Nigeria is a developing country and the signs on ground show that the majority of the citizens are poor. According to 2014 World Bank Survey, Nigeria is ranked 3rd among world top five poorest countries with 61% of its citizens living below poverty rate of \$1.25 per day and Nigeria alone constituted about 7% of world poorest. The level of poverty being witnessed in Nigeria is common to many African countries in the sub-Saharan Region. This situation should not be left unattended to. Although some actions have been taken in the past, not much has been achieved. For example, during the World Education Forum held in Dakar in April 2000, the international community underscored the need to eradicate extreme poverty and gave its collective commitment to work

towards this aim through education. The issue of Poverty Eradication and Education was extensively discussed at a workshop held in Kampala, Uganda in 2001. The workshop was organized by United Nations Educational Scientific and Cultural Organization (UNESCO, 2001). At the workshop, Julius said that "Education is not a way to escape poverty but a way to fight it". This underscores the role of education in poverty alleviation. A commitment to poverty eradication was also one of the most important outcomes of the World Summit for Social Development held in Copenhagen in 1995, where abject poverty was considered a severe injustice and an abuse of human rights. Its action programme proposes to support livelihood systems and survival skills to help poor people to combat poverty. Subsequently, the United Nations General Assembly declared the period of 1997 to 2006 as the first

United Nations Decade for the Eradication of Poverty. One of the sectors to be developed in order to help poor people combat poverty was education. The role of education in poverty eradication, in close cooperation, with other social sectors is crucial [1, 2]. According to Omoniyi [1], education fosters self-understanding, improves quality of lives and raises people's productivity and creativity thus promoting entrepreneurship and technological advances.

Science and Technology education globally is a veritable tool for sustainable development and a spring board to socio-economic growth. It can also be viewed as an investment in human capital and education for full living [3]. In other words, science and technology education is designed to develop skills, abilities understanding, attitudes, work habit and appreciation of knowledge and information needed for the world of work. Oranu [4] opined that science and technology education encompass mental and practical skills to sustain an individual and his immediate environment. Various developed nations such as Britain, United States of America, Japan, China and India have embedded science and technology education into their educational system, in their early existence as a nation. Adeyemi [5] acknowledges that through science and technology education, these countries were able to have rapid industrialization, accumulation of economic surplus, social equity and low level of unemployment. If Nigeria must not be tagged a developing country, focus must be directed on science and technology education. Aina [6] observed that the role of science and technology education in the reform initiatives of Nigeria is not clearly defined. Aina [6] expressed dismay that there has been a continued mismatch between the nations' developmental aspirations and her educational policies and practices. Aina [6] further stated that the recent development in Nigeria whereby a substantial section of the society remains unemployed, calls for a great concern among every well-meaning Nigerian. Consequently, less than 75% of the universities, polytechnics, colleges of education and other school leavers roam the streets in both urban and rural areas without any defined mode of living; this has heightened the need for emphasis on science and technology education for individual and natural survival [7]. Therefore, for a sustainable technology development in Nigeria, Science and Technology education must be given higher priorities.

2. Concept of Entrepreneurship, Science and Technology Education

Entrepreneurship is the ability to perceive and undertake business opportunities, taking advantage of scarce resources utilization. Entrepreneurship is the process of creating something new with value by devoting the necessary time and effort assuming the accompanying finance psychic and social risk and reserving the resulting rewards of monetary and personal satisfaction and independence [8].

Entrepreneurship education is a form of education that seeks to provide knowledge, skills, attitude and motivation to

students for entrepreneurial success in any setting. It equips people with the ability to seek investment opportunities [9]. Entrepreneurship education according to Paul [10] is structured to achieve the following objectives:

1. To offer functional education for the youth that will enable them to be self-employed and self-reliant.
2. Provide the youth graduates with adequate training that will enable them to be creative and innovative in identifying novel business opportunities.
3. To serve as a catalyst for economic growth and development
4. Offer tertiary institution graduates with adequate training in risk management, to make certain bearing feasible.
5. To reduce high rate of poverty
6. Create employment generation
7. Reduction in rural-urban migration
8. Provide the young graduates with enough training and support that will enable them to establish a career in small and medium sized business.
9. To inculcate the spirit of perseverance in the youths and adults which will enable them to persist in any business venture they embark on.
10. Create smooth transition from traditional to a modern industrial economy.

It is pertinent to discuss the concept of science and technology education for comprehensive understanding. Nigeria's National policy on Education [11] seeks among other things to create and promote self-realization, better human relationship, individual and national efficiency, effective citizenship, national consciousness, national unity, as well as socio-cultural, economic, political, scientific and technological advancement. Education is defined by Oranu (2007) as a learning process that ushers in relatively permanent change in behavior or capability that result from experience. In other words, education is an aspect of the many vital processes of socialization by which people acquire behaviors essential for effective participation in the society.

On the other hand, technology is a science that focuses on the use of practical skills to produce useful goods. Technology education can be referred to as any education which is necessary for effective employment in occupation which will eventually lead to wealth creation and self-reliance [12]. It is a systematic way of exposing individuals to practical task for developing and producing goods and services to meet the needs and wants of man [13]. It deals with developing devices, processes and product designed to control nature for the benefits of man. Technology Education is a necessary factor for improving efficiency, quality of life and increasing the chances of survival. Thus, science, technology and society are interrelated and inseparable.

2.1. Self-Reliance

Self-reliance is synonymous with self-sufficiency. It means doing things for ourselves rather than having things done for us. Self-reliance is the personal initiative in the ability and effort to identify, harness and manage effectively and efficiently the

personal and collective resources, human or natural in the immediate surroundings in order to uplift one's or a people's life quality, standard and condition of existence [14]. He noted that self-reliance cautions against dependency-syndrome on the government as the monopoly of development. Self-reliance and its kin-terms accentuates people's primary role as principal agents of development and self-determination both on the individual and collective levels. Self-reliance refers to the sole dependence of individual capabilities to improve life. It is the ability of an individual to rely on him/herself in order to accomplish a specific task and progress in it [12]. Acquisition of employable skills and benefits that accrues from it, engender self-actualization and job satisfaction which on the long run can lead to sustainable development.

2.2. Sustainable National Development

National Development is an aspect of the general development process. As a concept, development is the desire and ability to use what is available to continuously improve the quality of life and liberate people from the vicious circle of poverty. It is also synonymous with self-reliance which requires the ability to learn how to improve one's well-being without recourse to others. It involves the ability to act and apply knowledge, the ability to use underlying activities to improve the knowledge of the process of development and of knowledge itself.

Every state in the world according to Paulley [15] is in the race for development as it is the basis by which states in the world are classified either as first, second or third world/developing countries. Countries that have achieved a certain degree of success in the direction of development are referred to as developed while the others on the other side of the divide are either tagged underdeveloped or developing countries otherwise called the third world countries. This is where Nigeria comes in.

National development which is an aspect of the whole process of development conceptually covers on the other hand a wide range of positive and progressive changes in human activities and endeavors in the life of a people. As a concept, Ezewu (1991) sees it as, "... the level of efficiency attained by a nation through the performance of her social institutions".

Nduka [16] on his part conceptualized national development from a nationalist's perspective when he said, it is the totality of the concerted efforts made by individual societies (nations) to overcome weaknesses by acquiring increasing control over the forces of nature thereby progressively eliminating the centuries old scourge of poverty, ignorance and disease and making life on earth more worth living. For Okorosaye-Orubite [17], national development means "stages through which a nation (state) passes while taking a positive march towards quantitative and qualitative self-actualization by harnessing its human and material potentialities and using same to their maximum capabilities." The issue of harnessing the human potentialities in the above assertion is of paramount importance to us in this paper because education (here science education) is a major tool in this process where a teacher holds sway. Efemini [18], on his

part sees national development as not just an increase in quantity but a qualitative transformation of people's living conditions.

From the above, it implies that national development is symbolized by the presence of sustainable high literacy rate, qualitative and functional education, availability and provision of adequate medical facilities, food, housing, cultural perpetuation, respect for social justice and the laws of the land, commendable social behaviour, socio-political integration, cohesion and cooperativeness, political stability characterized by democratic reasonableness, rational mass political participation and representation, sensitivity to the yearnings and sufferings of the people, political efficiency, improved standard of living of the populace as well as a healthy and stable economy. Some of these indices in the Nigerian context, most of these indices are lacking thereby frustrating the national development effort of the country.

Paulley [15] defined teacher education as all types of formal instructions and professional preparation given to the teacher with the aim of preparing him for the teaching profession leading to the acquisition of a certificate, diploma or degree of a tertiary institution such as a colleges of education monotronics, polytechnics or a universities as a professional teacher.

Sustainable development is conceived by Abudulkadir [19], as those infrastructures, policies and behaviors that are conceptualized, instituted and maintained over a period of time. These infrastructures are considered essential to the general welfare and continued existence of the people and their immediate environment, such as housing, recreational facilities, agriculture, good roads, water, mineral resources, electricity, schools, industries, transportation, domestic services and good governance. Sustainable development is therefore, a continuous and progressive increase and expansion of the volume of goods and service provided in a given economy which could lead to improvement in the social, political and economic life of the present, as well as the future generation. It can be said that countries that achieved this status, experience good governance; because good governance provides adequate and sufficient social services required by the citizen for self-reliance and sustainable development. Science and technology education can promote self-reliance and sustainable development in Nigeria if some of the following strategies are adapted or adopted by stakeholders.

2.3. Science and Technology Education in Nigeria

According to Anyifite (2000), in Brown [20] the trends in science education in the last 30 years have centered on personal involvement by the pupils. Before the curriculum reform projects were initiated in the United States in the late 1950s, the emphasis on science education was on the acquisition of factual knowledge. Then came Physical Education Committee (P. S. S. C.), Chemical Education Materials Study (CHEM Study), Chemistry Board Approach (CBA) and Biological Science Curriculum Study (BSCS) in the United States followed by Nuffield projects in the United

Kingdom and then a wealth of other projects around the world including Nigeria. The aim of these projects was to give pupil the opportunity to be a scientist for the day-to-day, to experience how a scientist looks for evidence, how the scientist tests hypothesis.

Records show that social relevance of science to gain recognition as far back as the 17th century when science and technology made their first significant contributions to navigation, agriculture, industry, and of course, warfare. Edward and Leyner [21] has observed in the report of the Educational Policies Commission of the National Education Association and the American Association of School Administrators that the following seven basic values underlie science:-

1. Longing the know and to understand
2. Questioning of all things
3. Search for data and their meaning
4. Demand for verification
5. Respect for logic
6. Consideration of premises and
7. Consideration of consequences

The Commission states that to communicate the spirit of science and to develop people's capacity to use science, its values should be among the principal goals of education.

Today, according to STAN [22] values in Science Teaching is entirely different because of the following:

1. The pursuit of science is being accorded the status of an institution;
2. Scientist owe intelligence to the organization or agencies that fund their research projects;
3. The academic pursuit of science no more enjoys the premium it did in the olden days.

Science has value dimension. Anytime it induces conflicts in our thinking, modifies the culture or makes demands on society most of the time. While science does not directly impose values, it creates conditions which demand the re-interpretation of oil values or the formation of new ones.

Teaching science with value focus, provides students with a means for interpreting what they have learnt within their own experience. This kind of learning makes it possible for students to become self-adaptive as science-related social conditions change. The specific objectives as spelt out by Hurd (1975) in Evans Obinna [23] are as follows:-

1. To provides opportunities for students to think about and clarify their own value and to compare them with those of others;
2. to respect value pluralism in our society and to recognize that all people will not respond to problems in the same way, but at the same time to recognize the need for enough commonality to preserve society;
3. To understand that valuing is also a way of thinking;
4. To recognize human action as something more than a statistical expectation.

While the curriculum reform projects have done a magnificent job getting students to think for themselves and come to a better understanding of other sciences, there is a growing feeling that the sciences have failed to be popular as

their relevance in the society has not been felt. By that, the teacher merely imparts factual knowledge without the students feeling personally involved.

2.4. Entrepreneurship Education in Nigeria

The history of Nigeria educational system could be traced back to the colonial period. The educational system was tailored towards serving the interest of the colonial masters in terms of supplying manpower for their effective administration of Nigeria as a colony and protectorates [24]. The policy was aimed at producing Nigerian graduate who could read and write to hold certain positions such as clerks interpreters, inspectors and so on. Without any entrepreneurial skills or professional skills to stand on their own or establish and manage their own ventures. The Nigerian industrial policy that came immediately after independence placed emphasis on the establishment of big companies while completely neglecting the development and growth of small scale sectors [24]. This together with the poor educational policy of initial stage no doubt led to the neglect of a foundation for entrepreneurship. This neglect invariably meant destroying entrepreneurship at the micro level in Nigeria at the very beginning, which is considered to be very essential for economic growth and development. The ever pressing demand for white collar jobs for majority of graduates is certainly an upshot of colonial educational policies.

The Federal Republic of Nigeria Government has been making various efforts to enhance skill acquisition of youths and unemployment. However, Education for All (EFA) reported by Babalola [25] showed that sufficient attention is not given to skill training for youth and adults. This form the basis of the then President Obasanjo to mandate all university students in Nigeria, regardless of which major, to be exposed to entrepreneurship development study. However, as Babalola [25] reported, efforts at integrating entrepreneurship into the curriculum of Nigeria public university seen to be inadequate. As at 2010, the most coordinated entrepreneurship education in Nigerian public universities is reported to be at the University of Ibadan which commenced in the 2003/2004 academic session. The programme is reported to be integrated into the curriculum and only concentrated on few students who are interested in developing their entrepreneurial skills. At the University of Nigeria, Nsukka, in 2010 the Centre for Entrepreneurship and Development Research (CEDR) was set up to promote entrepreneurial culture and mind-set, skill acquisition, self-employment economic independence and self-actualization. The University of Ilorin was reported to have agreed since 2005 to create a directorate to handle entrepreneurship training however it was only in 2008/2009 the University established the directorate of Technical and Entrepreneurship Centre (TEC). University of Benin also established an entrepreneurship development center to; develop and offer courses, seminars, workshops and conferences to advance and propagate entrepreneurship.

- i. Offer a 2 credit course to penultimate analyzed student.

- ii. Provide clinics in entrepreneurship to students, staff and members of the public.
- iii. Serve as a national center for the training and development of experts in entrepreneurship.
- iv. Promote research and experimentation in entrepreneurship. and
- v. Commercialize innovation and inventions.

Considering the importance of entrepreneurship education in the life of Nigeria citizens in general and university graduates in particular, the National Universities Commission (NUC) made it a national policy to encourage Nigerian Universities to provide entrepreneurship education for undergraduates to address the challenges of unemployment. This made NUC design an entrepreneurship course titled Graduate Self Employment (GSE, 301) with the theory and practice components to be taught in Nigerian Universities. In Delta State University, it is the policy of the University that those reading Business Management or Accounting courses must register, study and pass courses in entrepreneurship. While it forms part of the general courses required to be passed before graduating.

In other state Universities in Nigeria, it is only offered as general courses. However, the case of Covenant University, Sango Otta is an outstanding example of where a serious efforts has been made to integrate entrepreneurship development study into the curriculum since the inception of the University in 2001. All the students from 100 to 400 levels are made to register for, study and pass Entrepreneurship Development Study (EDS). It is therefore observable that; there is a missing link in the National Universities Commission (NUC) policy on entrepreneurship education with the absence of a standard curriculum and course outline/content to guide and develop entrepreneurship in the Universities, since entrepreneurship education in Nigeria schools, colleges, polytechnics and universities is not given serious attention it deserves. Therefore there should be a systematic coordinated planning and implementation carried at producing well course structured, teaching contents, methods and materials.

3. Strategies for Enhancing Entrepreneurship, Science and Technology Education in Nigeria

Evans-Obinna [23] opined that the rapid industrialization of any nation is tied to acquisition of knowledge and skill in science and technology for sustainable development; but unfortunately in Nigeria, the zeal to advance in these areas is bridged by change of government and disrupted policy. It is pertinent to note that irrespective of the government on board, there should be continuity in policies already established by the government for science and technology education. No democratic government should abandon uncompleted or old project in place of new ones in order to enhance continuity in policies set up for the education system.

3.1. Constant Revision of Curriculum

If curriculum should at all times change with the needs, interests, aspirations and priorities of any society, it is expected that any shift in priorities as a result of changing social needs, will require corresponding changes in the curriculum; but unfortunately, curriculum changes in Nigeria schools are often static, in contrast to modern curriculum requirement for a dynamic society.

3.2. Adequate Funding and Articulated Management

The high rate of technological advancement across the globe necessitated the need for increase in funding of science and technology education. This will enable academic institutions search for qualified personnel procure instructional materials, equipments and other facilities. There should be improvement in the release and management of funds. This implies that allocation of fund for science and technology education should be released on time and appropriately in order to avoid diversion of funds.

3.3. Improvement of Staffing and Staff Incentives

The employment of teaching and non-academic staff should be qualitative and adequate; ensuring that a round peg is placed in a round hole, for positive productivity. Staff should be paid as at when due, while incentives in areas of staff promotion, leave allowance, in service training and other fringe benefits should be very effective and sufficient.

3.4. Increase in Student's Enrollment

Enrollment of students in science and technology education is low, compared to that of arts and social science. The Government should encourage student's enrollment, by incorporating bursary/scholarship award to students that major in science and technology education. Moreover, there are comparatively few available skill acquisition centers for graduates to be self-reliant; and the capital intensive nature of training students in the area of science and technology also hinders the enrolment of students in the programme. It is against this backdrop, that the Government and private firms should deem it, necessary to provide more skill acquisition centers in tertiary institutions in order to increase the rate of student's enrollment into science and technology education.

3.5. Well Equipped Workshop/Laboratory

Science and technology learning should be practical oriented. Workshops and laboratory should be adequately equipped for students practical and skill acquisition. It is better to have fewer well equipped workshops/laboratories where students will be perfected in both theory and practice; than having many that are ill-equipped for training students in their various areas of specialization. Standard imported equipment are preferable, but where it cannot be purchased, locally improvised equipment should be provided to avoid interruption in learning.

3.6. Computer Literacy and E-education

Students in science and technology education should be provided with computers for education. An e-education system is an integrated, simple to use, robust, with multilingual learning management and delivery system that is designed to enable rapid development and management of education content via the internet. E-education system fosters communication between students, parents, teachers and administrators in science and technology education. The government and private companies should employ appropriate information and communication technology to help advance science and technology education and collaborative learning practices.

4. Conclusion

The paper is of the view that the present status of entrepreneurship, science and technology education is not encouraging as evidenced by many science and technology education graduates who are unable to engage themselves in profitable activities for living. It is believed that entrepreneurship, science and technology education for sustainable development is a precondition for self-reliance, unfortunately, the program has been dwindling. It is less successful due to neglect, poor funding inadequate workshop equipment, poor staffing and incentives, hence the need for enhancement of the program to overrule these challenges in order to form solid foundation for the sustainable development of the nation. Therefore provision of adequate instructional materials, Funding and Laboratories will be a great step towards attainment of one of Nigeria's Goals of education which is a Great, Dynamic and self-reliant nation, that doesn't mean only the national rather individuals as a piece.

Recommendations

Prior to the information above, for entrepreneurship, science and technology education program to assume its place of priority in terms of attention and administration for self-reliance and national sustainability; the following recommendations should be solemnly embraced:

1. Adequate funds should be made available to science and technology institutions by the government and private individuals to enable it acquire and equip workshop/laboratories and libraries.
2. Government should provide adequate computers and internet facilities to enhance teaching and learning, smooth administration of personnel; student's records; and other relevant instructional materials.
3. Government should make entrepreneurship, science and technology education a core course for all students in tertiary institutions with practical application of such knowledge made available via seminars and workshops.

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