

Enhancing science, technology and entrepreneurial skills development for sustainable economic recovery

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Abstract

Education is a critical agent of transformation in terms of changing life styles, attitude and behaviour. Entrepreneurship is seen as a key to economic development process. The need for science, technology and entrepreneurship education in pursuit of sustainable economic recovery is indispensable. The reason being that the rate of unemployment in the country is becoming unabated and this cuts across the individual, male and female youths leaving various educational institutions. Concomitant effect of this has led to armed robbery, advance-fee-fraud, sex commercialization, drug addiction, gambling and host of others. To curb these vices, it has become necessary to vigorously galvanise this sector in order to make the youths not only becoming self-employed but also employers of labour. This paper discusses the concept and importance of entrepreneurship education, objectives of entrepreneurship education, science, technology and entrepreneurship education, strategies for effective entrepreneurship education, need for entrepreneurship education in science and technology, forms of skills involved in science and technology education, basic science and technology teacher as an entrepreneur in a school system, problems, strategies and policies of science and technology education for sustainable national development. Finally, the paper recommended among others that educational programmes at all levels should be made relevant by providing the youths with the needed entrepreneurial skills for sustainable economic recovery and growth in Nigeria.

Keywords: Science and Technology, Entrepreneurship, Education, Skills, Strategies, Sustainable Development

Introduction

Every country in the world is faced with the challenges of improving the capacity of their workforce to respond to their national development needs and to the demands of a rapidly changing, more globally competitive world. Therefore, the future success of every nation, individual, enterprise and community is highly dependent on the existence and possession of transferable skills and ideas. The recognition of the indispensable role that science and technology education plays in equipping individuals with relevant skills and knowledge ten to make people to participate effectively in socio-economic and technological innovation process which cannot be over emphasized. Through skills development, people can better their chances of securing productive and profitable employments thereby sustainably increase their income levels and access to a quality life (Eze, 2013). According to Uwaifo (2009), one would be living an unrealistic life if he is ignorant of the basic knowledge of current developments in science and technology and at the same time concluded that Science and technology as a discipline has touched virtually every aspect of life and conditions of living in most societies of the world. As such, Science and technology is directly or indirectly related to both the quality of life of the average individual and the economic health and security of nations at large.

Realizing the importance of science and technology in national and economic growth, most countries of the world continue to give priority attention to science and technology in their development efforts. For instance, in Nigeria the National Policy on Education (2013) emphasized science and technology at all levels of education and redirected the entire society towards scientific and technological thinking in order to develop new technologies and adapt existing ones to improve societal wellbeing and security. Science and technology is one of the basic needed for a nation's technological breakthrough. The use of science and technology education is also important in meeting the challenges of our complex society. To feed an expanding world population and keep it healthy is an ever-present challenge. New ways must be found to generate and use science and technology efficiently. Dwindling supplies of resources, must be replaced with other substances. Ways to recycle materials such as plastics rather than allowing them to clutter and foul our environment are needed. A good knowledge of science and technology, combined with entrepreneurial skills would equip youths well enough to become self-reliant rather than wage-employment seekers (Aladetan, 2014).

Concept and importance of entrepreneurship education in Nigeria

Entrepreneurship is the capacity to harness the right quantity, quality and combination of resources that are consistent with profit making under risks and uncertainty. Maigida, Saba & Namkere (2013), defined entrepreneurship as the totality of self-asserting attributes that enable a person to identify latent business opportunities, together with capacity to organize need resources with which to profitably take advantage of such opportunities. Entrepreneurship is a key driver of our economy; wealth and a high majority of jobs are created by small business started by entrepreneurially-minded individuals, many of whom go on to create big businesses. There is more creative freedom for people who are exposed to entrepreneurship education. There is higher self-esteem, and an overall greater sense of control over their own lives. It is the believe of many experienced business people, political leaders, economists and educators that fostering a robust entrepreneurial culture will maximize individual and collective economic and social success on a local, national, and global scale. It is with this in mind that the National Standards for Entrepreneurship Education were developed - to prepare youth and adults to succeed in an entrepreneurial economy.

Entrepreneurship Education is a lifelong process; starting as early as elementary school and progressing through all levels of education, including adult education. The standards and their supporting performance indicators are a framework for teachers to use in building appropriate objectives, learning activities, and assessments for their target audience. Using this framework, students will have progressively more challenging educational activities; experience that will enable them to develop the insight needed to discover and create entrepreneurial opportunities; and the expertise to successfully start and manage their own businesses to take advantage of these opportunities. Entrepreneurship education focuses on developing understanding and capacity for pursuit of entrepreneurial behaviours, skills and attributes in widely different context. It can be portrayed as open to all. The propensity to behave entrepreneurially is not exclusive to certain individuals. Different individuals will have a different mix of capabilities for demonstrating and acquiring entrepreneurial behaviours, skills and attributes. These behaviours can be practiced, developed and learned; hence it is important to expose all students to entrepreneurship education. Entrepreneurial skills and attributes provide benefits to society, even beyond their application to business activity. Obviously, personal qualities that are relevant to entrepreneurship such as creativity and a spirit of initiative can be useful to everyone in their working responsibilities and in their day-to-day existence.

The economic importance of the entrepreneur has been recognized for several decades. Ossai & Nwalado (2012) put forward the thesis that the protestant ethic is spirit of capitalism (Nwagwu, 2007). Other writers have discussed from different perspectives, the importance of entrepreneurship to different countries in the industrial era. Ojeifo (2013), who is, perhaps, believed to be the first major economist to analyze the role of entrepreneurship in economic development, attributed innovation to the entrepreneur. He described entrepreneurship as the engine of economic development. He argued that "to study the entrepreneur is to study the central figure in modern economic history". In the theory of distribution put forward by Eze (2013), a neoclassical economist, the entrepreneur plays a crucial role, though he or she is not a production factor. Unlike the capitalist, the entrepreneur directs the application of acquired knowledge to the production of goods for human consumption. From the above advantages/benefits Entrepreneurship Education should be taught to students in all disciplines in institutions of learning. It is not out of place to say that many business ideas emerge from non-business disciplines but are often waved aside or ignored because students are not sufficiently educated in the knowledge and skills required.

Objectives of entrepreneurship education

Entrepreneurship education is oriented towards different ways of realizing opportunities. This is what makes entrepreneurship education distinctive in its focus on realization of opportunity, whereas management education is focused on the best way to operate existing hierarchies. Entrepreneurship education seeks to provide students with the knowledge, skills and motivation to encourage entrepreneurship success in a variety of settings. Entrepreneurship education according to Aladetan (2014); Ojeifo (2013) is structured to achieve the following objectives.

- (a) To offer functional education for the youth that will enable them to be self-employed and self-oriented.
- (b) Provide students with adequate training that will enable them to be creative and innovative in identifying novel business opportunities.
- (c) To serve as a catalyst for economic growth and development.
- (d) Offer students with adequate training in risk management, to make certain bearing feasible.
- (e) To reduce high rate of poverty.
- (f) Create employment generation.
- (g) Provide students with enough training and support that will enable them to establish a career in small and medium sized businesses.
- (h) To inculcate the spirit of perseverance in the students which will enable them to persist in any business venture they embark on.
- (i) Create smooth transition from traditional to a modern industrial economy.

Science, technology and entrepreneurship education

In a bid to eradicate poverty, curtail the high unemployment rate, and empower graduates of Nigerian students with suitable employability skills, the federal government through the Ministry of Education in 2013 made entrepreneurship development study a compulsory course requisite for graduation. The essence was to offer students a well-rounded education in terms of knowledge, skills, techniques and values needed to produce self-reliant individuals who can compete favourably anywhere in the world. It is therefore desirable for every child to have some idea of a business enterprise market). Years after the introduction of this initiative, no proper evaluation has been done to assess the level of skill and competences acquired by the students in view of the enormous resources voted into the programme. It is important to determine how equipped the students are to in order to create a niche for themselves, given little impetus in the labour market (Maigida, Saba & Namkere, 2013).

The primary aim of entrepreneurship education is to boost small and medium scale enterprises, create wealth, and empower Nigerian youths. One observation (of formal education products) is that students graduate without knowing how to think in whole systems, how to find connections, how to ask questions, and how to separate the trivial from important. Now more than ever, we need people who think creatively and who understand systems, connections, patterns, and events root causes (Momo, 2012). Educators need to ensure the interconnection between the environment, economy and social structures becomes an integral part of formal education, starting with the pre-primary and continuing through primary and secondary school and through training at the tertiary institution, and at the professional level (Momo).

Strategies for effective entrepreneurship education

In order to achieve viable entrepreneurship that will enhance sustainable development in Nigeria, the following strategies according to Nwangu (2007); Uwaifo (2009) and Eze (2013) will help to solve the problem of entrepreneurship education in the country.

- (a) There should be some form of genuine school- work based learning incorporated in some studies as part of the national economic development strategies. This implies enriching the curriculum to incorporate more science and technology training. The development of apprenticeship scheme would give new graduates some work skills and experiences.
- (b) There should be School-based enterprises where students identify potential business, plan, create and operate small business.
- (c) Government should establish small business schools where interested students and community members can participate. This will make students to be self-reliant.
- (d) Government should develop entrepreneur internship programme by matching students with locally successful entrepreneurs with clearly established education programmes.
- (e) The Government should establish an enterprise college aimed at fostering the specific skills required for entrepreneurship. This will serve as skill-acquisition centre for the youths.
- (f) Government should create an economic friendly environment. This centres on reduction of taxes on small scale businesses.
- (g) There should be enough incentives for students of science and technology schools. This will motivate them to establish their businesses after school.

Need for entrepreneurship education in science and technology

As our Nation moves to become the twentieth largest global economy by 2020, the need to integrate our education and entrepreneurship becomes an important issue for wealth creation and employment generation. Educational Institutions therefore, need to provide enterprise centres and technology parks within their respective domains to generate ideas for commercial applications in order to start-up of micro, small and medium-sized enterprises. Our school system should ensure that social and economic opportunities are created in order to enable private sector come up with viable strategy capable of reducing current massive unemployment particularly among the youths in the country. It is no longer news that there are no job opportunities for the youth, unemployment is everywhere. Therefore, there is need for the students to develop and equip themselves so as to be free from dependency to independency and from job seeking individuals to job creators. With the proliferation of schools, colleges and universities presently and in the past, Nigeria has produced a varietal cargo of unemployed and unemployable youths. The result of this is the agitation for entrepreneurship education as one of the ways for solving unemployment. The private sector such as Manufacturers Association of Nigeria (MAN), corporate bodies such as banking industry, oil and gas industry, have welcome the initiative. Ossai & Nwalado

(2012) had earlier justified the need for entrepreneurship education for the Nigeria students describing it as: Skill they require to develop an entrepreneurship orientation and mind-set as a necessary preparation for the business, science and technology and professional lives after their formal university education by complementing their academic education with entrepreneurship and financial education, they are leveraged with the qualities and skills they need to become more relevant in today's global market places.

Forms of skills in science and technology education

There are assorted forms of skills students/graduates are expected to acquire through Science and Technology Education (STE);

1. *Innovative Skills*: the graduates of STE are expected to have acquired innovative/creative skills to enable them introduce something new that may be capable of sustaining them and others in the society. This sort of skills allows the individual to delve deeper, think of products, goods and services that are of importance to the society, which are not yet introduced into the society. Science and technology education trainers/teachers should endeavour to train their students on how to be creative so that they'll be able to inculcate the attitude of creativity in the students. Innovative skills involve integration of new ideas and/ or accumulation of new knowledge, casting a broader net for the discovery of potential opportunities. When the STE students are trained to develop such skills, they'll contribute positively to their nation's economic growth and development through jobs creation. The main aim of development in a nation is to improve the living standards of the people through effective utilization of human and material resources; hence developing nations must be fully involved in the development of Science and Technology education training for self-reliance. This according to Ojeifo (2013) will contribute positively to reduce poverty and hunger thereby boosting the economic and social status of any nation.
2. *Practical Skills*: when a graduate of STE is able to handle tools, equipment and at same time know how to join one or two objects to produce another, she/he is able to transform materials into products and services. Practical skills are acquired only when science and technology teachers are practically sound to teach the students through practical methods. But surprisingly, many science and technology education teachers' uses traditional teaching methods to teach the students and most times, the courses of study are theory based. Practical skills provide the STE students with occupational/career abilities to ensure self-reliance.
3. *Self-Motivation Skills*: Having acquired the innovative and practical skills, the study will be able to develop self-motivation skills. Self-motivation skills deal with the ability to be moved such that the practical and innovative skills acquired can be put to production of goods and services. Self-motivation is the ability to be self-confident with extra drive and commitment to make sure necessary steps are taken to make dreams of successful business a reality (Aladetan, 2014). Without the self-motivation skills, science and technology education graduates would not be able to establish themselves or be self-employed. In the world of struggle like ours, one must be motivated to be able to succeed. This is the role of the STE teacher. She/he must inculcate the attitude of self-motivation in the students such that they can stand in the midst of others professionals.
4. *Financial Resources Skills*: this is the skill that will enable the student to be able to handle money judiciously. This sort of skill includes knowing how to stretch the limit start up that you have, spending only when needed, identifying the best pricing structure for your business in order to get the best return for your products and services (Nwagwu, 2007). For one to establish an enterprise, spending

frivolously must be avoided. Therefore, science and technology teacher through teaching/training should be able to make the students develop this sort of skills. Nwachukwu & Nwamuo (2010) concluded that STE graduates who may wish to be self-employed are deeply sceptical to establish on their own for lack of capital or financial resource skills. This situation inhibits the survival of the few existing enterprises around.

5. *Marketing Skill*: This sort of skill involves thinking about how to reach the targeted audience for product and services. This entails understanding what people want, listen to the people's needs and interacting well with other people. Any STE graduates who acquire this sort of skill crossed the bar of unemployment because, with marketing skill, she/he can market him/herself to other established industries. For every goods and services/business, it must be well marketed. Therefore, when the students acquire this sort of skills, it is easy for them to stand alone and be independent of the governments' white collar jobs. To achieve this, the curriculum planners must make sure that opportunities are made available for science and technology teachers to impart such skills in the students.
6. *Time Management Skill*: this involves the ability to plan and manage time with a clear idea of the things to be done in a day. The graduates of STE must be able to multi-task and prioritize the day's tasks to be successful in any form of business or trade.
7. *Administrative skill*: the STE trainers are expected to teach their students to acquire skills on how to fill, bill, print, make invoices, collect payments, manage receipts, keep proper accounts of goods and services, tools, materials and equipment. Studies has shown that why many vocational enterprises are not flourishing is because, majority of the owners of such enterprises lack administrative skills. Many of them do not have records of how much money realized from the enterprise, how much cash to reinvest and how much gain made from an existing enterprise. This is why many small scale businesses do not survive. The curriculum planners and the school administrators should adjust science and technology education training programme to accommodate administrative training such that students or graduates will be able to acquire such skill to be self-reliant.
8. *Professional Skill*: Ojeifo (2013) asserts that this sort of skill is very necessary for success in an enterprise. It is obtained in a cooperate arrangement between the school and the industries. It also involves the code of conduct, customer care technique and opportunity recognition. Uwaifo (2009) listed some skills that the STE students must acquire to be self-reliant, enter the production business world to establish successful and thriving small scale enterprises in a developing economy.

Basic science and technology teacher as an entrepreneur in a school system

From the analysis, the basic science and technology teacher who implements the curricular package should have acquired these entrepreneurial skills. He/she should be able to identify skills that are needed and required for entrepreneurial activities, especially with respect to the teaching resources within the locality. He/she needs to explore the learner's environment to be able to meaningfully equip them for better skill acquisition.

According to Momo (2012), for a teacher to operate well and successfully as an entrepreneur in teaching enterprise, the following entrepreneur traits or skills are essential:

- (a) He/she must have requisite technical knowledge and expertise. For instance, a social studies teacher should not be asked to teach basic science and technology or vice versa;

- (b) The wisdom to seek out and listen to advice of those who know what he/she does not know. Proud teachers who claim monopoly of knowledge are bad entrepreneurs
- (c) Ability to learn from the mistakes.
- (d) Ability to make quality decisions and to be self-disciplined. He should ensure that the students imbibe the right entrepreneurial skills to be productive.
- (e) Students' management and decision making skills. The teachers should be able to draw local resources to meaningful products.
- (f) The basic science and technology teacher needs to possess basic skills necessary to enable him function effectively. This will enable him produce JSS graduates that would increase the employable level of their school products.
- (g) The teacher needs skills and qualities such as educational and business skills and personal attributes and management capabilities.
- (h) The basic science and technology teacher needs these basic skills to function well which include sales and marketing skills, reaching the audience with) the products.
- (i) Self-motivational skills where he sees himself as manager of his class and the resources at his disposal.
- (j) Time management and good manager of human and material resources. This means that the acquisition of relevant entrepreneurial skills by the students will enable them to produce materials that would make them contribute to the family's economic base. To achieve this, problems associated with the implementation of Science and Technology Education need to be given serious attention.

Problems of science and technology education in Nigeria

Skill acquisition in Nigeria science and technology education is faced with quite a lot of problem. These problems are highlighted as follows:

1. *Inadequate Laboratories and Workshops:* With the astronomical increase in the level of intake in our schools, it has been observed that laboratories and workshops on the ground fall - short of the requirements of meeting up with the excessive intakes of student. Over the years it has been observed that there has been a short fall in supply of equipment as it relates to the current trend of skill necessary in the industry, available in the country.
2. *Poor Learning Attitude:* Studies have reveal that most students in our institution of learning allow themselves to be carried away by-other non-knowledge contributing activities in the institution. They do not attend classes regularly as they are expected to, by the regulations yet they still find themselves • getting promoted to the next level.
3. *Poor Foundational Background:* Lack of equipment in our schools has retarded skill acquisition, and where this equipment is available they are not install, this has gone a long way in depriving the students, the required the foundational skill to be acquired, on which the next", level of education is required to build on.
4. *Poor Parental Contribution to skill acquisition:* Parenting entails caring, protection, guidance, provision of basic needs for a child up keep in order for him or her to be properly equipped to meet the challenges of life in accordance with the laws of the land. Studies reveal that parents have wrongfully guided their children into areas of profession where they have less flair for, subsequently leading to lack of genuine interest. This interest is very important for effective skill acquisition to take place, as the saying goes no interest no memory. The memory must have the capacity to accommodate new ideas that come in as skills.
5. *Misplacement of Students on Industrial Training:* Industrial Training (I.T.) of students is a programme that is aimed at making up for the inadequacies in the level of equipment and skill acquired in the institution as it relates to the proficiency of students in handling the various equipment they are expected to be acquitted with.

Studies have revealed- that some student's do not carry out the programme in companies that engages and practice the particular activity that is required of them. For instance, an engineering student engaged in the teller section of a bank all through his industrial training programme.

6. *Poor Supervision of Students on Industrial Training:* Studies have reveal that appointed Industrial Training supervisors from the schools rarely visit the students at the place of training as at when they are supposed to do so. This has made students to inculcate a lackadaisical attitude toward the programme. Some of them present addresses that are not traceable while some give fictitious address are presented to discourage the supervisors.
7. *Absence of Multinationals:* Most multinational companies in the country have completely refused to contribute to the development of our students by way of donating equipment to schools that are close to them.
8. *Poor Subvention on the Part of Funding Agencies:* Most of our schools are suffering from inadequate fund for the payment of technologist and technicians for extra time input.
9. *Lack of Quality and Vocational Manpower:* Our workshops and laboratories are not adequately staff, a situation where only one technologist is made to handle a large group of students without support staff to reduce the workload.
10. *Too Much Emphasis on Theoretical Knowledge:* Instead of theoretical work more time should be allocated for practical work and demonstration.
11. *Wrong Orientation:* The misconception that skill acquisition is only for poor or less intelligent students has affected the orientation of our students negatively. Hence, it is high time the students are made to understand that skills acquisition through science and technology education remain a vital tool for individuals, economic and National development.

Science and technology education for sustainable national development

Nation building or development has to be sustainable in practical terms. This, however, is dependent on available resources, the ability to optimize the application of these resources beneficially as well as keeping the physical environment safe, healthy, stable and highly conducive. Sustainability, according to the World Commission on Environment and Development (2015), is the development that meets the needs of the present without compromising future generations' opportunities to meet their own needs. Sustainability includes a just and peaceful society, gender equality, and intergenerational equity. Science and technology education constitutes a vital engine for economic, social, practical and all round development of any nation. It has been identified as a tool for sustainable, virile and stable economy. In Nigeria, science and technology education was previously not seen as fundamental to national development or for the economic development but Nwagwu (2007) argues that science and technology education is also linked to human resource development, economic growth and at the same time impacts on the overall development of the individual and society. If science and technology education is efficiently implemented with well integrated and necessary entrepreneurial skills, the country could move to the next level in terms of poverty alleviation and employment generation. In a bid to achieve successful implementation, science and technology policies are in place. Uwaifo (2009) asserts that no nation can move forward technologically, industrially or economically without developing a strong partner initiative in the creation of wealth, poverty reduction and employment generation with required skills. These skills include technical, human and specific skills necessary to cope with the challenges of the future since science and technology education is a vital tool for the sustainable advancement of any nation.

Thus; Science and technology education.

- (a) Serves as learning and training centre for the translation of dreams and ideas into successful ventures.
- (b) Builds technical and conceptual skills in the individual that prepares him for today's world of work.
- (c) Leads to technological advancement.
- (d) Reduces poverty and idleness.
- (e) Directs towards self-reliant and sustainable means of livelihood.

Science and technology policy

Skill acquisition in science and technology over the year has taken a new dimension as result of some policies fashioned out by the government both at the federal and state level, has brighten the future of skill acquisition in our country. These policies are:

1. The establishment of national Board for Technical Education (NBTE).
2. Provision of vocational education service to train, retrain and upgrade employed and unemployed workers in new skill for which there is demand in specific occupations or employment in specific occupations or employment.
3. Assisting the state to expand, improve, modernize and develop education programme that will meet the needs of the nation's existing and future work force for marketable skills to improve productivity and promote economic growth.
4. Financing the training of youths and adults who need science and technology education is an imperative to the overall skill acquisition. Government should set aside special fund for this purpose.
5. Assisting the most economically deprived areas to raise employment and occupational competencies and in making science and technology education more responsive to the labour market in Nigeria. Hence, strict adherence to the outstanding policies could be a driving force towards the attainment of the objectives of entrepreneurship education.

Conclusion

It is clear that there are many factors militating against the progress of entrepreneurship development through science and technology education. The identified challenges can be handled if the government and the policy makers are truly ready to implement the strategies and policies that support empowerment and jobs creation. Science and technology education and entrepreneurship centre tutors/trainers as well need to be mobilized, motivated and re-trained to understand the impact of collective efforts and responsibilities in the running of such training programmes. This will enhance achieving the educational goals of Science and Technology Education of the Federal Government of Nigeria. Also, when the students are given the required science, technology and entrepreneurial skills needed to fit adequately into the world of work, through effective teaching/training methods or techniques, they will not only become entrepreneurs but also capable of contributing their quota towards the economic growth of the country.

Recommendations

1. Educational programmes at all levels of education should be made relevant to provide the youths the needed entrepreneurial skills.
2. Nigerian Government should give adequate attention to full blown entrepreneurial education in Nigeria.

3. Both government and private sectors should provide equipment and facilities in science and technology school for acquisition of skills.
4. Government and other education stakeholders should make sure that educational programmes at all levels of education are made relevant to provide youth and graduates' needed science and technology skills.
5. Science and technology educators should involve technological, technical and business organisations, the government, NGOs and successful industrialists in the service delivery to the students.
6. A training plan that states clearly what the student is expected to learn and what the employer is expected to provide, should be developed as an integral part of national strategy.
7. Regular seminars and workshops should be organised to keep teachers abreast of current development in the field of science and technology education and how best to impact them on their students.

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