

Restructuring STM (Science, Technology, and Mathematics) Education for Entrepreneurship

F. O. Ezeudu, T. O. Ofoegbu, N. J. Anyaegbunnam
University of Nigeria, Nsukka, Nigeria

This paper discussed the need to restructure STM (science, technology, and mathematics) education to reflect entrepreneurship. This is because the present STM education has not achieved its aim of making graduates self-reliant. Entrepreneurship education if introduced in the STM education will produce graduate who can effectively manage their personal businesses. Entrepreneurship education was explained and the advantages outlined. The paper gave an insight into what the chemistry education will look like when entrepreneurship education is included using secondary school chemistry. This situation applies to biology education and in the application of technology to teaching and learning.

Keywords: entrepreneurship, STM (science, technology, and mathematics) education, restructuring, curriculum

Introduction

Nigeria is underdeveloped because her citizens are still mentally and economically colonized. Political upheavals, economic depression, and unemployment have frustrated development in Nigeria. It is hopeful that a lasting solution to these problems would be achieved through education. Many people have defined education. Okeke (2007) defined education as the process individuals undergo through the acquisition of knowledge, skills, abilities, and attitudes that are necessary for effective living in the society. It then follows that education should prepare people to be enterprising as they may be employees and entrepreneurs/employers. In Nigeria, today, the above-named definition of education is farfetched. Graduates find it very difficult and impracticable to get job or to handle their own business or be self-employed. The SIWES (students' industrial work experience scheme), which was introduced by the National Policy on Education, has not helped the graduates to be self-employed or employable. There is an urgent need to overhaul our educational system. To this end, STM education should be able to solve the problem of education. It is supposed to provide the basic tools for industrialization and national development (Maduabum, 1999). It should bring economic and social development by providing employment and improve the welfare of the recipients (Aguete & Agwagah, 2007). It should foster the students' habit of scientific attitudes and help them to acquire skills of constructive reasoning, effective mental activity, and imaginative thinking. It is only STM (science, technology, and mathematics) education that can help Nigerian youths become confident and disposed to survive the harsh social and economic conditions of our times. The question is: Has STM education been able to achieve its objectives? The obvious answer is "No" because according to Ayogu (2007), science education has a lot of problems in Nigeria. Some of the problems

F. O. Ezeudu, Ph.D., Department of Science Education, University of Nigeria.
T. O. Ofoegbu, Ph.D., Department of Arts Education, University of Nigeria.
N. J. Anyaegbunnam, Ph.D., Department of Science Education, University of Nigeria.

are: (1) Lack of policy implementation guidelines: This means that there are no specific steps in the policy to actualize its objectives, which stated that there should be well-trained and well-motivated teachers; (2) Resources: (a) Human resources: Science teachers are inadequate in Nigerian schools so that they are also trained laboratory technologists and laboratory attendants; and (b) Material resources: Most of the schools do not have well equipped laboratories. Improvised materials are also lacking; (3) Attitude to work: Nigerian teachers are poorly motivated and salaries are paid irregularly. This gives rise to poor teaching, indiscipline on the part of teachers and the students, examination malpractices, and failure in external examinations; (4) Administrative problems: Administrative problems are hindrance to advancement in science education. Most policies are hardly implemented. Those in-charges of education are not science-inclined and so they show no interest in science issues; (5) Inadequate funding: Education budget is usually low and not much is given to science education. This has negatively affected the teaching and learning in schools as well as research and laboratory activities; (6) Corruption: Dishonesty, laziness, bribery, embezzlement, and looting of public fund meant for science education. In view of the problems stated above, STM education in Nigeria has failed in achieving its objectives. It is then penitent that STM education should be restructured towards entrepreneurship education. This means that a cash-productive education should be introduced to make for maximum self-development and self-fulfillment (Iloputaife, 2002).

What Is Entrepreneurship Education?

Entrepreneur comes from a French word *entreprendre*, which means to undertake, i.e., one who undertakes to supply goods or services to the market for profit (Onyenyi, 2003). Leebaert (1990) defined entrepreneurship as a process of organizing, managing, and assuming risk of a business. Butter (1990) defined the entrepreneur, as one who manages and takes the risks of business enterprise. It is, therefore, the process of owning and managing a business enterprise with the hope of making profit. Entrepreneurs invest their own capital in a business and take the risks associated with it. Entrepreneurship elements are combination of motivation, vision with judgment, communication, determination, optimism, courage, endurance, and the power of creating cooperation, which finds market opportunities (Bolarinwa, 2001).

Ojukwu (2001) described entrepreneurship development as a programme of human capital development inputs aimed at increasing the supply of adequately trained entrepreneurs who are motivated to make a success out of a business. Entrepreneurship education is defined by Bolarinwa (2001) as education provides training, experience, and skills that are suitable for entrepreneurial endeavours. Entrepreneurship education should, therefore, prepare graduates with entrepreneurial knowledge, competence, and skills needed to be self-reliant.

Ashmore (1989) stated that entrepreneurship education offers student's opportunity to anticipate and respond to changes. Iloputaife (1997; 2002) stated that functionality in education (entrepreneurship in STM education) would serve to:

- (1) Identify students that possess entrepreneurial traits;
- (2) Motivate and develop students for launching and managing their own small-scale business enterprises;
- (3) Create necessary awareness and motivation in students for promoting self-employment and alternatives to wage empowerment.

Odo (2001) stated three benefits of entrepreneurship as: (1) It fosters economic growth; (2) It increases productivity; and (3) It creates new technologies, products, and services.

Advantages of Entrepreneurship Education

According to Bolarinwa (2001), entrepreneurship education has the following advantages:

- (1) It will help the students to form a base of knowledge about the function and operation of a business and develop some level of familiarity and comfort with business environment, since technology changes micro-enterprises;
- (2) It will play as a complementary role in developing the occupational knowledge, job skills, and work experience;
- (3) It offers opportunities to students for job experience and for earning, saving, and investing money at an earlier stage of life than their peers, contributing to their belief in their abilities and a sense of self-worth;
- (4) There will be a great reduction in the high rate of unemployment in the society, and self-employment and business ownership will become viable and appealing goals for today's students.

The STM education has failed in its responsibilities of fostering scientific skills and attitudes as the graduates roam the streets with no job and no skill to start off their own business. Therefore, there is the need to restructure the STM education for entrepreneurship. There is also the need to introduce into the school curriculum entrepreneurship education for the acquisition of right habits, attitudes, and skills as a means of surviving in the face of unemployment. In fact, there should be total overhaul of STM education in Nigeria.

A new curriculum for STM education should be developed and various sectors like the Nigerian Business Educators Association, Chamber of Commerce and Industries, Manufacturers Association of Nigeria, etc., should be included in the formation of the new curriculum. The society, the schools, the students, the trade associations, and club and business owners should be included in the development of the course contents. The course contents should reflect the local labour markets and the students' needs.

According to Iloputaife (2002) STM education should include in its objectives:

- (1) Taking up employment in industries and factories requiring their areas of specialization;
- (2) Providing employment for self and others;
- (3) Being computer literate and being able to service and maintain computers.

STM education classroom should reflect business sessions. Electrical applications like locally made torch lights that could be constructed for sale. Detergents, soaps, pomades, perfumes, beads, etc., could be made and sold to make money. Dyes, colourings, and spices could be produced by students for sale. There should be a shop in each institution to sell students' products. Seminars, workshops on starting a business, small business management, profit utilizations, personnel administration, etc., can be organized for both teachers and students. There should be a way of rewarding the students and the teachers from the yields realized from the ventures. This will increase their enthusiasm and enhance their interest. At least, they will experience profit making. Students should be imparted with open mindedness, intellectual honesty, love of God, and love of their neighbours. Most products to be made and sold should come from the local environment, which differs from school to school. The various levels of government should fund STM education to ensure a successful, fruitful, and result-oriented STM education. STM education should also inculcate values, such as punctuality, regularity, tenacity to work, and reward for merit.

Insight Into the Kernel of the Issue Using Chemistry as Example

Curriculum designed for chemistry education in tertiary institutions should include courses in

entrepreneurship education.

For the SSS (senior secondary school) chemistry, the following should be included:

(1) For SS 1:

- (a) Meaning of entrepreneurship;
- (b) Basic elements of entrepreneurship;
- (c) Characteristics of entrepreneurship;
- (d) Key steps to entrepreneurship;
- (e) Causes and remedies of entrepreneurship failure.

(2) For SS 2:

- (a) Laws and procedures relating to registering a small business;
- (b) Sources of fund for financing small-scale business;
- (c) Small business management-principles and application;
- (d) Profit utilization and credit and debit management;
- (e) Computer/information processing and international business.

(3) For SS 3:

- (a) Seminars and Workshops on entrepreneurship;
- (b) Management of the school shop;
- (c) Production and selling of items produced during practicals.

The SS 3 students can produce the following items during practicals:

- (a) Ethanoic acid for preserving food-flavouring food and dyes;
- (b) Esters used in making perfumes;
- (c) Butter and margarine;
- (d) Soap and detergents;
- (e) Pomades;
- (f) Glucose used in making sweets and jams;
- (g) Breads and biscuits;
- (h) Cassava flours;
- (i) Acids for charging batteries;
- (j) Shoe polishes, palm kernel oil, vegetable oils, etc.;
- (k) Insecticides, antiseptics, and disinfectants.

Challenges of Entrepreneurial STM Education

Inconsistency in Policy Implementation

STM education polices may not be implemented, supervised, and evaluated by the relevant government officials.

Poor Laboratories and Facilities

Unqualified instructors/teachers, inadequate instructional equipment/materials, and lack of properly equipped laboratories may hinder the progress of entrepreneurial STM education.

Inadequate Fund

There may not be enough funds to provide the necessary materials needed for the programme. This may be

as a result of poor allocation of fund to education sector. Non-payment of teachers' salaries or science teachers' allowances or even promotion of teachers can result in low morale on the part of the teachers who may not like to take up extra job resulting from entrepreneurship.

Solution to the Problems Militating Against Entrepreneurial STM Education

The solutions to the problems militating against entrepreneurial STM education are as follows:

(1) STM policies as specified in the national policy on education must be implemented, supervised, and evaluated by those concerned with STM education. The development of intellectual, manipulative, social, and other skills that will ensure self-fulfilled and self-reliant citizens should be the watchword;

(2) Properly equipped laboratories must be provided in schools. These laboratories should have enough equipment, materials, and even improvised materials;

(3) Laboratory technologists, technicians, and laboratory assistances should be provided and re-trained in improvisation;

(4) Adequate fund should be allocated to education especially to STM education. Teachers' salaries and science allowances should be paid on time. Some of the money generated from the sales of the products should be given to the students and the teachers to sustain their interest.

Suggestions and Recommendations

STM education should be diversified, made more functional, and geared towards solving the problems of contemporary society. To this end, it should be restructured to reflect entrepreneurship so that the graduates should be self-reliant, empowered, and self-employed. Hence, STM education should be a priority in Nigerian educational system to ensure a successful, fruitful, and result-oriented entrepreneurship education. Teachers' pre-service and in-service workshops and seminars should be organized.

Values, such as punctuality, regularity to work, honesty in sales, reward for merit, and other attitudes that will enhance productivity and promote orderly societal growth should be enforced.

STM laboratories that will produce the products to be sold should be stocked with equipment and materials.

STM practical lessons should be geared towards production of materials for sale to the college communities and outside the college environment.

There should be advertisement units to advertise the products to the public. If these suggestions and recommendations are made and implemented, STM education will surely transform the society and ensure rapid development of the nation.

Conclusions

Entrepreneurship is the hub of national development and STM education should form the base. Nigeria should therefore gear towards functional entrepreneurial education through diversified entrepreneurial STM curriculum. STM education should be diversified and made functional than its present status. It should be geared towards solving the problems of our contemporary society. To this end, STM education must be re-structured to include entrepreneurship. STM classroom should be business like to ensure education for work, and employment and education for self-reliance.

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