

**TEACHING BIOLOGY EDUCATION FOR CREATIVITY AND SKILLS:
AN IMPERATIVE FOR ENTREPRENEURSHIP AMONG TECHNICAL
COLLEGE GRADUATES IN KANO STATE, NIGERIA**

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Abstract

The quality of science teaching and learning will continue to be the yardstick for the classification of countries of the world into developed, developing and underdeveloped nations. This is because the level of knowledge of science and technology determines, to a large extent, the quality of life of the citizens. It is the belief of biology educators that the quality as well as the level of development of a nation can be enhanced by inculcating creativity into the teaching of science and technology in its schools the paper advocated. Teaching biology education skills an imperative for entrepreneurship, education among NCE technical college graduates. The review looked into the implementations of entrepreneurship education and viable opportunity for NCE biology graduates, concept of creativity and skills for entrepreneurship. Workable agenda for creativity and entrepreneurship and the implication for the educational system in Nigeria. Recommendations are suggested for positive change, the paper concludes on a hopeful note that problem which could impede the success of entrepreneurship Skills acquisition can be overcome through proper planning.

All over the world, education, particularly in science and technology, remains an indispensable tool for national development. If science and technology education is properly planned and executed, a nation can experience breakthrough in every facet of her life. It is true that any nation that neglects the teaching and learning of science in her schools does so at the risk of remaining

underdeveloped. Okey (2012) has remarked that most African countries including Nigeria have remained with an under developed economy largely because of the unsatisfactory state of science (biology) education. Biology is one of the science subjects which most of the students offer in almost all secondary and post secondary schools. Biology as a school subject is expected to help students to understand their environment and to

maximize the management of their environment. Unfortunately, students perform poorly in Biology examinations and this has led researchers and Biology educators to search for innovative methods to impart the knowledge of Biology. Several teaching methods such as demonstration, discussion, concept mapping among others have been adopted without positive result (Okoli & Mbonu, 2014). According to them, these methods when applied considering the abstract nature of Biology and emphasis on covering the scheme of work before writing examinations have proved ineffective. Fleith., Renulli & Westberg (2002) opined that to reach diverse learners' audience, biology teachers must differentiate and diversify their teaching methods and the pedagogical approaches used in science subjects.

Njoku and Nwagbo (2014) defined creativity as the tendency to generate ideas or possibilities that may be useful in solving problems, communicating with others and entertaining one and others (Kaufmann & Sternberg, 2010). Creativity can also mean turning new and imaginative ideas into reality. Teaching with creativity and teaching for creativity imply that a teacher should teach creative skills using innovative approaches that promote creativity and also teach to awaken creativity in the learners. Teaching with creativity and teaching for creativity include all characteristics of good teaching such as high motivation, high expectations, the ability to communicate and listen, the ability to interact, engage

and inspire. Creative educators need expertise in their particular fields more especially the techniques that stimulate curiosity and raise self-esteem and confidence (Kaufmann & Sternberg, 2010). Omorogbe and Ewasih (2013) were of the opinion that effective and quality Biology teaching lies with the educator's capacity to transform written knowledge into forms that are pedagogically powerful and adaptive to students' abilities and backgrounds. Dikki (2013) listed instructional methods and strategies which promote creativity in biology classroom as follows: Peer-Led Team Learning (PLTL), Play Method, Inquiry Method, Discovery Learning, Drill and Practice, Brain storming, Linking teaching/learning of concepts with one's environment, Commercially Produced Computer Assisted Instructional Packages (CPCAIIP) Field-trips/excursions, having listed the methods and strategies that can be harnessed in biology education to enhance creativity (Dikki, 2013). The question then is; are Biology educators and pre-service Biology educators of Kano State technical Colleges aware of these teaching methods? If so, do they use these teaching methods in their classrooms? If not what are their reasons?

Moreover entrepreneurs mean different thing to different people. To economist, an entrepreneurs is one who brings resources, labour materials and other assets into combinations that make their value greater than ever before and also one who introduces changes innovations and a new order; to others an

entrepreneur appears as a threat, an aggressive competitor. Entrepreneurship according to Cherwits (2006), is the practice of starting new organizations or revitalizing mature organizations, particularly new business generally in response to identified opportunities. Entrepreneurship is absolutely inevitable in positioning biology education for creativity. Creativity skills have been identified as one of the most distinct of human attributes and are basic skills (Kaufmann & Sternberg, 2010). Creativity and entrepreneurship skills can be learnt. There is a need for training people in creativity and entrepreneurship. Entrepreneurship education is presently neglected in Nigeria schools, yet this aspect of education is critical for economic development. The youth need to acquire skills in creative as well as Entrepreneurship, so that they can become self-reliant

Awotunde and Uzor (2002) defined creativity as the ability to produce novel ideas or product which society values as a breakthrough in the effort to solve certain problems that have hitherto posed a problem even to the producer. From the above definitions creativity can be seen to be a process and product. The process component of creativity involves skills which are also employed in science processes. These skills are the foundation for both scientific inquiry and development of intellectual skills (Nwosu, 2004; Olorukoba & Lawal, 2007). The process skills are the mental and physical abilities and procession of strategies used in conducting scientific inquiries which

are observing, measuring, classifying, communicating, predicting, questioning, controlling variables, formulating models, designing experiment, interpreting data. Creativity is synonymous with productive thinking, critical thinking and problem solving and it can be developed through training. (Okoli & Mbonu, 2014) opined that creativity is said to be the fundamental premise and that the genesis of entrepreneurial activity, while creativity encourages the growth of entrepreneurship, He further said there is a strong link between creativity and that entrepreneurship ends up with the word creativity or its variations, Logshaw (2009).

Entrepreneurship centers on innovation, mainly introduction of something new, different and unique. An entrepreneur has a duty to reform or revolutionize the pattern of production by exploring an invention of an untried technological method or producing a new commodity or producing an old one in a new way. Furthermore, wealth creation and risk taking are all involved in entrepreneurship. Education has a lot to contribute in equipping individuals for entrepreneurship. In all levels of education (Onu, 2006; Olorukoba & Lawal, 2010) noted that "encouragement to form a company can be sustained by a teacher who can significantly influence individuals to regard entrepreneurship as a desirable and valuable career. Njoku & Nwagbo (2014) opined that schools with exciting courses in entrepreneurship and innovation, tend to develop entrepreneurs and can actually derive the entrepreneurial

environment in economic era. Njoku & Nwagbo (2014) further stressed that the more a number of entrepreneurship courses a person take the more probability of starting a new venture.

The Role of the Biology Teacher in the Development of Creativity in the Learner

The Biology teacher at all levels; most especially at the secondary and tertiary levels have a greater role to play in the development of creativity in the learner. This is because the teacher is the driving force behind creative thinking in the school. Hogan, (2012), clearly stated that childhood experiences are critical for the development of creative potentials, because creativity is related to early life experiences particularly the caregivers' attainment and adaptation to the child's needs. Where the child's experiences are negative, all the frustration that the child cannot handle becomes impingement and creativity remains hidden. It is for this reason that the biology teacher at the basic levels of education should utilize science teaching strategies that can facilitate creativity in the classroom. Inquiry method has been identified by biology educators as important because it involves the basics of the creative process such as combining and generating new possibilities, experimental exploration of the limits of reality and fantasy. Omorogbe & Ewanisiha (2013), believed that a good session of inquiry leaves a child calm, entertained, stimulated and satisfied. An environment that is too strict or too rigid could however be unhealthy

for the learner as such environment can have a harmful and negative impact on the personality formation of the learner, thus influencing the learner's creative potentials and mental health.

The teacher of biology should therefore create a friendly and comfortable environment where the learners can feel free and comfortable to voice their opinions and explore new ideas. The biology teacher should also give research assignments that could involve writing a paper and presenting the findings. This would require that the learners present their findings and in the process develop confidence in self-expression. The biology teacher should also use technology to present information, because giving the learners this type of liberty challenges, motivates and empowers them to give their best. In addition biology teachers should also:

- Create a forum that recognizes creativity thus embracing creativity as part of learning
- See creativity as a skill and teach it as such, ask for creative answers and give scores to show you value it.
- Encourage competition among students of various ages and schools to incorporate cognitive and emotional functioning and design and give classroom assignments that takes care of divergent and convergent thinkers
- Encourage and give chance for students to ask questions and do not criticize rather

- Use collaborative creativity thinking models to solve problems and encourage curiosity.

Where the biology teacher is able to create a friendly and comfortable environment for the learner, learning will be encouraged and the development of creative mind will also be encouraged. This is why Adamu, (2014) noted that it is difficult to foster high level of creativity in a climate in which fear, one right answer, and little acceptance for a variety of students' products, extreme level of competition and extrinsic rewards is predominant. A biology teacher must therefore take note and guide against such in his / her classroom so as to foster creativity in the learners.

Viable Career Opportunity for NCE Technical Colleges Graduate

NCE certificate is a field of study with abundant opportunities for self-development: provided the learners are well prepared and groomed in the field. However, how well the learners internalize these opportunities depends on the competence of their teachers and enabling environment. The NCE biology graduate has potentials of going into full scale self employment or could decide to go for corporate employment if he/she so desires, such as self-employment opportunities in crop protection, or set up consultancy services on crop protection or waste disposal. Biology education equips the learners with aptitudes with which they can establish small scale refuse collection and disposal outfit for individual homes and offices for a fee or

embark on research assistance or field assistance which can help them develop skills in data collection and analysis. Holders of NCE biology graduate have great potential to embark on fish and poultry breeding, or establishing schools, which though is highly rewarding financially, but capital intensive. He/she could embark upon it if the candidates could raise soft loans from banks cooperative societies or from philanthropists. Holders of NCE certificate in biology have great potential to contribute to Economic Growth of individual and nation in terms of job creation, employment opportunities.

Concept of Creativity and Entrepreneurship Skills

The central problems of mankind are currently being linked to the manifestations of a fundamental lack of meaning in the lives of the vast majority of human beings. The resultant effect is their inability to discover, develop or engage their "unique creative abilities in significant beneficial social and ecological actions. There is also the inability to recognize one's potentials, equally from institutions, economical, social and political arrangements and operating practices that artificially constrain people's capacities and potentials (Obioma, 2008). These patterns create an erroneous belief that makes people think that economic motivation rather than actualization of one's natural abilities to solve man's problem is the primary force in human life.

Maslows theory of hierarchy of needs has equally demonstrated the possibility of actualizing ones potentials, that is, realizing ones innate potentials or possibility, that is the needs can become a reality only after the basic human needs to live, socially and ecologically responsible lives have been met. Therefore, to achieve the much desired future positively, institutional arrangements and cultural patterns that will allow humans to express themselves as intelligent and creative individuals who are capable of evolving goals that are worthy of their commitment, time efforts and energies, need to be put in place. In order to accomplish this, bureaucracy, which is the mortal enemy of the creative process must be driven underground. Educationally, intellectual entrepreneurship would therefore mean the ability to educate scholars who are accountable and who utilize their intellectual prowess to add to disciplinary knowledge and as a lever for social good (Cherwitz 2006), The academics therefore are seen as innovators with a focus on multi disciplinary collaboration, aimed at translating advancements into real solutions to society problems and needs. These notions transcend the traditional notions of schooling, which until now had been for school sake and for the acquisition of certificates that could barely be defended. Schooling should form the basis for which inventiveness and the spirit of creativity are cultivated in the learner. It should be the bedrock upon which training in creativity is allowed to form the basis of the learners' capital knowledge for a better tomorrow.

Furthermore, in unleashing constructive creativity in business, education and society bottlenecks that always impeded fundamental functioning will diminish and promote in the citizenry the spirit to create something new. The resultant effect then would be the-growth of knowledge capital.

Workable Agenda for Creativity and Entrepreneurship Education

It is important to develop creativity and skills in individuals and making it compulsory and authentic, it should be predicated on the following:

- I. Restructuring the academic and professional training of entrepreneurship educators with emphasis on quality and technological advancement.
- II. Designing an agenda for the future which includes skills analysis this will mean ascertaining the level of manpower development in all levels of education.
- III. Curriculum development this simply means emphasizing on the skills acquisition, knowledge and attitude to the needs of the workers with work and life.
- IV. Follow up survey of schools / institutions should determine the level of job performance and the degree of job satisfaction and general level of career situation in labour market.
- V. Reappraising the teaching of entrepreneurship skills, Content, process and attitude with

emphasis on practical training and integration of related components

Designing a workable agenda for future entrepreneurship in biology education in Nigeria brings about the need to extrapolate as plausible from the past and present trends into the future. It is expected that the future should be better than the past. Next is forecasting and planning followed by further planning and forecasting in a functional cycle. Since; it is established beyond reasonable doubt that entrepreneurship teaching needs to be repositioned in Nigeria context for empowerment and technological development, the following need to be observed.

a) Eliminating the current qualitative and quantitative inadequacies becomes the first hurdle on the agenda to be cleared

b) Encouraging better professional academic training for entrepreneurship and skills development

c) The entrepreneurship education that is fast gaining acceptability in the educational sector is a worthwhile area of focus in the education refocusing agenda. Its incorporation into the advancement upon completion of their studies. Other steps in the proposed agenda include re-orientation of teaching entrepreneurship and skills acquisition should inculcate the element of clear thinking and strong commitment to work in the students.

Training can be organized to ensure that the individuals' intellectual resources are put to better use, It requires that lecturers in technical colleges put away their

moribund lecture notes for a more dynamic promotion and utilization of information communication Technology (ICT), which has increased the inflow of most current information, creativity and invention.

Implications of Developing Creativity and Entrepreneurial Skills for the Education

- The above situation calls for the need to revise the Nigerian national Curriculum for schools to rise to international standards within education. The new curriculum should reflect global perspectives to education as ideas and resources are made available to technical colleges.

- Schools in Nigeria must reflect quality, coherence and effectiveness. Students should be empowered with techniques that will enable them to measure, assess and have a change in attitudes and behaviours.

- Students must be allowed to participate in programmes geared towards training and the skill acquisition information exchanges, planning; monitoring, evaluation and professional development and having to change their orientation concerning innovations.

Moreover creativity and entrepreneurship skill could be achieved through national advancement in Kano state in the following ways;

- School should accept the challenge of modern society to develop the total capacity of each child so that in adulthood he or she will be equipped with

the entrepreneurship skills and knowledge to contribute effectively to the development of self and society.

- Emphasis should be laid on the production of quality materials, as entrepreneurship education should be taught by specialists in the field to promote quality development and skill.

To achieve the broad aim of education, creative thinking and application of entrepreneurship knowledge stand out as innovative development with challenges in the world today; the resourcefulness, initiative and innovative skill of the individual can be a great asset- based on our discussion the following recommendations are made;

Conclusion

Creativity is inherent in all humans and therefore has a universal distribution. It has also been established that creativity can be likened to a driving force that drives human behavior to shape their lives. It is necessary that individuals be given opportunities for the actualization of creative potentials or talents in them for meaningful existence, growth and development in all facets of human endeavors. These creative talents must be nurtured. In using creativity, new and useful things are developed, human lives and existence improved and contribution is made- to the world of knowledge. Since creativity is developed through the process of solving problems, then children must be trained to learn to generate ideas, defer judgment, seek to combine all ideas generated, and evaluate their ideas. Furthermore, bureaucratic

bottlenecks must be totally eliminated if human beings will engage their unique abilities and see themselves as participating and contributing members in their community. The education system must deliberately set out to raise students who will build new knowledge, be innovators and collaborate with others to advance real solutions to society's problems and needs, through creative entrepreneurs.

Recommendations

Based on discussion above the following recommendation were made

1. Skills and abilities that will enable students assume responsibilities for expansion of their own learning can be acquired through the learning periods if the learners are exposed to activities that will challenge them mentally and provide them with numerous opportunities to think their way out of such problems,
2. A conducive learning environment should be created in all technical colleges for effective teaching and public enlightenment should be mounted to educate parents and children regarding the positive attitude towards entrepreneurship skills.
3. Training in entrepreneurship education, should use students centered methods, specific to entrepreneurship education, enhance the communal planning and learning process and give guidance in the use of various entrepreneurial work methods in teaching?
4. Training in entrepreneurship education and skill should be supported by

public authorities with proper planning and supervision of the programme.

5. Reflection on the interrelation of research, curricula and pedagogy should be intensified while knowledge of working life and business, industry should be enhanced among the education personnel.

6. Self-motivated continuing professional education relating to entrepreneurship education should be targeted by national, regional and local development projects.

7. The core curriculum of entrepreneurship skills should be included in the initial teacher training.

8. Curriculum reforms should also focus on promoting teachers professional development.

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