The Need to Incorporate Entrepreneurship Education into Chemistry Curriculum for Colleges of Education in Nigeria

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Abstract
The need to develop entrepreneurial skills among NCE chemistry graduates of Colleges of Education has become imperative due to the growing graduate unemployment and world economic recession. Chemistry in schools were taught using inappropriate methods which have failed to expose students to the economic relevance of chemistry and to develop in the student the skills inherent in chemistry education. This paper tried to look at entrepreneurship education, the need to develop entrepreneurial skills in NCE chemistry graduates. It highlighted the importance of entrepreneurship education. It identified some entrepreneurial skills that chemistry graduates can undertake on a large scale for self reliance. The paper also looked at some teacher factors that seem to affect entrepreneurial skills development in chemistry education and provided some strategies that could help in developing entrepreneurial skills in chemistry education. Some recommendations were also given.

Keywords: Entrepreneurship Education, Chemistry Education, Colleges of Education

Introduction
What is entrepreneurship Education?
Entrepreneurship according to Ikeme and Onu (2006) is the effective manipulation of human intelligence as demonstrated in a creative performance, choosing to assume risk, identifying business opportunities, gathering resources, initiating actions and maximizing opportunities (p.55). Steinhoff and Burgess (1993) opined that entrepreneurship occurs when an individual develops a new venture, a new approach to an old business or idea, a unique way of giving the market place a product or services by using resources in a new way under condition of risk (p.110).

Entrepreneurship Education according to Lemechi and Anyakoha (2002) refers to a carefully planned process leading to the acquisition of entrepreneurship skills for efficient and effective living. Entrepreneurship Education is the key that opens the way to economic growth and
development. It is the instrument that empowers youths to be in control of their future (p. 97). Bolarinwa (2001) in Ezeudu (2008) defined entrepreneurship education as education that provides training experience and skills that will be suitable for entrepreneurial endeavors.

**Entrepreneurship Skills and Its Advantages**

Entrepreneurship involves the ability to set up a business enterprise as different from being employed (Nwaokolo, 2004). According to Nwaokolo, this ability should be acquired and should differ in some respect from the abilities acquired to enable a person obtain paid employment. Odo (2001) refers to entrepreneurship as the dynamic and complex production factor which involves the ability to recognize a business opportunity and mobilize both human and material resources to exploit the identified opportunity. It is the organization and direction of labour, land and capital for the purpose of production. According to Bolarinwa in Ezeudu (2008), entrepreneurship education has the following advantages;

- Skill acquisition: It helps 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 such as technological change, the micro enterprise, etc.
- It plays a contemporary role in developing the occupational knowledge, job skill and work experience among teachers and students
- Creation of employment: It offers opportunities to students for job experiences 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.
- There will be great reduction in the high rate of unemployment (particularly graduate unemployment) in our society. Self employment and business ownership will be viable and appealing goals for today’s students.
- Effective utilization of local resources
- Decentralization and diversification of business
- Promotion of science and technology
- Capital formation and
- Promotion of entrepreneurship culture.

**The Chemistry Education and the Need for Entrepreneurship**

Chemistry Education has a crucial role to play in helping to find answers to various human and socio-economic problems as well as making the society more scientifically literate. Chemistry is that aspect of science that deals with the nature of matter, its properties and its change in condition. It is very important to human life and is very essential for human survival. It is the core of every technology we enjoy today. The power of chemical science is what creates an enabling infrastructure that delivers food, medicine and materials that are the hallmarks of modern life. Its importance in modern societies is indisputably significant because of its requirements as pre-requisite to the study of courses like medicine, pharmacy and all fields of engineering. For majority of students, Chemistry is just a classroom affair. Rarely do students know that the acid work in the science laboratory is found in the farm, at home and at play. The inability of the chemistry teacher to cite and expose the economic relevance of chemistry to students through the appropriate teaching methods has led to poor misconception about chemistry. The commonly used lecture method has continued to hide this aspect of chemistry. Application of chemical knowledge learnt in the class to utility depends on the teacher’s use of appropriate teaching technique that will help students understand the relevance of the concept learnt to daily life.
Chemistry is an investigative subject and thus is activity oriented. Learning chemistry is something students do, not something that is done for them (National Research Council NRC 1996). Project method is student centered class room activities that focus on active learning with assignments that engage the student to high order thinking (Bonwell and Elaison, 1991, p. 95). Project method is intended to help students’ gain concrete understanding of abstract or comprehensive ideas. It is a productive activity that motivates and sustains the interest of students and their desire in productive and useful activities (Odo, 2001).

According to Twoli (2006) project is a measure of how capable and responsible one is at individual basis with minimum supervision. A well produced project is self assessing and will demonstrate the competence of students in a number of ways. It is for this reason that in chemistry syllabus, it is encouraged that project tasks be undertaken at the end of chemistry topics. This is viewed as very important in the learning of chemistry. It involved variety of capabilities such as intellectual skills, cognitive facility, motor skills, verbal information and attitude; this will in turn enhance, incite and encourage entrepreneur skills in the students (p. 83).

**Entrepreneurship Skills for Self Reliance in Chemistry Education**

The NCE Chemistry student in addition to acquiring teaching skills should be able to undertake the production of the following on commercial scale for self reliance and self employment.

- Soap making e.g. toilet soap, washing soap, liquid soap, detergents, black soap.
- Cleaning solution and bleaching solutions
- Pomade making
- Shoe polish production
- School chalk production from gypsum
- Production of ethanol from local materials
- Production of paint from local materials
- Cosmetic production
- Production of distilled water

Also in the area of environmental chemistry, entrepreneur skills can be developed where the students have opportunities of being entrepreneurs. They can set up waste management services (business) which will involve collection and disposal of waste from homes, offices etc. This will be a worthwhile venture as Dike (2008) pointed out that the operation of the public health authorities responsible for the collection of waste from the government – owned and personal dustbins to the dumping sites is generally low and inadequate with the result that they remain uncollected for months. The graduates can convert the waste to wealth. This will involve identifying where the waste can be taken to. A fee can be collected from the respective beneficiaries (homes, offices, markets etc) who may be charged on the basis of the amount of waste they throw away i.e. they may be charged by volume and weight of their garbage (p.103).

In addition, the waste could be sorted and some of the materials recycled for economic benefits. Wright and Nebel (2004) for instance noted a few of the major established techniques together with current percentages of their recovery by recycling as follows:

- Most glass (25.5% recovery) that is recycled is crushed re-melted and made into new containers; a smaller amount is used as fiberglass or “glassphalt” for high way construction.
Some forms of plastics (5.4% recovery) can be re-melted and fabricated into carpet fibre, outdoor wearing apparel, migration drainage tiles, building material and sheet plastic.

Metals can be re-melted and re-fabricated. Making aluminum (28% recovery) from scrap aluminum saves up to 90% of the energy required to make aluminum from virgin ore.

Yard wastes (leaves, grass and plant trimmings – (45.3% recovery) can be composted to produce soil manure.

Textiles (12.8% recovery) can be shaded and used to strengthen recycled paper products.

Old tyres (22% recovery) can be re-melted or shredded and incorporated into highway asphalt (p. 120).

Physical management of wastes by the NCE graduate will serve both as an environmental and an economic issue as heaps of waste will varnish and pockets of NCE graduates will be filled with money.

**Teacher Factor in the Development of Entrepreneurial Skills in Chemistry Education**

The role of the teacher should involve skill demonstration. Proper teaching with demonstration of the use of equipment and tools must be done by the teacher. Adequate period must be given for intensive exposure of students to practical knowledge. The teacher should try as much as possible to create or invent the equipment or tools needed or improvise where the need arises. He should have a good mastery of the subject matter and good use of effective instructional strategies which will enhance scientific and pedagogical skills. Appropriate use of a variety of teaching strategies will make teaching meaningful and effective. Dike (2009) listed some of the effective instructional strategies in teaching environmental and other relevant chemistry education topics. They include – field trips, lecture methods, role playing, inquiry, case studies, concept mapping, pictorial representation, values classification, dramatization and use of analogies. Suleiman (2008) suggested the use of some teacher and student – oriented method of inculcating entrepreneurship which include instructional media like slides and transparencies on business ideas, films showing board meetings, self – paced instructions on entrepreneurship marketing and distributive educative education classes, developing self – confidence in students, debates for developing high student positive thinking and field trips (p. 56).

In using field trips strategies for example, to teach land pollution, the teacher could take the students to a waste dumping site within the locality where they can observe and identify a list of garbage. They can sort and group the materials into biodegradable and non bio-degradable pollutants. To inculcate entrepreneurship the teacher could take the students to big firms and industries where they could interact directly with experienced businessmen and women. This will help them to have first hand information on how to run a business using some of the refuse. Also in the area of other skills like in soap making, detergents, cosmetic, a field trip could also be undertaken to firms and industries where such are manufactured. This will incite and expose the students to such fields. Akano (1998) further pointed out that during field trips:-

- Learning becomes more meaningful and easy to recall since students can associate ideas with experience acquired through contacts with life situations.
Fieldtrips provides for direct interaction of students with realities of their physical and social environment and this kind of lessons overcome day – dreaming and absent mindedness which impede effective communication.

It also reduces meaningless verbalization which characterizes lessons in the traditional setting, hence making way for variety of experiences. Students get motivated and tend to develop more interest in the lesson.

Fieldtrips creates opportunity for first hand experience which cannot be got in the classroom and provides a way for activities done in the classroom to be validated.

There is the stimulation of curiosity in students and opportunity to receive multidisciplinary knowledge of science (p. 281).

The teacher is expected to update his knowledge of subject matter and revisit his teaching methods from time to time and coupled with this, is the development of skill in evaluation of his subject matter, his students and implicitly himself (Ayeni 2007, p. 43). Evaluation of students for example is very important in that as NCE graduates, they should be proficient at performing the task they encounter when they graduate therefore their assessment should require them to perform meaningful tasks that replicate real world challenges. Ngozi (2008) advocate the use of authentic assessment methods for students as they have to do with students demonstrating that they know a body of knowledge, have developed a set of skills and can apply them in a real life situation and can solve real life problems. It is also performance – based and requires students to exhibit the extent of their learning through a demonstration of mastery. Other factors identified include:

- Insufficient laboratory facilities: Most laboratory facilities in most Colleges of Education lack the necessary capacity to acquaint students with tools they need to acquaint themselves with skills needed for entrepreneurship.
- Inadequate teacher preparation: The chemistry teachers are not adequately trained in entrepreneurship and so cannot develop such skills in the students.
- Low level motivation: Teachers are not adequately motivated to teach effectively and so cannot develop the right type of entrepreneurial skills.
- Teachers’ attitude to work: Teachers look worm attitude to work due to poor environment of work also affects entrepreneurial skill development.
- Teacher’s lack of improvisation skills and use of varieties in their teaching.

Strategies for Developing Entrepreneurial Skill in Chemistry Education

Based on a study by Lassa (1995), the following are some of the strategies that could be employed to develop entrepreneurial skills among chemistry teachers and graduates in Nigeria.

- Building achievement motivation in teaching learning situation. Entrepreneurship education in Colleges of Education should seek to motivate students to seek for success and expertise in new ventures through one’s effort and skill. So individual student need to be adequately motivated to achieve.
- Quality Performance of models:- Teaching of certain topics or courses should not be divorced from history. Reference should be made to the experiences and exploits of successful entrepreneurs who started from the slum, waded through poverty and penury, employing their wits and resourcefulness to create, manage and control resources that ultimately brought them into fame.
Career Education: Career Education should seek to orient young NCE graduates of chemistry education towards creative and honourable means of livelihood when the teaching job is not available.

Training in management efficiency: NCE chemistry graduate should be trained in management of resources to enhance management efficiency which is the hallmark of entrepreneurs enterprise.

Research and innovations: There should be more serious investments in research in the form of research grants because, investment in research is important since it is through it that knowledge expands, innovations emerge and skills realized.

Technical skills and confidence: There is need to develop teachers technical skills and build their confidence in the system. This will ensure effective transfer of skills into their students.

Conclusion
Entrepreneurship education has the advantage of equipping individuals with skills necessary to be self reliant and successful entrepreneurs. For an individual to be able to effectively grab and identify business opportunity, utilize resources with high level of innovativeness, be able to motivate and handle both his direct delegated and other sectors to ensure an efficient synthesis of resources, he has to be exposed to entrepreneurial skills. Therefore, in order to produce self – reliant and competent teachers who serve as eye openers and help direct the nations development, entrepreneurship education should be made part and parcel of teachers education curriculum particularly chemistry education.

Recommendations
The effective enhancement of entrepreneurship education and the development of the right type of entrepreneurial skill in chemistry education among teachers and students can be achieved through the following.

Curriculum review or inclusion: Entrepreneurship Education should be made part of teacher education at various levels of Education so that the system do not only strive for self employment and reliance, but produce graduate, that are self reliant and can be self-employed.

Science Teachers Association of Nigeria (STAN) and Sister Organizations should organize regular workshops, seminars and talks on entrepreneurial skill acquisition and development for their members.

Investment in research should be encouraged as initiated by step – B – because through it knowledge expands and innovations emerge.

Conducive Regulatory Environment: Effective government legislation should be made to encourage small skill enterprises to facilitate the emergence of young entrepreneurs.

Credit facilities: The issue of collateral has made accessing of loans by young entrepreneurs difficult if not impossible. Therefore such bottleneck should be removed to make loans readily available.

Establishment of skill acquisition centre in colleges of education.

Reference