**Basic Science and Technology curriculum contents; Antidote to functional Universal Basic Education for sustainable development**

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***Abstract***

*Basic Science and Technology curriculum content was conceived out of the present needs and desire of the society, One of the objectives of Universal basic education is to ensure the acquisition of appropriate levels of literacy, numeracy, manipulation, communication and life skills as well as the ethical, moral and civic values needful for laying a solid foundation for lifelong learning. This theoretical paper examines the potentials of basic science and technology curriculum as a catalyst towards products’ self-reliance and sustainable development. The paper identified inadequate funding, inconsistencies in government policies and curricular issues amongst others as impediment to effective teaching and learning of basic science and technology at the basic education level of our educational system. How functional science and technology curriculum content can be implemented and used to stem the tide of unskilled graduands at the basic level form the focus of this study. The study recommends the provision of well-equipped science and technology laboratories for all middle and upper basic schools*

**Keywords**: Basic Education, Curriculum, Science and Technology, Functional Education,

Sustainable development

***Introduction***

Education no doubt is a vehicle for national growth and development, this supposition is in keeping with the old Chinese tradition saying; if you are planning for one year ahead plant rice, if you are planning ten years ahead, plant trees and if you are planning a hundred years ahead, educate people. Basic education was introduced in Nigeria in cognizance of the realities that education is the tool for both human and economic development. Basic education transcend literacy and numeracy, it embraces a wide range of basic knowledge and skills vital for an individual to live a meaningful and contended life, in addition to be an active participant in the society he finds himself. Basic education aimed at engendering in children and youth a scientific outlook and rudimentary understanding of both natural and social environment on one hand and promote adult literacy and continuing education on the other hand in other to help develop the basic skill like parenting , family management and civic participation (Okeke,2006)

Universal Basic Education (UBE) is conceived to embrace formal education up to age 15, that is, it include junior secondary school as well as adult and non-formal education and education for the marginalized groups within the Nigerian society. It is a policy reform measure of the Federal Government of Nigeria.The vision of UBE is to bring about socio – economic development, as explained by (Tahir, 2005), the role of science and technology education in the UBE programme can-not be said to be over emphasized. World – over, it is generally agreed that development could only be meaningful if and when it is science and technology driven. As such, countries of the world are now categorized as developed, developing or underdeveloped as a result their scientific and technological attainments. (Oludipe,2009) remarked that the prestige, political power, and economic survival of any nation reside in its level of scientific activities. Hence, the incorporation of Science and Technology, as a co –subject in the 9 – year Basic Education Programme is desirable.

Science explains “what is” and technology creates what never existed before” science is concern with search for knowledge and technology set out to satisfy human needs. Functional education include, ability to communicate effectively, ability to think about system (natural and scientific), ability to think in time-forecast, ability to think about value and issues, ability to separate number, quantity, quality and values, ability to move from awareness to knowledge to action, ability to work cooperatively with other people, and the capacity to use these processes : Knowing, inquiring, acting, judging, imagining, connection, valuing, and choosing and the capacity to develop an aesthetic response to the environment (Nnabuo,2012). (Omebe,2013) established that functional education is determined by the quality of the curriculum content, and that functional science and curriculum content must possess the characteristics of being valid, significant, learnable, consistent with social realities, useful, and must reflect the interest of the learners.

Agboghoroma and Imhanlahmi,,2009 Quoting World Commission on Environment Development known as Brundtland Commission viewed Sustainable development as a development that meets the need of the present without compromising the ability to future generations to meet their needs. Development is a product of growth, and science and technology can afford this growth and development through a sustainable education. This paper, therefore, highlights the various ways through which the new UBE Science and Technology Curriculum content can serves as a catalyst to bring about the desired development and self-reliance

**Basic Science and Technology Curriculum**

Curriculum can be viewed as an interaction between teachers and learners, between learners and learners, between learners and curriculum content. (Igwebuike,2008) consider curriculum as an organized sequence of intended learning experiences, their implementations and the evaluation of their effectiveness, (Okunloye,2014) conceptualized Curriculum as all planned experiences designed for and made available to learners for the purpose of achieving some objectives ends including knowledge acquisition, skill development and cultivation of altitude and value and other capacities for personal and social problem solving and effective living usually under the auspices of the school. Implicit in this definition are the following ideas: There is a source from which content and learning experiences are selected, one or more people select content and learning experiences and their selection is based on specified criteria and /or influenced by a number of factors and that, the learner should experience a change in behaviour and these changes should be those expected by educators in the teaching learning process.

Basic Science and Technology Curriculum (revised,2012) is a product of the restructuring and integration of four primary and Junior Secondary school (JSS) science curricula namely, Basic Science, Basic Technology, Physical and Health Education, and Computer Studies/Information and Communication Technology. The integration of the science curricula become necessary as a result of recommendations of the Presidential Summit on Education (2010) to reduce of subjects offered in Primary and Junior Secondary School and the need to promote the holistic view of science at the Basic Education level for better understanding of contemporary and changing world

The 9 – year Basic Science and Technology Curriculum according to Adeniyi, 2007 is the product of re – alignment and restructuring of the revised curricula for Primary Science and Junior Secondary School Integrated Science. Curriculum content can be seen as a body of knowledge or information that makes up learning materials, the body of knowledge may comprises of facts, laws, principle or generalization. In selecting the basic science and technology curriculum contents, major issues shaping the development of nations worldwide, and influencing the world of knowledge today were identified. These are globalization, information and communication technology, security challenges and entrepreneurship education.

The ways in which the learning experiences and content are put together and organized greatly affect achievement of the desire objectives. In considering the organization of learning experience two kinds of relationship or patterns exist, there is the relationship over time and there is the relationship from one area to another, these two relationships are referred to as the vertical and horizontal relations. The contents were sequenced in spiral form across the 9– year of Basic Education in order to sustain the interest of learners and promote meaningful learning. (Fatima and Umaru, 2011) affirmed it that, the new UBE Basic Science and Technology Curriculum can be said to be carefully planned, well written and documented having all it entails to bring socio – economic development through the achievement of the Millennium Development Goals and the critical elements of National Economic Empowerment and Development Strategy. But the workability of any curriculum depends on its effective delivery which involves the learner, the teacher, the resources, the methods of teaching and evaluation as well as the physical and psychological environment

The overall objectives of the new Basic Science and Technology Curriculum content as outlined by Junior Secondary School Curriculum, for Science and Technology (2010), are to enable the learners to; Develop interest in science and technology; Acquire basic skills in science and technology; Apply scientific and technological knowledge and skills to meet societal needs; Take advantage of the numerous career opportunities offered by science and technology; Avoid drug abuse and related vices, be safety and security conscious and finally become prepared for further studies in science and technology.

The prescription below represents the minimum content to be taught in Junior Secondary Schools as contained in Junior Secondary School Curriculum for Basic Science and Technology; production of Nigerian Educational Research and Development Council (NERDC)

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| --- | --- | --- | --- |
| **Theme** | **Sub-theme** | **Topics** | **Content** |
| Basic Science | Learning about environment | Family Trait | Important of Family trait |
| Basic Science | Leaning about environment | Environmental Hazard | Soil Erosion (Causes and control) |
| Basic Science | Leaning about Environment | Environmental Hazard 11 | Bush-burning, (Practice and reason for deforestation |
| Basic Science | Learning about environment | Environmental Hazard III | Depletion of Ozone layer and it effects and control Measures |
| Basic Science | Learning about environment | Resources from living/non-living thing | Meaning and importance of these resources to self and society |
| Basic Science | You and Energy | Light Energy | Reflection, refraction and vision |
| Basic Science | You and Energy | Sound Energy | Production, transmission/ reflection of sound |
| Basic Science | You and Energy | Magnetism | Law of magnetism, magnetic poles and magnetic field and its care |
| Basic Science | You and Energy | Electrical Energy | Flow of electron, Circuits; series and parallels, fuse and breakers, bill reading |
| Basic Science | You and Energy | Radioactivity | Meaning, element, types and uses |
| Basic Science | Science and Development | Skill Acquisition | Meaning, and reason for skill acquisition |
| Basic Science | Science and Development | Ethical issues in science and Tech, | Meaning or right and wrong application of science |
| Basic Technology | Materials and Processing | Processing of Materials (Timber) | Timber processing, growth, felling, conversion and seasoning |
| Basic Technology | Materials and processing | Processing of Materials (Metals) | Metal processing method (Smelting & Casting) |
| Basic Technology | Materials and processing | Materials Processing (clay, & ceramic | Method of processing clay, ceramic and glass materials |
| Basic Technology | Materials and processing | Plastic and Rubber | Method of processing plastic and rubber product |
| Basic Technology | Drawing Practice | Isomeric Drawing | Display models of isomeric objects |
| Basic Technology | Drawing Practice | Orthographic projection | Meaning, Component and its principles. Dimensioning Technique |
| Basic Technology | Tools, Machines and Processes | Woodwork /metal work project | Production of various object using simple woodwork metal machines |
| Physical and Health Education | Contact and Non-contact game | Contact and non-contact game | Takwando and basic swimming skills |
| Physical and Health Education | Health Education | Personal, School and Community Health | Family life Education |
| Information and Technology | Basic Computer operation and concept | Computer carrier opportunities | Computer professionals |
| Information Technology | Basic knowledge of Information Technology | Internet | Example of search engines; goggle, mama, ask.com |
| Information and Technology | Basic Knowledge of information and technology | Digital divide and Data base | Concept of digital divide and Database terminologies |
| Information and Technology | Computer Application packages | Spreadsheet and Worksheet | Examples of spreadsheet and worksheet, Data entry and editing |

**Source: *Junior Secondary School Curriculum for Basic Science and Technology***

***B*asic Science and Technology curriculum: Key issues and concerns**

The challenges towards implementing basic science and technology curriculum content for sustainable development and products self-reliance is gigantic. Policy-makers need to give basic science and technology adequate priority and attention so as to achieve pre-determined objectives. Some of the problem militating against qualitative science and technology curriculum content implementation includes:

1. **Insufficient instructional-aids;** instructional-aids are material and tools that stimulate teaching and learning process, it is equally used to clear misconception and misunderstanding of ideas, concepts, principles and issues. (Andrew, 2007) viewed instructional materials to include those materials used by the teachers as well as laboratories and other special facilities which student must used to acquire skills. Science and Technology curriculum are practical-oriented, the instructional materials are not in the right quality and quantity in our basic public schools., our laboratories where it exists, are ill-equipped, reagents and tools are inadequate or not available at all especially at the lower and middle basic educational level.
2. **Inadequate professional science teachers:** Science teacher at this level of our educational system is grossly insufficient in relation to student’s population, this account for poor academic performance of learners. Teaching science at this level required special skills in-terms of methodology, creative thinking, self-motivation and decision making ability. The inadequacy of professional science and technology teachers gives rooms for quack to flourish in the act of implementing science and technology curriculum, hence this significantly influence the performance of learners in-terms of skills acquisition and self-actualization
3. **Poor funding:** In 2008, only 13% of the Federal budget was allocated to education. In 2009, education got almost the least allocation. In 2010, out of a budget of N4.07 trillion, education got the sum of N2.49 billion to which an analyst said “is a drop in the ocean”, in 2012 budgetary provision, 921.90 billion was allocated to Security and 400.15 billion to Education. However, in 2013, budgetary proposal allotted N426.5 billion to education, the highest in recent times, a remarked by Dr. Ngozi Okonjo-Iweala at the budget breakdown session. (Alabi, 2013). In addition to inadequate funding in recent past, internal crisis including misappropriation and misapplication of funds are bane to implementation of science and technology curriculum. A programme that is not well funded will not achieve quality transformation,(Aguokogbuo,2002)
4. **Inconsistencies in government policies and programmes:** Government policies are often not static, they are dynamic and often subjected to change with every regime that comes into power .The inconsistencies in government policies can be seen from the academic calendar, which was initially from January to December and later changed from October to June. In addition, the educational system was changed from 6-5-2-3 to 6-3-3-4 and again to the present Universal Basic system, the challenges here is that plan are usually made midway into the implementation process. The concept of 6-3-3-4 was to cut unemployment level among our youths by arming them with sellable skills, this is in line with (Igwe, 1988) when it was opined that, the advantage of 3-3 system of secondary education therefore, is that it will equip its product both intellectually and vocationally depending on their areas of interest, aptitude and capability, but behold, from the inception, the government think more of buying finished technology and goods as basis of pre-vocational education. The Government busied itself shopping technology products from the cheaper Eastern Europe Markets; such as Yugoslavia, Bulgaria, Romania, etc.
5. **Curricular issues :** A critical content analysis of the curriculum revealed that, the curriculum were geared towards theoretical aspect of science and technology ignoring the social and organizational aspect, the implication of this is that the products lacks organizational and decision-making skills, by extension the learners are ill-baked to deal with the complexity of design and analysis. (Edosomwan and Onuodafin, 2009) remarked that most science curriculum are rarely modified, they are geared towards producing people with a specific skills that do not match the demand for industry or reflect changes in technology, they however recommend that curriculum content should be dynamic to accommodate emerging concepts

**Potential of Science and Technology curriculum content towards self-reliance**

The place of Science and Technology education in the life of any nation is inextricably tied with the pace of development, in-fact the nation’s level of science and technology education can be a reliable indicator of potential for sustainable development. Gado, 2011 quoting Iloputaite, 2004 remarked that, a nation with scientifically uneducated citizen cannot expect to make any reasonable socio-economical and political decisions. Science and Technology curriculum content will assist the student as the recipient of the subject matter to learn by doing, refine understanding, build new knowledge, visualize difficult concepts; access extensive collection of information as Information and Telecommunication Technology is a component of Science and Technology as a discipline

Lewis, 2004 established that science and technology will empower the teacher and the students in transforming teaching and learning processes from being teacher-centred, and this transformation will result in increased learning and allow learners to develop creativity skills, problem solving abilities, information reasoning skills and communication skills.

Other potential of science and technology curriculum content delivery are;

1. It gives greater exposure to vocational and workforce skills for students,
2. It provides opportunities for multiple and integrated self-sustaining skills
3. It helps in producing Information and Communication Technology literate students
4. It aids the Production of students capable of working and participating in the new economies and societies arising from ICTs and related developments,

For science and technology curriculum content to be implemented at the basic level to stem the tide of unskilled graduands, the teacher is core to the implementation of planned curriculum; the teacher is to handle teaching-learning process in logical and sequence manners such as proceeding from the treatment of the simple to more complex theme and at the same time the teacher should examine thoroughly the characteristics of the learners, some of the characteristics as highlighted by (Ughamadu,1998) includes ; Age and maturity of learners, capabilities, needs and interest of the learners, socio-cultural background, motivation and attitude towards the subject, special talent and the learners’ entry behaviour. The way and manner a planned curriculum is implemented influence the degree of its success. Centre-periphery model, proliferation model and shifting centre model of curriculum implementation must be adhered to, so as aid products effectiveness. The approaches science and technology teachers needs to adopt to make teaching-leaning process eventful at the basic level is to approach teaching in a manner that will make the content relevant to daily endeavor of the learner and teaching should be realistic and physical

**Condition necessary for UBE science and technology graduands effectiveness**

For teaching and learning of science and technology curriculum to be effective at the UBE level and to attain its preconceived objectives the following must be put in-position;

* There is a need to address the fundamental problems associated with the training of UBE science teachers, vis-à-vis, more funding for the training and development programme from the government, the trainers and trainees deserves to be well remunerated, and training material should be adequate in quality and in quantity as a tool less worker is a useless workers
* Conducive classroom and well-equipped science laboratories/workshop should be provided in our basic schools to prevent conducting lesson/practical in dilapidated or overcrowded room that has negative influence on teaching and learning
* The government needs to provide more funds for basic education, and, specifically science and technology component of pre-vocational subjects at the middle and upper basic level, as this level of education is the foundation upon which other ties rest. More funds in-terms of plants and machinery upgrade, research and development and recruitment of quality teacher to teach science and technology.
* Profession payment and working conditions of UBE teachers in general and Basic Science and Technology Teachers in particular should be significantly improve in order to enhance productivity, and the teachers should be regularly promoted with cash-backing as and when due just like other civil servants.
* Scholarship should be given to deserving teachers and brilliant students in the field of science and technology to pursues careers in science and technology at higher level, this will act as incentives to teachers and learners for maximum productivity

**Conclusion**

All countries of the worlds implement programmes for education to prepare their citizens for the world of works which generate the need for streaming of pupils at secondary school level to reflect their aptitude or cognitive abilities. From the foregoing it is obvious that curriculum content for science and technology is adequate and can bring about products/ learners self reliance for sustainable development in Nigeria, however, content delivery at this level in Nigeria is still very low, as a result of challenges inherent in the level’s educational system. However, it is established in this paper that no state can be self-reliant without a functional science and technology education, therefore credible basic science and technology education is a function of graduands’ self- reliance for sustainable development

**Recommendations**

The following recommendations are made based on the previous discussions:

1. Government at the Federal, State and Local levels should show more interest in Science and Technology Education by providing more fund for basic education, the funding may be inform of facilities/laboratories/workshop upgrade and Teachers Professional Development to ensure the effective implementation of the curriculum content
2. For teacher to effectively and efficiently execute their duties at this level, I strongly advocated effective supervision mechanism, where teachers would be assisted, directed, stimulated and motivated for optimal output
3. Quality science and technology teachers must be recruited via due-process at the basic level, recruitment should not be subjected to political influence
4. Thu issue of epileptic power supply must be addressed with all seriousness it deserves by the government. For our laboratories and workshop to be functional it must be constantly powered to enhance practical acquisition of skills, and internet bandwidth must be made available to our schools to enhance accessibility to the outside world
5. The laboratories and workshop should be adequately equipped with necessary tools and gadget in relation to our environmental settings and at the same time be provided with current textbook, journals, newspaper, periodicals, and magazine

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