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## Technical, Entrepreneurial and ICT Skills Incorporated Into Senior Secondary Physics Curriculum as a Strategy for National Development

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### Abstract

*The paper opined that the antidote to extreme poverty and hunger, over-dependence and drooping national economy lies in appropriate regeneration of senior secondary physics education. It advocates a regeneration procedure that calls for a systematic incorporation of the re-inforcing and supplementary components of technical, vocational, enterprenurial and ICT skills with senior secondary physics curriculum. It recommends a teacher-training programme that takes cognisance of this regeneration.*

Education is a process of teaching, training and learning, especially in schools or colleges, to improve knowledge and develop skills (Hornby, 2000) necessary for the improvement of the learner and the society (NTI, 2000). In keeping with the National Economic Empowerment and Development Strategies (NEEDS) which features gainful self-employment, and as enshrined in the Millennium Development Goals (MDGs) which focuses on eradication of extreme poverty and hunger, the Nigerian philosophy of education (FRN, 2004) expresses a vision for the Nigerian society of the future: a self-reliant nation, a great and dynamic economy, and a land full of bright opportunities for all citizens. The philosophical question, therefore, is this: what kind of knowledge should be imparted (or what type of curriculum should be implemented) so that citizens will acquire the necessary skills that define the attainment of these social (educational) goals?

Today, Government's efforts are directed towards the teaching of science and technology, of which senior secondary physics education is the pivot. This is to ensure

that by the end of this century, Nigeria will emerge a great and self-reliant nation. Now, since senior secondary school physics is the anchor of science and technology, upon which our hope for self-sufficiency rests, we can zero down our philosophical question to: what kind of senior secondary physics education should be delivered to guarantee extreme poverty eradication?

### **Senior Secondary Physics Curriculum**

Physics is the branch of science concerned with matter and energy and their interactions in the fields of mechanics, acoustics, optics, heat, electricity, magnetism, radiation, atomic structure and nuclear phenomena (Geddes & Grosse, 2005). Featuring a spiral approach to content organization, our senior secondary physics curriculum is structured with a thematic approach to content selection, with six themes, which have related concepts and topics, thus:

1. Interaction of matter, space and time
2. Conservation principles
3. Waves: Motion without material transfer
4. Fields at rest and in motion
5. Energy quantization and duality of matter
6. Physics in technology.

The general objectives of senior secondary physics are to (Obioma, 2009):

1. Provide basic literacy in physics for functional living in the society.
2. Acquire basic concepts and principles of physics as a preparation for further studies.
3. Acquire essential scientific skills and attitudes as a preparation for technological application of physics, and
4. Stimulate and enhance creativity.

### **The Drooping Quality of Science and Technology Education**

It is apparent that government, communities, organizations and parents translate their problems, needs and aspirations into educational goals and objectives. They tend to look onto education as the panacea to social, political and economic problems. Unfortunately, today, the quality of education the children receive in school no longer endow them with the means to lead a more satisfying life and enjoy the humanistic aspect of education as an end in itself – the school products are no longer making a living in the society in which they live; and the economy is declining. The parents, and indeed the general public, tend to wonder whether the school system is still making dividends, adjusting science and technology to be losing focus.

It is opined (Okyeocha, 2006) that if education is unable to provide the recipients with a veritable source of living through employment (whether self-or paid

employment), such education is sterile and a futility to man. The implication is that our science and technology education needs to be critically repositioned for poverty eradication, self-reliance and sustainable economic growth and development of the nation; and this necessity calls for urgent regeneration of senior secondary physics education, as a pre-requisite.

### **Regenerating Senior Secondary Physics Education**

Our senior secondary physics education is excessively academic; and is rather fading. This is the key reason: Recent technological, economic and labour market changes in the world and within nations have brought about significant changes in educational goals. The school is, therefore, called upon to equip the learners not only with basic knowledge of physics education but also with practical skills that allow for continuous self-development involving technical and vocational skills, entrepreneurial and ICT skills that guarantee poverty reduction, self-reliance and national economic growth and development. For instance, opportunity for the construction and operation of workable device as well as acquaintance with some products of modern technology should be provided. Thus, our physics education is begging for regeneration.

To regenerate is to recreate, reproduce or form anew (Standard International Media Holdings, 2012 Edition). It is the hallmark of revival and reorganization (Geddes & Grosset, 2005). Within the context of physics education at the senior secondary level, the curriculum must reflect the needs of occupational world; and training must be a replica of skills required for effective performance at work after college; and this will entail a systematic incorporation of the reinforcing and supplementary components of technical and vocational, as well as those of entrepreneurial and ICT education into senior secondary physics education. A truly regenerated physics education curriculum shall have emerged.

### **Regenerating Components of Technical and Vocational Education**

Technical and vocational education is used as a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life (FRN, 2004). The goals of national economic growth and development, as well as individual self-sufficiency are tied to technical and vocational education. Thus as set out in the National Policy on Education (FRN), (2004: pg30), technical and vocational education seeks to:

1. provide trained manpower in applied sciences, technology and business, particularly at craft, advanced craft and technical levels.
2. provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development.

3. Give training and impart the necessary skills to individuals who shall be self-reliant economically.

From the afore-going, embedding technical and vocational education in senior secondary physics curriculum will be a good strategy for attaining self-reliance as senior secondary school graduates can now set up their own business and become self-employed and will be able to employ others. In pursuance of this goals, senior secondary physics curriculum should be embedded with the following technical and vocational education components:

1. Workshop practice
2. Small business management and entrepreneurial training
3. Computer craft practice
4. Computer maintenance work
5. Data processing
6. Radio, television and electrical work
7. Appliances repairs.

### **Regenerating Components of Entrepreneurial Education**

An entrepreneur is an individual who generates business activity, a business man or woman, often associated with business risks. In practice, entrepreneurship can be

1. starting your own business
2. inventing something new
3. a spirit of creative thinking and innovation

Businesses owned by entrepreneurs include: auto dealerships, restaurants, retail stores, wholesale distributing companies.

Entrepreneurship education prepares graduates with entrepreneurship knowledge, competence and skills needed for self-reliance (Anthony, Saidus, Mohammed & Junguru, 2009). To impart these attributes of entrepreneurial education to senior secondary Physics Student, the following components of the former should be embedded in the latter:

### **Leadership Skills**

1. Demonstrating honesty and integrity
2. Demonstrating responsible behaviour
3. Demonstrating initiative
4. Exhibiting passion for goal attainment
5. Recognizing other people's efforts
6. Leading others using positive statements

7. Developing team spirit
8. Enlisting others in working towards a shared vision
9. Sharing authority, when appropriate
10. valuing diversity.

### **Personal Management Skills**

1. Maintaining positive attitude
2. demonstrating interest and enthusiasm
3. Making decisions
4. developing orientation to change
5. Demonstrating problem –solving skills
6. Assessing risk
7. Assuming personal responsibility for decisions
8. Using time-management principles
9. Developing tolerance for ambiguity
10. Using feedback for personal growth
11. Demonstrating creativity
12. Setting personal goals.

### **Computer Skills**

#### **(a) Computer Basics**

1. Using basic computer terminology
2. Applying basic commands of operating software
3. Employing desktop operating skills
4. Determining file organization
5. Demonstrating system utilities for file management
6. Compressing or altering files
7. Using reference materials to access information
8. Using menu systems
9. Using control and components
10. Accessing data through various computer drives

#### **(b) Computer Applications**

1. Demonstrating basic search skills on the webs
2. Evaluating credibility of internet resources
3. Demonstrating file management skills
4. Communicating by computer
5. Solving routine hardware and software problems
6. Operating computer –related hardware peripherals
7. Explaining the nature of e-commerce
8. Describing the impact of internet on business
9. Developing basic web page.

The three benefits of entrepreneurship education are: fostering economic growth, creating new technologies and services, and increasing productivity (Odo, 2001 in Ezeudu, 2008). About two-thirds of Nigerians are living below poverty line despite the countries enormous potential wealth. Given adequate human resources, if our natural resources are well harnessed, Nigeria can grow to a leading world economy. This will be dream come true when there are a significant number of informed and empowered small and medium scale physicist entrepreneurs driving the economy.

### **Regenerating Component of ICT**

The ability of existing educational approaches to impact knowledge, skills and values appropriate to a rapidly changing world has been questioned by educationists, researchers, as well as employers. Such concerns are stimulating a growth in application of educational technology. Government and education system around the world recognize the need for students to be skilled, creative and confident users of a wide range of information and communication technologies “(Charalambous & Karagiorgi, 2002; Lim, Hung, Wong & Hu, 2004; Voogt, Gorokavatschke & Pourcheva, 2000)”. ICT integration in school is needed in order to accomplish many objectives and improve the quality of lessons in all subject areas, including physics education. Thus, all schools have to be equipped with the necessary ICT in order to provide the next generations with the needed tools and resources to acquire the expected skills.

Generally, ICT education is the education acquired through computers and other electronic media. ICT classrooms are equipped with computers, printers, instructional softwares, electronic references, video players, overhead projectors and television sets. The policy makers expect that the introduction of ICT into formal education system would improve the academic performance of teachers by encouraging them to improve their ability to use and apply technology and software in their jobs. “Preparing students for real life in our technological and diverse world requires that teachers embed ICT in significant learning experiences” (Braun & Kraft, 1995). ICT skills embedded in physics education, play key roles in alleviating poverty, attaining self-reliance and promoting economic growth and development of a nation. In targeting this role, the following ICT components should be incorporated in senior secondary education.

- a. Computer operations, including Microsoft Word, Microsoft Excel and power point.
- b. Data base and spreadsheet manipulation
- c. Internet and e-mail use, computer virus
- d. Website design
- e. Computer programming
- f. Maintenance of computer and other ICT facilities.

Students must master these skills if they are to succeed within and contribute to, a technology driven future workforce.

### **Summary, Conclusion and Recommendation**

The dynamism of the world economy has brought about changes in demand in the global labour market that is in favour of education for living which endows its recipients with technical and vocational, entrepreneurial and ICT skills in order to fit into the competitive labour market within nations. Incidentally, the Nigerian streets are, today, teeming with unemployed or underemployed school graduates, testifying that all is not well with our science and technology education which is looked upon as a panacea for eradication of extreme poverty, over-dependence and economic downturn. This scenario is begging for regeneration of indigenous science and technology – with physics education as a pre-requisite, since it is the most fundamental and indeed the pivot of science and technology education.

Effective regeneration of physics education (including teacher education programme in physics education) calls for a systematic incorporation and blending of the reinforcing and supplementary components of technical/vocational, entrepreneurial and ICT education with senior secondary physics curriculum. Until this is done, the vision of Nigerian philosophy of education-eradication of extreme poverty, building of a strong and self-reliant action, as well as a great and dynamic economy – will remain an optical illusion.

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