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Developing Improvisation Skills For Alleviating Poverty In Nigeria: The Place Of Chemistry In Entrepreneurship Education

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Introduction

One of the activities in science is experimentation. It provides a forum for practicalising the theoretical knowledge gained in the classroom and for demonstrating the psychomotor skills of a teacher and learner. It further aids the understanding of difficult concepts in the curriculum; creates opportunity for the testing of facts and theories in science. It is believed that learners can achieve more if given the opportunity to practicalise what they have been taught in the classroom. Experimentation thus gives room for better attainment of lesson objectives. Experimentation in science is however dependent on the availability of science equipment for proper understanding, development and application (Ugwu, 2008)

One of the goals of Education in Nigeria is the acquisition of appropriate skills, the development of mental, physical and social abilities and competencies as equipment for individual to live in and contribute to the development of the society (Federal Government of Nigeria, 2004). The realization of this goal can be impeded by non-availability of science equipment that can ensure effective teaching and learning. Many authors have, however, reported the issue of inadequacy of science equipment in educational institutions in Nigeria. (Ogunleye, 2007 in Ugwu, 2008; Ogunmade et al 2006; Nwagbo, 2008; Bajah, 1982; Osobonye, 2002). It has also been reported that the non-availability of science equipment in educational institutions serve as barrier to effective science teaching (Adeyemi, 1990; 2007), which confirms the persistent poor performance of students in science in educational institutions in Nigeria over the years. The situation is attributed to various factors, prominent among them being the issue of inadequate science equipment. The issue of inadequate funding of the education sector is also a contributing factor to the inadequacy of science equipment in educational institutions. Over the years, financial allocation to the education sector has been inadequate for the needs of the sector thus making it impossible to procure adequate equipment for teaching and learning.

Asiruiwa (2005) regarded education in science and technology as centrally and necessarily concerned with teaching or training of individual in order to acquire systematic skills, knowledge and attitude and application of these to the society. In spite of the benefits of education to man and the society, the educational system has continually turned out products (graduates) with skills and attitudes that are neither needed in the modes of production nor saleable in the limited industrial-commercial establishments. This, according to Olowo-Onyanemi (2007) has continuously led to mass unemployment of school leavers with the attendant problem of increased economic, social and moral vices. Aggarawar (1980) declared that all knowledge a learner gains will be of no use if he or she cannot make ends meet in his life after school.

The goal of education is entrepreneurship (Iykepolo, 2007). That is, the production of an individual who is self-reliant, and an employer of labour. Entrepreneurship plays a significant part in employment generation in any country because it enhances self-employment or self-reliance. This paper therefore focuses on developing entrepreneurial skills through active learning of process skills.

Concept of and Rationale for Improvisation in Nigeria Education System

Various Authors have defined the concept 'improvisation' in different ways. Ogunbiyi, Okebukola and Fafunwa (1990) defines it as the act of substituting for the real thing that is not available. Bajah (1991) takes it to be the use of substitute equipment where the real one is not available. Kamoru and Umeano (2006) further define it as the act of using materials obtainable from the local environment or designed by the teacher or with the help of local personnel to enhance instruction. According to Ihegbulem (2007), it is the act of substituting for the standard equipment or instructional materials not available, with locally made equipment or instructional materials from readily available natural resources. From these opinions, improvisation entails the production of equipment using available local and cheaper resources and the use of such equipment for effective teaching.

Improvisation serves the following purposes in the education system:

- Reduces the money spent on the purchase of equipment in educational institutions;
- Ensures the realization of lesson objectives;
- Helps in solving the problem of lack of equipment in educational institutions;
- Gives room for a teacher to demonstrate his creative skills;
- Gives room for the use of cheap local materials as alternatives to the expensive foreign ones;
- Encourages students towards the development of creative abilities;
- Enables teacher to think of cheaper, better and faster methods of making teaching learning process easier for students;
- Affords students the opportunity of becoming familiar with resources in their environment.

There is no gainsaying that science and technology plays prominent role in the development of a nation. According to Okeke (2007), science and technology serves as the key to modernizing or developing society. The developed nations in the world today have achieved greatness due to the special attention given to science and technology. One of the strategies for enhancing the growth of science and technology in a nation is by paying attention to the training of children at the foundation stage. This implies that there should be more focus on science and technology at the primary and secondary levels of the education system. Over the years, issue of inadequate equipment for the teaching of students in educational institutions in Nigeria has been predominant. It is therefore imperative that the issue of improvisation of equipment be given adequate attention.

Many factors make the call for improvisation of equipment in educational institutions in Nigeria expedient. One of these is the persistent poor funding of the education sector. Over the years, financial

allocation to the education sector has been inadequate for the realization of educational objectives. There is therefore inadequate science equipment in educational institutions at all levels in the country. For instance, many authors such as (Ango & Silas, 1986; Cirfat & Zumyil, 2007; Ogunniyi, 1983; Ajaja, 1998; Ajaja Kpandgbang, 2000) have observed the ineffective teaching of Biology in educational institutions in Nigeria due to non-use of science equipment for teaching, among other factors. Consequently, there is poor performance of students in Biology in internal and external examinations (Okafor, 1993; Chikobi, 1997; Igwe, 1990), a situation that calls for urgent attention of all education stakeholders.

Concept of Poverty and Types

The perception of what constitutes poverty varies from individual to individual, society to society and culture to culture. There is thus no universally accepted definition of the concept. Some people consider security, freedom and self-esteem and general well-being. According to Otaigbe (2002), poverty is an unacceptable level of living conditions, which some people find themselves due to lack of/inadequate financial and material resources. To Iguisi (2002), poverty is the deprivation of material requirements for minimally acceptable fulfillment of human needs including food, shelter, basic health and education. Whatever the definition poverty implies that somebody that is poor lacks the necessities of life and shows some physical, emotional and psychological symptoms.

United Nations has identified three types of poverty including:

- *Absolute poverty*: Inability to provide for physical subsistence to the extent of being incapable of protecting human dignity including food, clothing and shelter, portable water, health care, basic education, public transport and others.
- *Relative poverty*: Inability to satisfy basic needs and others.
- *Materials poverty*: Lack of ownership and control of physical assets such as land, animal husbandry as well as capital and other inputs for productive endeavours.

Education Poverty: The Role of Improvisation in Alleviating it and ensuring-Reliance

Education in Nigeria is affected by poverty. Poverty in education can be viewed from the perspectives of the resource inputs (funds, teachers and equipment) and access to the system among others. Okeke (2007) confirmed that education statistics in Nigeria indicates increase in enrolment at all levels of the education system as well as increase in literacy rate. Unfortunately, many school-age children are yet to have access to education today. This implies that the increase in enrolment and literacy rate are not holistic and are yet to bring about corresponding national development hence the country is today still being regarded as a developing nation.

Poor funding of education has been another issue at stake in Nigeria. Over the years, funding of education sector has been inadequate in quantity and epileptic in supply. Allocation to the sector has been insignificant relative to the total budget of the nation. For instance, a (Federal Ministry of Education, 2003) statistics confirm that during the period 1990 to 2002, allocation to education sector in Nigeria was between 4.60% and 14.85% of the total budget despite the importance of education to the nation's development. Poor funding of the sector makes it impossible for educational institutions to provide adequate equipment for teaching and learning.

Another aspect through which poverty of education can be viewed is the inadequacy of teachers. In many educational institutions in Nigeria today, teachers are inadequate relative to the population of students. As at 2005, there were 599,172 teachers in primary schools relative to the number of pupils in primary schools, which stood at 2,115,432 with pupil-teacher ratio in the range of 36 to 43 from 1999 to 2005 (Federal Ministry of Education, 2007). The situation has been undermines qualitative teaching in educational institutions.

Improvisation is a major way of solving the problem of inadequate equipment in educational institutions; it goes a long way in reducing the effects of inadequacy/lack of basic science equipment and contributes to the alleviation of poverty in the education sector. In this period of global economic recession, which is characterized by high-level unemployment improvisation can play a key role in alleviating this problem. Science teachers should involve their students in the act of improvisation so that when they eventually graduate from school, they can set up small-scale industries for the production of some science equipment. This will encourage self-employment rather than relying on white-collar jobs from government.

Government can encourage teachers to imbibe the culture of improvisation through the provision of loans to them. This can enable them produce the equipment on a large scale and discourage the over reliance on foreign materials at the expense of local ones. This will also encourage the local raw material producers to strive to produce more materials for improvisation.

The place of chemistry in Entrepreneurship

Entrepreneurship is defined by Nickel in Uzoka (2005) as a clear manifestation of effective manipulation of human intelligence as demonstrated in creative resources in a new way in the course of creating a new business concept or opportunity within an existing firm.

An entrepreneur is a person who organizes and manages a business, and undertakes and assumes risks for the sake of profit. He or she tends to start ventures that build on specific skills already acquired either through formal education or in a certain occupation or industry. An entrepreneur is the chief executive or leader of one-man business (Ugiagbe, 2007). In other words, an entrepreneur is one that creates, founds or originates. He is an architect, author, creator, inventor, maker or an originator (Roget's II, 2003), of a business idea or venture.

Science is a branch of study especially concerned with facts, principles and methods. It is the knowledge acquired by careful observation and deduction of the laws which govern changes and conditions by testing those deductions by experiments. Chemistry as a physical science, is the study of the material substances that occur on earth and elsewhere in the universe. It is concerned with the utilization of natural substances and the creation of artificial ones. In the words of Holman (1995),

“Studying Chemistry helps you to understand how materials behave, whether they are in the kitchen, in your clothes or in a builder’s yard. It helps us to understand how to make better materials, how to get the energy we need and how to protect the environment”(p:5)

Chemistry involves process skills which are mental tools used in the discovering and acquiring of scientific knowledge. It includes conversion, making, process, production, rebirth, transfiguration, etc (Roget's II, 2003).

Skills are natural or acquired capabilities in a specific activity. It is the ability to do something well. Entrepreneurial skills are occupational survival skills (Nelson & Leach, 1981). These skills are equivalent to what is called process skills in science (Chemistry). The process skills in chemistry are the paths (or ways) and strategies followed by the chemist in order to arrive at the product of science. They include:

- | | |
|---------------------------|-----------------------------|
| (1) Observation | (2) Classification |
| (3) Measurement | (4) Counting numbers |
| (5) Recording | (6) Communication |
| (7) Prediction | (8) Hypothesis |
| (9) Inference | (10) Experimentation |
| (11) Research | (12) Interpretation of data |
| (13) Controlling variable | (14) Generalization, etc. |

The use of these process skills over a period of time lead to an accumulation of scientific knowledge in forms of scientific laws, principles and theories, all of which put together constitute the products of science. (National Teachers' Institute (NTI, 2006).

Development of these process skills should lead to the acquisition of the skills that successful entrepreneurs use to start their ventures. Some of the entrepreneurial skills are:

- | | |
|--------------------------|---------------------------|
| (1) Creative thinking | (2) Planning and research |
| (3) Decision making | (4) Organization |
| (5) Communication | (6) Team building |
| (7) Marketing | (8) Financial management |
| (9) Record keeping | (10) Goal setting |
| (11) Business management | |

(<http://www.mvp.cfee.org/en/selfassessmentskill.html>., 2009).

Olalekan, (1998) outlined the following as part of entrepreneurial skills – observation, determination and interpretation of market, exhibition of knowledge and mastery of skills, ability to communicate, etc. All these skills are encompassed in the process skills.

Entrepreneurship occurs when an individual develops. A new venture, a new approach to an old business or an idea or a unique way of giving the market a product or service by using resources in a new way under conditions of risk (Umar, 2006). Entrepreneurship helps to create wealth, self-direction, satisfying career and also adds value to society's well-being. Chemistry, on the other hand, is

concerned with the utilization of natural substances and the creation of artificial ones. It is an artistic enterprise which offers a lot of occupational opportunities in areas like:

- *Manufacturing of goods* such as pharmaceuticals, foodstuffs, packaging, detergents, soap, flavours, fragrances, pulp and paper, paints, candles, metals, textiles, agricultural products, oxygen, chlorine, ammonia, sulphuric acid, etc.
- Sales of goods,
- Analytical and Consultancy services
- Researching
- Laboratory services
- Consumer education.

The acquisition of professional qualification in Chemistry equip an individual with skills to be self-employed because of having acquired entrepreneurial and/or process skills. Functional Chemistry education emphasizes applicability or transferability of the acquired knowledge to the immediate environment. This is the purpose of Chemistry education as stated in the *National Policy on Education* (2004) which includes the “Acquisition of appropriate skills and development of mental, physical and social abilities and competencies to contribute to the development of his society”. (p;67) Consequently, Chemistry, like entrepreneurship, aims to equip an individual to be self-reliant.

Teaching Chemistry to Develop Entrepreneurial Skills

Developing entrepreneurial skills through chemistry will best be achieved through an active learning of the process skills. What learners learn is greatly influenced by how they are taught. For the learners to develop the process or entrepreneurial skills (since they are one and the same), the teachers must have a theoretical and practical knowledge and abilities about chemistry teaching and learning . The decision about content and activities that teachers make, their interactions with students, the selection of assessment, the habits that teacher demonstrate and nurture among their students and the attitudes conveyed all affect the knowledge, understanding, ability and attitudes that students develop. There is considerable research evidence that if learners are active in the class, they will learn more effectively (NCCE, 2009).

Active learning as a teaching-learning strategy emphasizes that the planning, teaching and assessment are focused on the needs and abilities of the learners. The learners are actively engaged in doing most of the work by using their hands and brains in the teaching and learning process. In active learning, learners are do manipulate, report, observe, measure, record, communicate, and handle, etc; they are involved in process and entrepreneurial skills. Many advantages accrue when learners are active participants in the classroom activities. The advantages include information retention, learner-teacher interaction, learner-learner interaction, academic achievement, communication skills, team work and positive attitudes towards the subject and the motivation to learn (NCCE, 2009)

There are many active learning strategies that can be used in the chemistry classroom. They include: discussion, Games, Excursion, Role playing, Drama, project, Demonstration, Discovery, Brainstorming, Problem-solving method and process-based approach. These methods develop in

students, critical thinking skills, creativity, open-mindedness, intellectual honesty, etc. These attitudes will not only help students in developing the process skills but also their entrepreneurial skills and their socio-economic lives. These activity-based strategies yield better quality and entrepreneurial learning.

Conclusion

One of the purposes of science education is to ensure that every learner acquires such a good grasp of science as to be able to apply it man's need. This has to be pursued through active participation of the learners

The learners should be taught through the handling of materials. They should be taught how to observe, classify, hypothesize, communicate, report, record and conclude. Through acquisition of the above skills, unemployment and its attendant social vices will be highly reduced in Nigeria.

In review of the persistent inadequacy of science equipment in educational institutions in Nigeria over the years, institutions' administrators and government have roles to play towards encouraging the act of improvisation as a solution to this problem and enhancing the growth of science and technology in the nation.

Recommendations

In view of the enviable role of improvisation in the teaching and learning of science, it is recommended that:

- Institutions' administrators should provide the enabling environment for teachers to improvise science equipment.
- Sufficient time should be created for science teachers to improvise. In this regard, excess work load of those that wish to improvise should be reduced to allow them ore time to think and carry out the act.
- The government has a significant role to play in developing entrepreneurial skills through Chemistry education. There should be a continued and increased government support for Chemistry and science in general to meaningfully contribute to socio-economic development. This could be achieved through:
 - Provision of facilities for active participation of the learners;
 - Periodic review of science (chemistry) curriculum;
 - Inclusion of entrepreneurship education in chemistry education;
 - Establishment of business incubation centres; and
 - Provision of soft loans to chemistry graduates as a take off grant.
- Indeed, the government should encourage science teachers to improvise equipment by granting them loans for the production of improvised equipment on a large scale. This will reduce the level of unemployment in the nation. Teachers should however establish collaboration with industries for assistance in this regard.

- Science teachers in educational institutions should be granted in-service training to acquire more knowledge and skills, which can help them to improvise equipment. Government should organize seminars, workshops and conferences for science teachers so that they can be taught the techniques of improvisation. Science teachers should however improve their skills by reading books, Journals and other scientific publications to garner adequate information about science equipment, particularly those to be improvised.
- Science teachers should involve students in the improvisation of equipment to give them the opportunity to acquire creative skills. Curriculum programmes at all levels of education should emphasize improvisation activities by teachers and students.
- In order to involve the learners actively in chemistry classroom, the chemistry teacher should take the following into consideration.
 - Focus and support inquiries while interacting with the learners;
 - Initiate discourse among teachers about scientific ideas;
 - Challenge learners to accept and share responsibility for their own learning;
 - Recognize and respond to learners' diversity and encourage all learners to participate fully in science learning;
 - Encourage and model the skills of scientific inquiry; as well as the curiosity, openness to new ideas and data and skepticism that characterize science (National Science Standards, 2005).

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