INFUSING ENTREPRENEURSHIP EDUCATION INTO SCIENCE AND TECHNOLOGY TRAINING IN NIGERIA: ISSUES AND STRATEGIES

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Abstract

Science and Technology remains unarguably the fulcrum on which advancement, progress and improvement in all sectors of any economy revolves while entrepreneurship through learned ingenuity galvanizes and optimizes the opportunities, innovations, skills and competencies derivable from the former for product development, commercialization and wealth creation. The growing incidence of youth unemployment and general poverty level in Nigeria calls for a serious rethinking of the capabilities and capacity of the graduates of Science and Technology. It is against this background that the paper examined entrepreneurship, science and Technology as major drivers of the economy and national development. It reviewed the current system of education and its inherent inadequacies that preclude practical application and foray into entrepreneurship. The paper distilled practices prevalent in emerging economies of Asian countries with a view to extrapolating such lessons as a model of adoption for the crystallization of sustainable entrepreneurship in the Nigerian Science and Technology education. The issues of curriculum, pedagogy, manpower, infrastructure, attitudes, orientation and funding were discussed as critical preconditions for the emergence of effective entrepreneurship in Science and Technology. The paper concluded that the entrenchment of entrepreneurship in Science and Technology education would rekindle the interest of the millennia in the enrolment of the disciplines. It would result in a departure from theoretical knowledge to empowerment for wealth creation and practical solution to societal problems. Some recommended solutions include establishment of incubation hubs, industry partnership, strengthening of compulsory internship, international exchange programmes, product development and commercialization policies, special legislations and corporate social responsibility initiatives.

Keywords: Entrepreneurship, Science and Technology, Education, Wealth creation, National development, Graduate self – reliance.

1.Introduction

Countries that pay lip service to,or sideline science and technology have unwittingly endorsed their gradual extinction and irrelevance in the comity of global economies. Twenty first century knowledge society is driven by the discoveries and application of scientific and technological principles for inventions, innovation and development. Gabriel Benjamin (2014) averred that the endowment of natural resources is desirable but not a sufficient condition for wealth creation and national transformation noting that it is science and technology through entrepreneurship that can convert natural resources into valuable goods and services for economic development and improved quality of life.

National Research Council (2006) noted that science and technology (S&T) capabilities are fundamental for social and economic progress of countries and decried the inability of African nations to leverage on these for industrialization and combating local challenges. In a sharp contrast, the Asian nations are aggressively pursuing and integrating S&T and becoming major actors in the global market (The National Science Foundation, 2007). Over dependence on importation and consumption of foreign goods and services with resultant loss in foreign exchange are traceable to deficiency in science and technology entrepreneurship.

The motivation and ingenuity to take advantage of opportunities and discoveries provided by science and technology and translate same into products and services for wealth creation, value addition and betterment of society are the pivotal roles of entrepreneurship. It transcends mere possession of degrees in science and technology. Entrepreneurship undertakes the creation, organization, ownership and risk of business outfits with the aim of generating requisite value and profits. Entrepreneurship is seen as a principal engine for economic growth and wealth creation as well as crucial for providing variety of employment opportunities (Oteh, 2009).

There is need to stem the high unemployment or under-employment rate of science and technology graduates. The situation where these graduates are struggling for employment in banks, civil service, and other unrelated sectors is a clear evidence of under-utilization of potentials. Adeyemo, Ogunleye, Oke and Adenle (2010) noted the alarming proportion of unemployment for graduates of science and technology in Nigeria. The concerns to solve the problem prompted the Federal Government under the UNESCO assistance to reform Nigeria's Science and Technology in 2004 to introduce entrepreneurship in the University Curricula. It was envisaged that the inclusion of entrepreneurial education would provide necessary impetus for science graduates to start businesses related to their fields of specialization. The fundamental question would be? To what extent are these lofty objectives realized in Nigeria? Do the graduates have sufficient capabilities derivable from their training to venture into entrepreneurship?

2. Teaching of Science and Technology in Nigeria

The teaching of science and technology requires a perfect blend of theory and practices culminating in exploration and experimentation. Hornby (2010) conceptualized science as knowledge of principles and causes, which can be tested to ascertain their truth. The delivery method and pedagogy must be problem based, learner- centred and participatory to spark off and sustain genuine love for the subjects in the students. The dearth of science and technology entrepreneurship in Nigeria is traceable to the poor teaching and learning of the subjects. Do the classroom and laboratory interaction lend themselves to practical solution of societal problems and the motivation as well as capacity to start businesses along the line of scientific discoveries. The approach must be devoid of rote memorization and regurgitation of abstract facts. National Teachers Institute (2010) agreed that the current teaching of science and technology subjects in Nigeria is defective attributing the inadequacies to inadequate infrastructure and learning environment, skipping unfamiliar concepts or area by the teacher, inability to organize practical activities for the students, brushing the students to complete the syllabus etc.

Apart from the entrepreneurship programme under the General studies, no faculty of science and technology in the country seem to have integrated entrepreneurship courses into its curriculum. Brown (2012) highlighted basic hindrances to entrepreneurship education in Nigeria Universities as: lack of entrepreneurship teachers, materials and equipment, poor enterprising culture, inadequate facilities

and equipment for teaching related courses and non-inclusion of entrepreneurship courses in the subject curricula. The science and technology entrepreneurship education appears to be gaining currency in our time but may remain a mere slogan if nothing drastic is done to spur the interest of the millennia and empower them to be creative and innovative in identifying business opportunities along their subject specialization. It is important to learn lessons from the Asian nations who are taking giant strides in entrenching science technology entrepreneurship.

3. Asian Nations and Science – Technology Entrepreneurship

Asian nations as a regional entity perceive the development of science, technology and innovation as critical for their economic growth and have entrenched the establishment of science and technology parks to facilitate growth of start –up businesses and entrepreneurship in the areas of artificial intelligence, robotics, biotechnology, virtual reality, internet of things etc. The parks also exist at national levels such as India Science and Technology Entrepreneurs Park, Chinese, Indonesia, Thailand and others. The parks provide central platforms for incubation of ideas, product development, commercialization, funding, marketing, state-of-the-art facilities and infrastructure (Economic and Social Commission for Asia and the Pacific 2017). Asian countries provide full scholarship to their citizens to study science and technology in the United States, Canada and United Kingdom as well as ensuring enabling home environment for enterprise development (Baark, Erik, 2005, British Council, 2014). The Asia model clearly shows ready platform to nurture science and technology entrepreneurial ideas and propels greater enrolment into the disciplines as a national priority. In order to ensure that the current momentum towards entrepreneurship does not become mere national slogan certain preconditions must be in a place to guarantee effective implementation.

4. Preconditions for Effective Science and Technology Entrepreneurship Education

The issues to be addressed as matters arising from the current systemic inadequacies of Nigerian system and lessons from the Asian countries include:

Curriculum

The reliance on the GST 1 Unit course on entrepreneurship to foster capacity for seeking business opportunities and establishing requisite enterprises in science and technology related arears is grossly inadequate. There is need to design appropriate courses that will engender creative business solutions to local problems and integrate same into the general curricula. Some courses may be audited from management and social sciences to enrich the capability of the graduates. It is possible for graduates of chemistry, microbiology through training from robust curricula to be able to develop businesses having products, in the areas of cosmetics, health products, fertilizers, animal feeds, biopesticides, pharmaceuticals, foods and nutrition.

Pedagogy

The system of copious dictation and solving problems by the teacher while students passively follow is not only unproductive but anachronistic. A problem based learning approach is advocated to ensure active participation by students in applying principles to solve identified problem. This method

transcends the traditional lecture mode and requires more preparation and resources to facilitate and support group learning.

Manpower Requirement

Introduction of new curriculum and pedagogy without corresponding training for the available manpower is usually an exercise in futility. Lecturers would usually skip topics in which they have not sufficient mastery, or materials for effective delivery. It therefore behooves relevant authorities to plan workshops to update the knowledge base of teachers to be in tandem with new contents and techniques.This is vital as the quality and competency of the teachers determine effectiveness.

Requisite Infrastructure

Studies have reported the non-availability of basic science laboratories and facilities in most schools (Nnorom 2012; Eya and Elechi 2011; Aliyu 2006 and Oriade 2008). It would be absurd prospecting for scientific discoveries and entrepreneurship in the absence of enabling equipment, facilities, and standard laboratories, Basic infrastructure becomes an irreducible minimum requirement for effective science and technology education.

Funding

Science and technology entrepreneurship is capital intensive hence prospective entrepreneurship in this regard would want to be assured of possible sources of funding before venturing out. The economy must therefore provide necessary incentives to attract appropriate sponsors and investors. This stems from the fact that one of the major issues in effective entrepreneurship is financing the enterprise. Young start-ups find the process of securing Loan in Nigeria considerably tedious.

Attitudes and Orientation

The perception of education in Nigeria is geared towards employability. Parents and schools advise prospective graduates to choose courses that lead to employment in the public sector, private organizations and multi-national corporations. This attitudinal disposition undermines self-employment and entrepreneurship. Most curricula only prepare graduates for employability and thus reinforce the low tendency for business enterprise. In some quarters it is viewed with stigma as inability or lack of connection to secure juicy employments. There is need for reorientation to accept entrepreneurship as a global driver of sustainable wealth and national development. Perpetuating science and technology entrepreneurship in Nigeria would require some strategies.

5. Recommended strategies

5.1 Incubation and Accelerator Hubs

There is need to build, popularize and strengthen incubator and accelerator hubs to assist budding startups with funding, access to mentors, knowledge and expertise to nurture the new outfits. There should be annual competitive proposals from science and technology graduates to the incubators for intervention to be determined on merit and viability of projects. This practice will spur and encourage youths into entrepreneurship. Few of such hubs in Nigeria currently include Passion incubator, IDEA, Co-creation hub, 440NG, Leadpath Nigeria We novation Hub and Spark Accelerators (Anibe Idaji, 2017).

5.2. Industry Partnership

Faculties of science and technology in Nigeria should evolve strong industry partnership in the training of their graduates Science and Technology experts should be invited to speak to the students on regular basis. There could be annual exhibitions on campus where cognate firms showcase their products and services to further stimulate the entrepreneurial acumen of the students.

5.3. International Exchange Programmes

Nigeria students need international exposure to benchmark and learn from scientific and technological developments in more advanced countries. Faculties should ensure that their students go on study visits and exchange programmes abroad before the penultimate year sequel to graduation. Exposure can be a vital catalyst to building confidence and stirring up the tendency to replicate creative ideas. Good classroom and laboratory teachings in Nigeria are necessary but not sufficient condition to birth the required passionate curiosity and stretching of the imagination that exposure propels. Such international exposure would spark off a rethinking and a broadened perspective. The cost of the international exposure should be borne by parents, government and possible travelling grants from corporate sponsors.

5.4. Product Development and Commercialization Policies

Universities should have clear-cut commercialization policies detailing the critical roles and rewards of various stakeholders in the process of developing new products and services and launch same to the market. Investors would like to be assured of sharing formula and the approval of National Office for Technology Acquisition and Promotion (NOTAP) for such products by way of patents. The scientist on the other hand is interested in the protection of intellectual property and appropriate royalties. The University can interface between the external investors and the scientist through its own business venture and can at times invest on commercializing the products by providing the required capital outlay after entering into valid agreement with the scientists. The scenario can be realizable and effective once there exists a codified product development and commercialization policy

5.5. Corporate Social Responsibility Initiatives

Corporate businesses and multi-national corporations operating in Nigeria have both legal and ethical obligations to ensure beneficial development of their host communities beyond profit maximization. Multi-national corporations should be involved in technology transfer and development of scientific enterprise noting that these represent critical development needs. The Nigerian science and technology community must aggregate the interest of the sector in this regard and bring necessary pressure through the agencies of government on the corporations to effect comparable corporate social responsibilities performed by their centralized head offices in other countries of the globe.

5.6. Special Legislation

Strong advocacy and parliamentary lobbying vanguard will be required to persuade the National Assembly to enact special laws that would stimulate and accelerate scientific instrument and technology transform in Nigeria. The legislations should emerge the protection of local firms for a period of five years from international competition. It would also entail the facilitation of tax incentives to fuel scientific and technological entrepreneurship as well as compel multi-national corporations and

different tiers of government to establish robust science parks, incubator and accelerator hubs. Appropriate legislations and policies should be used to foster international collaborations, partnerships and exchanges in science, technology and innovation.

6. Conclusion

Science and technology entrepreneurship is critical to sustainable national development as one of the major drivers of economic growth and wealth creation. It is entrepreneurship that propels the transformation of scientific discoveries into valuable products and services for advancement in the quality of societal livelihood. Asian nations have leveraged on aggressive pursuit of science, technology and innovative businesses to leapfrog into the global market. Nigerian scientists can get involved in biotechnology, leather technology, solar technology, space technology, renewable energy, food and nutrition, health products, cosmetics, fertilizers, and animal feeds. The dearth in productive capacity and low entrepreneurship in science and technology in Nigeria is traceable to poor funding and inherent inadequacies in the education system. The paper has discussed preconditions and strategies required for the entrenchment of entrepreneurship in the science and technology education. The approach drawn mainly from the Asian model if implemented will rekindle sustained interest of the millennia in the enrolment of the disciplines and result in a departure from theoretical knowledge to empowerment for wealth creation and a panacea to graduate unemployment as well as providing practical solutions to societal problems.

References

Adeyemo S.A, Ogunleye A.O, Oke C.O and Adenle S.O. 2010. A Survey of Factors Determining the Employability of Science and Technology Graduates of Polytechnics and Universities in the Nigerian Labour Market. Journal Of Science And Technology Education Research 1(5)99- 106 the Nigerian context.

Aliyu, U.D. 2006. Issues and Insight in the Universal Basic Education: A Case Study of Jigawa State. A Conference Paper Presented at the 8th Annual Conference of Nafak, Held at College of Education, Ekiaddor, Benin.

Benjamin G. 2017. Science, Technology Innovation And Enterprenuership: An Idea Whose Time Has Come. Concord times, Tuesday. Retrieved from https://www.s/concordtimes.com/sciencetechnology - innovation-andenterprenuership-and-idea-whose-time-hascome/ Accessed on 28/04/2019

British Council. 2014. The Rationale for Sponsoring Students to Undertake International Study: An Assessment of National Student Mobility Scholarship Programme. Retrieved fromhttps://www.britichcouncil.org/site/def ault/files/e002_onward_mobility_study_fin al_V2_web.pdf

Brown P.B. 2012. Why Everyone Will Have to Become an Enterprenuer. Retrieved from Http://Www.Forbes.Com/Sites/Actiontrium pseverything/2012/11/03/Why-Everyonewill-Haveto-Become-an-EnterprenuerCrowd-Sourcedversion/. Accessed on24/4/2019

Erik Baark. 2005. Technology and Entrepreneurships in China: Commercialization Reform in the Science and Technology Sector. Review of Policy Research. Retrieved from https://doi.org/10.1111/J.1541-1338.2001.tb00970.x

ESCAP. 2017. Asian-Pacific Forum on Science and Technology Park. Retrieved from https://www.unescap.org/events/asiapacific-forum-science-and-technologypark. Accessed on 24/04/2019

Eya, N.M And Elechin C.N. 2011. Avalability and Ulization of UBE Basic Science Laboratory Faculties for Teaching Basic 6 Science in Upper Basic Secondary Schools. 53rd Annual Conference Proceedings of STAN. PP183-189.

Hornby, A.S. 2010. Oxford Advanced Learner's Dictionary 7th Edition. New York: Oxford University Press.

Idaji, A. 2017. 7 Accelerators and Incubators for Nigerian Startups. Retrieved from Http://Www.Techcityng.Com Accessed On 26/04/2019

National Research Council. 2006. The Fundamental Roles of Science and Technology in International Development: An imperative for the U.S. Agency for International Development. Washington, DC: the National Academies Press. National from https://doi.org/10.17226/11.583 Accessed on 12/4/2019

National Teachers Institute. 2010. Manual for Retraining of Primary School Teacher: Basic Science and Technology. Kaduna NTC Press.

Nnorom N.R. 2012. Avalability and utilization of UBE Basic Science Laboratory Facilities for Teaching Basic Science in Upper Basic Secondary Schools. 53rd Annual Conference Proceedings of STAN. pp 183-189.

Oteh, A. 2009. The Role of Entrepreneurship in Transforming the Nigerian Economy. 7 th convocation Lecture, Igbinedion University, Okada.