CREATIVITY AND INNOVATIONS IN SCIENCE/TECHNOLOGY EDUCATION: A PANACEA FOR NATIONAL DEVELOPMENT

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Abstract

The importance of Science Education in the rapid development of any nation cannot be overemphasized. Nigeria in recent past; has witnessed great concern in the area of Science and Technology by Government and private sectors toward realizing the goals of Science Education for National Development. However, in spite of the renewed emphasis on new methods of teaching science, the level of science education in Nigeria has not led to the production of quality and functional manpower needed for sustainable National development. The structures (physical/Social) and agencies engaged in science education do not seem to possess the skills and knowledge needed to embark on a deliberate development of creative abilities of students in the basic Level of Education in Nigeria. This paper examines the role of creativity and innovation in Science and Technology Education for National Development, concept of creativity, innovations and National development, problems of science technology and Society Education and Science education for National Development were discussed. Relevant conclusion and recommendations were advanced based on the discussion of the subject matter.

INTRODUCTION

There are lots of challenges facing Nigeria today that should spur her up to the action of developing creativity and innovations in science education. Some of the challenges includes; insecurity (Boko Haram Insurgence), inter ethnic and tribal conflict (Fulani Herdsmen and Farmers), menace of kidnapping and armed robbery, unemployment, threats to the environment, hunger, refugee problem and a host of diseases that cannot be cured, desert encroachment, erosion menace etc. This and many more other challenges are enough to inspire Nigerian educationalist, scientist and leaders to seek ways to circumvent them (Odo 2013).

The role of the school in the encouragement of creativity and innovation cannot be embarked upon without the teacher. The Nigerian Government has identified science and technology as a major set of initiatives on science on schools, drawing on a considerable resource base of funding through TETFUND and ETF. The teacher is the prime move in every successfully programme on innovations and creativity in science Education. National policy on Education (2014) explains that

"No education system can rise above the quality of its teachers". The policy further explains that, the purpose of teacher education is to produce highly motivated, conscious and efficient classroom teachers for all levels of educational system and to create spirit of enquiry, creativity, innovation in teachers. The policy also stresses on the need for pupils in pre-primary, primary and secondary schools to inculcate the habit of creativity and innovations. This policy is simple to formulate but implementation may be difficult to accomplish. However, the situation or reality on ground with regards to the enhancement of innovations of creativity of Nigerian children shows that, Nigeria is doing little or nothing (Ekpeyong, 1992). Some states government in Nigeria declares free and compulsory primary and secondary education without adequate preparation. The physical and social structures in the schools are in a state of coma. The large number of children of Nigeria enrolled in schools in Nigeria does not give room for close monitoring of children who shows signs of creativity and innovations. The facilities and teachers are over stretched by the large number of pupils/students enrolled.

The Concept of Education

Education is derived from the Latin word "erudio" meaning to bring out a child physically and mentally or to rear. There is a general definition that conceives education as all round development of an individual, physically, socially, morally, mentally, temperamentally, psychologically and spiritually. Any education that lives out any aspect of human development would be the worst. Therefore, education is not just what has been reduced to transmission of scientific knowledge but assimilation of skills and values. According to Fafunwa (1976), education is the process that prepares individual for the future. Education is expected to reflect in the life of the recipient a kind of behaviour that conforms with norms and values of his society. Functional education is therefore, that type of education necessary for inculcating values and skills for future challenges and for national development.

The Concept of Creativity

It is relevant to discuss the meaning and nature of creativity before going into ways by which it can be nurtured through science education in the school, and out of school. According to Chamber 20th Century Dictionary, the word "Creativity" refers to the state or quality of being creative, ability to create. Here, creative means to bring into being or form out of nothing, to bring into being by force of imagination to produce or form, to design to be the first to act. However, creativity could not fetch a single definition because different thinkers consider it from different perspectives. All the definition of creativity indicates that, it involves development of something unique by individuals. Some writers like Ekpeyong (1992) have followed the method of delineating the ingredients that makes for creativity instead of defining it. Thus, he defined creativity as the capacity to originate, invent, reflect, analyse and synthesize. Guildford in Fasko (2000) considers creativity as a thinking skill that can be developed through training after the identification of the characteristic trials possessed by the individual. Thus Guildford in Fasko (2000) explained those patterns of trials that are characteristics of creative persons. According to him, creative pattern manifest in creative behaviour which includes such activities as; inventing, designing, contriving, composing and planning. People who exhibit this type of behaviour to a marked degree are recognized as being creative.

The Concept of Innovations

Innovation refers to the process of adding to or removing from an existing programme, new idea or method; with a view to improving the programme (Okeke, 1985). The addition or removal may originate at any point of the programme as a result of information collected at evaluation stage or as a result of other factors. The innovation which took place in Nigeria educational system; introduction of the 6-3-3-4 system, was major curriculum innovating, as it required a total change in the attitude of the people and new personnel and facilities to successfully implement the programme. A major curriculum innovation can only be adopted by the people if they are aware of the benefits derived from the innovation. They opine that Nigeria Secondary Education Curriculum is not achieving its lofty objective due to lack of awareness of the essence of the curriculum and poor method of implantation (Fafunwa, 1988; Osunde, 1988; Imhanlahimi and Oriahi, 2003). It is one thing to adopt an innovation and another to implement it. Adoption of an innovation is the point at which the users express acceptance of the change, while implementation is the point at which the change is actually realized in the classroom (Rutherford, 1978). No educational innovation can be adopted by the people without being aware of the objectives at such innovation. According to Cross (1971), innovator needs to gain not only the knowledge about the proposed innovation but also know how to modify their own (users) behaviours accordingly.

Concept of Science Education, Technology and Society

The Science, Technology and Society movement has a long history in science education reform, and embraces a wide range of theories about the intersection between science, technology and society (Solomon and Aikenhead, 1994; Pedretti 1997). Over the last twenty years, the work of Peter Fensham, that noted Australian science educator, is considered to have heavily contributed to reforms in science education. Fensham's efforts included giving greater prominence to Science Technology and Society in the school science curriculum (Aikenhead, 2003). The key aim behind these efforts was to ensure the development of a broad-based science curriculum, embedded in the socio-political and cultural context in which it was formulated. From Fensham's point of view, this meant that students would engage with different viewpoint on issues concerning the impact of science and technology on everyday life. They would also understand the relevance of scientific discoveries, rather than just concentrate on learning scientific facts and theories that seemed distant from their realities (Frensham, 1988).

However, although the wheel of change in science education has been set in motion during the late 1970s, it was not until the 1980s that STS perspectives began to gain a serious footing in science curricula, in largely Western Contexts (Gaskell, 1982). This occurred at a time when issues such as, animal testing, environmental pollution and the growing impact of technological innovation on social infrastructure, were beginning to raise ethical, moral, economics and political dilemmas (Fensham, 1988 and Osborne, 2000). There were also concerns among communities of researchers, educators, and government pertaining to the general public's lack of understanding about the interface between science and society (Bodmer, 1985; Durant et el. 1989 and Millar, 1996). In addition, alarmed by the poor state of scientific literacy among school students, science educators began to grapple with the quandary of how to prepare student to be informed and active citizens, as well as the scientists, medics and engineers of the future (e. g. Osborne, 2000 and Aikenhead, 2003). Hence, Science Technology and Society advocates called for reforms in science education that could

equip students to understand scientific development in their cultural, economic, political and social contexts. This was considered important in making science education accessible and meaningful to all students-and, most significantly engaging them in real world issues (Frensham, 1985; Solomon, 1993; Aikenhead, 1994 and Hodson 1998).

The concept of National Development

Education in a broad sense is a process by which an individual acquires the many physical and social capabilities demanded by the society in which he/she is born to function. Education is an ultimate value and hence, through the provision of social services, it is an agent of change. Therefore, the single most significant complex is found in the educational system. Either the formal or informal education aids the production of a total man for him to be a useful member of the society. National Development therefore, can be described as the overall development or a collective socio economic, political as well as religious advancement of a country or nation. This is based achieved through development planning, which can be described as the country collection of strategies mapped out by the government.

Problems of Science Education in Nigeria

Uko (2008) carefully enumerate the following as the major hindrance to science education:

- Poor and unrewarding instructional delivery
- Unfriendly learners environment
- Ill-prepared science teachers
- Poor and unrevised science curriculum
- Poor scientific culture and ethics
- Communication and Language problems
- Poor Examination Administration

Science Education: A Panacea for National Development

Science can simply be described as an integral area of study which considers both the subject matter of science discipline such as the traditional science: Biology, Chemistry, Physics as well as the processes involved in the learning and teaching of science. Ogunniyu (1986) opined that people confuse science and science education, while science as other subjects has well defined disciplines such as Biology, Chemistry, Physics and Geology, Science education cut across many fields of human endeavours such as; the natural sciences, sociology, physiology, psychology among others.

Science education is the bedrock upon which scientific and technological development depend. It is believed by most educators that the rapid development made by the developed countries such as Japan, United State of America (USA), and Britain is connected with the science education available in those countries. Science education needs to be efficiently transmitted to produce all kinds of manpower with functional and technological knowledge and skills in order for the nation to utilize it manpower to attain its development.

For any nation to experience economic growth and development there must be a strong stimulation and growth in the teaching and learning of science and technology. According to Ajibole in Ogundara (2007), national development encompasses development in every aspect of life of the citizens. However, human resources development is central to any development. So any conspiring for development must identify the human and material resources it needs and their values, integrate them for a sustainable development. Sustainable development means development that continually meets today's need of a nation in a way that does not jeopardize the future generation (Pietila, 1990). No nation can continually develop without resourceful human power.

Mustapha (2003) asserted that the teaching of science and technology has been guaranteed in Nigeria education system but the utilization of science and technology to attain development and cause sustainable development has been very slow because of Nigeria's economic recession. To develop a scientific and technological human power by providing sound foundation in the basic scientific, technical principal and practices requires individuals to develop their potentials and take up careers in science and technology in the service of the society. The attainment of the above is indeed part of the aims and purpose of science education. That is to equip individuals with appropriate skills, abilities and attitudes that will enable individuals to live and contribute to the development of the society (NPE 2004). Functional education is the education that equips the individual to contribute positively to the development of his/her society.

Conclusion

As technology advancement and changes continue to pop up with increasing frequency, it becomes progressively and intensely more difficult for Nigeria to stay at top without giving priority to educating the young with readjusted set of skills and knowledge in science and technology. Requiring a child to successfully complete one additional credit in a core subject area will probably not ensure that child secures a better paying job or a higher quality of life. The knowledge and skills needed to achieve or maintain success are constantly changing.

It becomes the responsibility of educators to better equip students, not necessarily with more textbook knowledge, but with different types of skills. Such skills include, but are not limited to: problem solving, time management, innovations, creativity, and how to be a self-learner. There is a real need for education in general to support changes that will increasingly cultivate and encourage creativity and innovation in individual classroom across the nation. By their nature, science and technology education should be an area in education where creativity/innovation develops in among students with relative effortlessness towards sustainable development in Nigeria. Educators should take care of the obstacles which hamper creativity innovation namely; pressure to conform, authoritarian attitude and environments, ridicule and similar attitudes, traits making emphasizes on reward such as grade and success, hostility towards the divergent personality and intolerance of the "play" attitude. The combined effort of parents, teacher trainers and politicians can help in a large extent in identification, development and encouragement of innovations creativity and consequently in the sustainability development of our nation.

Recommendations

1. Teacher training institution in the country should make deliberate effort to emphasis creativity in the core curriculum and minimum standard for training the teachers since only creative teachers can produce creative children.
2. It is equally importance for the government at all levels to adopt programmes that encourage creativity in our youths, too much emphasis on paper qualification as the basic for employment opportunities should be reviewed.
3. Provision of science and technology equipment in our schools should be of utmost priority. A situation where obsolete and non functional equipment are supplied by bad contractors should be checked.
4. Our schools should be centres for promoting entrepreneurial skills so that before graduation, a student would have perfected the skills to make himself reliant and a nation builder.

REFERENCES

Aikenhead, G. S. (1994) What is STS science teaching? In Solomon, J. & G. Aikenhead (eds.), STS Education: International Perspectives in Reform. New Yolk: Teacher's College Press.

Aikenhead, G. S. (2003) STS Education: a rose by any other name. In A Vision for Science Education: Responding to the world of Peter J. Fensham, (ed.) Cross, R.: Routledge Press.

Bodmer, W. F. (1985) the public Understanding of Science. London: the Royal Society.

Ekpeyong, L. E. (1992); A forgotten concept in education? Implication for Vocational Education Curriculum. *Nigeria Journal of Technical Education 9(1&2) 49-63.*

Fafunwa, B. (1974). "The National Policy on Education some factors militating against imperialism". Journal of Nigeria educational Research Association 4(1): 1-8.

Fasko, D. (2000). *Creativity Research Journal 13 (3&4) 317-327.* Bowing Green State University.

Federal government of Nigeria (2004). National Policy of Education. Lagos: Federal Ministry of Education.

Fensham, P.J. (1985) Familiar but different: Some dilemmas and new directions in Science Education. In P.J. Fensham (ed.), Development and dilemmas in science education. New Yolk: Falmer Press PP. 1-26.

Fensham, P.J. (1985)Science for all. Journal of Curriculum Studies, 17: PP 415-435.

Gaskell, J.P. (1982) Science, Technology and Society: Issues for Science teachers. Studies in Science Education, 9, PP. 33-36.

Mustapha, M. T. (2003). The impediments in utilizing science education. Paper Presented at the First National Conference FCE Kontagora.

Odo, L. O. (2013). Fostering creativity in science and technical education towards functional education. *For Nigeria for National Development Journal of Academic Excellence Vol. 10. No.1 December 2013. University of Nigeria, Nsukka.*

Ogundare, D. A. (2007); Science Education: the foundation for technological and economic development in Nigeria: *Multi-Disciplinary Journal of Empirical Research 4 (1) 99-104.*

Ogunnyi, M. B. (1986). Teaching science in African, Ibadan: Salam Media.

Okeke, A. C. (1985). The Dynamic of curriculum revision. Curriculum development for Africa. Nigeria: Africana publishers limited.

Osunde, E. (1998). "Diversified Secondary Education Curriculum in Nigeria: A reconceptualization". Education and National Development, edited by Ehimetalor, T. E. Benin City: Nigerian Education Research Association.

Pielil, H. (1990); Environment and sustainable development. Reflection on bruthlam Report. Our common stand on the IFDA dossier. 61-70

Rutherford, W. L. (1978). "Implementing Criterion Reference Instructional Programmes: truth or fiction". Paper presented at the Annual Meeting of the American Educational Research Association.

Uko, P. J. (2008). Protecting Nigeria Science Education beyond the present State of the Pre-Eminence. *Journal of Qualitative Education Vol. 4 No. 1 May 2008, University of Benin, Benin City.*