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SKILLS IN BASIC SCIENCE AND TECHNOLOGY FOR LOCAL TECHNOLOGY AND ENTREPRENEURSHIP IN NIGERIA

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ABSTRACT: *With the broad search for skills to drive the home grown local technology in developing countries like Nigeria, Nigerian Educational Research and Development Council (NERDC) in the new Curriculum for Basic Science and Technology, encourages teachers to lead their students to identify entrepreneurial skills in Basic Sciences. This study is one of the efforts to determine such skills in Basic Sciences and Technology for Local technology and entrepreneurship. The research took place in one of the biggest cities in a flourishing State in Nigeria with 120 students (30 each), randomly selected from four secondary schools. The validated prime instrument for the descriptive survey design was questionnaire. The data was analyzed using inferential statistics. The researcher made recommendations that could answer the usual local and global question of "Where next is technology driving the local entrepreneurial?"*

KEYWORDS: Skills, Basic Science, Technology, Local Technology, Entrepreneurship, Sustainable Development.

INTRODUCTION

Value affirms and delineates the beauty of a meaningful academic programme. It is in view of this that education is seen as the power house for the development of a nation. In Nigeria, emphasis has been laid on science and technology education because of domineering power it has on national development. In the same vein, much of Nigeria research effort is directed towards improvements in agriculture, entrepreneurship and oil sector (Edward, 2011).

The attempt to meet the global demand and sustain the financial crisis prompted Nigeria government to adopt the Universal Basic Education programme in 1999. It was a prominent and positive reaction to the Global Education for all by year 2000. This was the 'Jomtien decade' as captured by Okeke, (2012)

This programme comprises of early childhood, primary, junior secondary and other kinds of non-formal education, it is a complete nine year basic education programme. Looking at National policy on Education (FRN, 2014) Science, Technical and Vocational Education is expected:

(a) To lead to fundamental and applied research in the sciences at all levels of education. The implication is that Science education shall emphasis the teaching and learning of science process and principles.

(b) The goals of Science Education shall be to:

  (i) Cultivate inquiring, knowing and rational mind for the conduct of a good life and democracy;

  (ii) Produce scientist for national development;

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(iii)Service studies in technology and the cause of technological development; and

(iv) Provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

(c) Special provisions and incentives shall be made for the study of the sciences at each level of the national education system. For this purpose, the functions of the agencies involved in the promotion of the study of sciences shall be adequately supported by government;

(d) Government shall popularize the study of the sciences and the product of adequate number of scientists to inspire and support national development.

While 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 occupation in various sections of economic and social life. Technical and vocational education is further understood to be:

(a) An integral part of general education

(b) A means of preparing for occupational fields and for effective participation in the world of works;

(c) An aspect of lifelong learning and a preparation for responsible citizenship;

(d) An instrument for promoting environmentally sound sustainable development;

(e) A method of alleviating poverty.

In line with the global crusade of Education for all (EFA) and Millennium Development Goals (MDGs). It is expected that at the end of the 9 years training every child should have acquired the basic literacy, numeracy, communicative and manipulative skills which would enable them survive in the society and reduce the dependence on white collar jobs, as well as promote positive contribution to national development. Each child is expected to display good moral, ethnical and civic values within the society; it is in this regard that this paper focuses on some of the skills children should acquire during the first nine years of educational training in Nigeria in Basic Science and Technology.

Emphasis from the Nigerian integrated science Project (1970) made it known that integrated science is to produce, among other things a course of study which:

a. Is relevant to student-needs and experiences;

b. Stresses the fundamental unity of science;

c. Lays adequate foundation of subsequent specialist study; and

d. Adds a cultural dimension to science education.

Also, Afuwape (2011) enlisted process skills, such as observing, counting, reporting, organizing, predicting, manipulating, experimenting, designing, modeling, generalizing as reported in the STAN publication of 1970.

The widely gained popularity of Integrated Science (Basic sciences and Technology) commenced with the Phelps-Strokes curriculum, 1925-1952, the commission saddled with the

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investigation of the educational needs of the people in their social, religious, hygiene and economic status. This commission was known and recognized for the introduction of technology and vocational subjects vis-à-vis methodologies in schools, later Ashby commission began to build on Phelps-Strokes Commission. These events were tied with Banjo (1961) and Taiwo (1968) reports that led to revision of the school syllabuses, an initiative of Aiyetoro 1968 "Aiyetoro Basic Science Programme" attempted the teaching and learning of science subjects as one entity at the lower forms (one & two) of secondary school in Nigeria. Around this period, Russians launched their space craft, the sputnik, in 1957, while Americans put the first man in the moon in 1969. The first international conference on Integrated Sciences teaching took place in Warna (Bulgaria) in 1968 followed with the curriculum conference of 1969 in Lagos, Nigeria. By the year 1970, the first publication of the Nigerian Integrated Science Project (N.I.S.P) was released. This document spelt out the objectives of Integrated Science as been better imbibed and recognized by relevant cadres of our educational system.

Basic Science and Technology subjects are to provide Background knowledge on manpower training in applied Science, technology and commerce, to provide preliminary knowledge and acquisition of skills necessary for physical, agricultural, industrial, commercial and economic development, to provide student with early basic scientific knowledge to the improvement and give solution for environmental problems for the use and convenience of many; to give an introduction to students who want to be professionals in science and technologies field. In conclusion, an insightful study of this nature will assist to identify such skills in Basic Science and Technology for local technology and entrepreneurship.

METHODOLOGY

This study employs a descriptive survey design using a questionnaire as the prime instrument. The study was carried out in Ijebu-North Local Government Area of Ogun State, Nigeria. Four major secondary schools were used (Ijebu-Igbo, Ijebu-Oru, Ijebu-Awa and Ago-Iwoye). In each of the secondary school 30 students were randomly selected to make a total of One Hundred and Twenty (120) students that participated in the study. The instrument was validated and data were analyzed using inferential statistics (simple percentage, mean and t-test at 0.05 level of significance).

RESULT AND DISCUSSION

This session presents the result of the data analysis and discussion.

Research Question 1: Are there concepts and principles to develop skills for local technology and entrepreneurship in Basic Science and Technology?

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Table 1: Mean responses of perceived concepts and principles of Basic Science and technology

SN	Statement	Mean	Standard Deviation	Remark
1.	Basic science and technology is part of the subjects I am studying	4.0000	.00000	Accept
2.	I like Basic Science and Technology than other subjects	2.9167	.93110	Accept
3.	I do enjoy Basic science and technology classes	2.8833	.77982	Accept
4.	I like Basic science and technology because it is more of practical's and interesting to study	2.8583	.89156	Accept
5.	Basic science and technology as a subject provides training for self-reliance	3.2667	.80683	Accept
6.	Basic science and technology is very good because it will reduce unemployment	2.7333	.95031	Accept
7.	Basic science and technology will make me to become independent, even without going to Senior Secondary School	3.3667	.72103	Accept
8.	I can establish my enterprise with the knowledge gained from Basic Science and technology	3.1500	.93170	Accept
9.	I am able to produce local products with the knowledge, gained from Basic Science (e.g. liquid soap, local perfume etc.)	3.3000	.71714	Accept
10.	Concepts and Principles of Basic science and technology makes me to believe a bright future even if I don't further my education	3.1167	.89989	Accept
11.	I am capable of setting up my own enterprise after school with the knowledge of Basic science and technology	2.9083	.87923	Accept
12.	Knowledge gained from Basic Science and Technology will influence and develop the local technology in the society	2.4833	.91655	Reject
13.	Basic science and technology will lead me to useful innovation	2.6000	.89255	Accept
14.	Basic science and technology make me to have entrepreneurship skills	2.7417	.97443	Accept
15.	I will love to know more on Basic science and technology as a Universal Basic Education School Subject	2.6417	.93302	Accept

Grand Mean = 2.99778

Table 1 indicates that majority of the items numbered in 1 - 15 were all with mean scores above 2.50 with a grand mean score of 2.99778 which is above 2.50. This revealed that the student believe that there are concepts and principles to develop skills for local technology and entrepreneurship in Basic Science and Technology.

Research Question 2: Are students aware of the concepts and principles to develop skills for local technology and entrepreneurship in Basic science and Technology?

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Table 2: Mean responses of perceived Students Awareness of concepts and principles of Basic Science and technology

S/N	Concepts/ principles	Skill	Trade	Mean	SD	Remark
1.	Living things (plants and animals)	1. Local herbalist 2. Poultry work 3. horticulture	Tradomedical (elewe omo) Fishery, snary, fowl rearing Flowers	2.3583	.68349	**Reject**
2.	Changes in matter (water)	Culturing of water	Pure water	2.6083	.53915	Accept
3.	Information and Communication Technology	1. electronic communication 2. computer operation	Phone call business, Data processing.	2.5667	.56111	Reject
4.	Family Health (Nutrition) Hair Dressing	Food (cooking) Hair dressing, barbing	Food vendor Hair dresser, Barber	2.8172	.43121	Accept
5.	Crude oil petrochemicals	1. Production of soap 2. Petroleum jelly	Soap production, Vaseline	2.5417	.54843	Accept
6.	Resources from living Organisms	1. Hide skin 2. Production of honey from bees	Leather shoes Collection of honey	2.1250	.77310	Reject
7.	Simple machine	Automobile	Automobile mechanics	2.5612	.54311	Accept
8.	Skill Acquisition/Ethical Issues in science and development	1. Blacksmith 2. Goldsmith	Cutlasses, knives, local gun for hunting Earrings and chains	2.9122	.21121	Accept

Grand Mean = 2.5613

Table 2 indicates majority of items numbered in 1 - 8 were all with mean scores above 2.50 with a grand mean score of 2.5613 which is above 2.50. This revealed that the student are aware of the concepts and principles to develop skills for local technology and entrepreneurship in Basic Science and Technology

Research Question 3: Is knowledge gained in those concepts and principles sufficient to develop skills for local technology and entrepreneurship in Basic Science and technology?

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Table 3: Mean responses of Students on the Knowledge gained in the Concepts and principles of Basic Science and technology

SN	Statement	Mean	Standard Deviation	Remark
1.	Basic science and technology is part of the subjects I am studying	4.0000	.00000	Accept
2,	I like Basic Science and Technology than other subjects	2.9167	.93110	Accept
3.	I do enjoy Basic science and technology classes	2.8833	.77982	Accept
4.	I like Basic science and technology because it is more of practical's and interesting to study	2.8583	.89156	Accept
5.	Basic science and technology as a subject provides training for self-reliance	3.2667	.80683	Accept
6.	Basic science and technology is very good because it will reduce unemployment	2.7333	.95031	Accept
7.	Basic science and technology will make me to become independent, even without going to Senior Secondary School	3.3667	.72103	Accept
8.	I can establish my enterprise with the knowledge gained from Basic Science and technology	3.1500	.93170	Accept
9.	I am able to produce local products with the knowledge, gained from Basic Science (e.g. liquid soap, local perfume etc.)	3.3000	.71714	Accept
10.	Concepts and Principles of Basic science and technology makes me to believe a bright future even if I don't further my education	3.1167	.89989	Accept
11.	I am capable of setting up my own enterprise after school with the knowledge of Basic science and technology	2.9083	.87923	Accept
12.	Knowledge gained from Basic Science and Technology will influence and develop the local technology in the society	2.4833	.91655	Reject
13.	Basic science and technology will lead me to useful innovation	2.6000	.89255	Accept
14.	Basic science and technology make me to have entrepreneurship skills	2.7417	.97443	Accept
15.	I will love to know more on Basic science and technology as a Universal Basic Education School Subject	2.6417	.93302	Accept

Grand Mean = 2.99778

Since students perceived and accepted concepts and principles to develop skills for local technology and entrepreneurship in Basic Science and Technology: It could then be concluded that knowledge gained in the subject will enhance their skills and knowledge for local technology and entrepreneurship as revealed in tables one (grand mean: 2.99778) and two (Grand mean: 2.5613).

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DISCUSSION

This study investigated Skills in Basic Science and Technology for Local Technology and Entrepreneurship. The discussion follows the sequence of research questions as stated below.

The first research question which states: Are there concepts and principles to develop skills for local technology and entrepreneurship in Basic Science and technology revealed that the students are of the opinion that there are concepts and principles to develop skills for local technology and entrepreneurship in Basic Science and Technology. This is in line with the Nigerian Integrated Science Project-Science Teachers Association of Nigeria [STAN] which states that Integrated Science principles are intended to produce, among other things a course which is relevant to student-needs and experiences; stresses the fundamental unity of science and lays adequate foundation for subsequent specialist study. Also, the study corroborate Wosu (2016) and Alebiosu (2017).

In this twenty first century, science curriculum developers must bring to the open, skills that will provide science and technology with the confidence to make significant contributions for the scientific, technological and mathematical development of the nation (Rae, 2009 and Adeyemo, 2013). Ndu (2013) in his work opined that the most prominent roles practical skills played in schools are to promote effective learning activities, manipulative skills, good memory, organizational skills, communication skills, power observation, relationship between form and function, data analysis, power of hypothesizing, creativity, experimental and drawing inferences. Baiyelo (2010) reported the four roles of skills that is, to promote effective managerial skills, valuing skills, parsimony skills and economy skills. For the above roles to be felt and effectively practiced by students, the science teacher must possess the following competencies Aliyu (2012): Adequate and up to date knowledge of science subject under focus; Educational knowledge relating to psychological; characteristics of the students; Knowledge of processes (and methodologies) involved in learning and how to promote them; Motivation or new enforcement of learning to sustain the interest of the students; Skills for effective planning and presentation and he must possess technical and scientific skills for proper performance of requisite skills. The student do not agree with the question that knowledge gained from Basic Science and technology will influence and develop the local technology in the society. This can be attributed to lack of practical, dearth of teachers, current pedagogy and loss of interest from the students studying Basic Science and Technology. It is therefore a must for all science and technology teachers to possess appropriate skills of teaching in order to meet the productivity challenges teaching deserves in this new millennium.

For the student to agree that there are concepts and principles to develop skills like electronic communication, poultry work, horticulture, production of honey from bees etc. for local technology and entrepreneurship in Basic Science and Technology, it can be said that the teachers played an important role in impacting the student with the right knowledge of basic Science and technology. Experts agreed that the teacher is a critical factor in the successful implementation of any educational innovation (Wokocha, 2009; Nwadiani, 2012). They argued that previous policies on Education failed partly because teachers did not possess adequate knowledge about them. This argument was supported by the declaration in the National Policy on Education (2014) that no education system can grow above the quality of its teachers. Nwadiani (2012) stated that among the problems in reform implementation in Nigeria is lack of understanding of the policy. According to Ereh (2010), curriculum implementation consists of two components: the technical and the managerial. The technical component consists of actual development of the curriculum or programme. The managerial component consists of

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planning for its development. The teacher is central in the task of implementation of any curriculum. His understanding of the curriculum objectives, contents, materials and methods is crucial and fundamental.

The second research questions which states: *Are students aware of the concepts and principles to develop skills for local technology and entrepreneurship in Basic Science and technology* also revealed that student are aware of the concepts and principles. This is in contrast with the work of Nsa (2003) which states that the evolution of Science and Technology in less developed countries including Nigeria lacks the basic ingredients required for sustainable growth and development which include production and societal awareness or pressures. With the opinion of the students, Science and technology activities in Nigeria can be said to have a great and positive impact on the Economy. The usefulness of Science and Technology in education is inestimable as it stretches from an individual to the society at large. Olaintan (2012) buttresses this fact by concluding that apart from individuals being the primary beneficiaries of Science and Technology Education, the nation is usually the fundamental beneficiary of this form of education. UNESCO (2004) says there is some measure of agreement that school science and technology should be concerned with promoting scientific and technological literacy (STL) for all. The Millennium Project Declaration asserts that priority should be assigned to the development and introduction of programmes leading to scientific and technological literacy for all in all the countries of the world. It is important to note that local technologies and the various forms of understanding of, and operation within, the natural world, are both acknowledged and valued. There is no shortage of examples of how local technologies can be used to illustrate underlying scientific and/or technological principles (Knamiller, 2012; Swift, 2012).

Barlex and Pitt (2010) said, Science and technology teachers are working more closely together with coordination or collaboration. The teachers of the two subjects may plan their work with a sensitivity to each other's needs, for example by establishing a common terminology, deploying the same analogies and sequencing the teaching of scientific concepts to optimum mutual advantage. Those elements will allow students to experience for themselves the interaction of scientific/theoretical and technological/practical knowledge and help them develop their skills in both areas.

The third research question which states: Is the knowledge gained in those concepts and principles sufficient to develop skills for local technology and entrepreneurship in Basic Science showed that students have knowledge of the concepts and principles in Basic Science and Technology. Students with knowledge and skills are expected to have enough skills for local technology and entrepreneurship. This is also in contrast to the study of Nsa (2003) who observed that non-performance of students and teachers in Science and Technology could be decline in government intervention for education development in Nigeria. Loening (2005) asserts that a better-educated labour force has a positive and significant impact on economic growth. When skill and knowledge is gained, it will be useful to the society and the individual in so many ways. Fryklund (1956) regards a skilled person as representing the highest type of workman, whether in production industry or in trade. Holdings (2005) describes a skilled person accurate and wastes little time. Roberts (2009) complemented this description by saying that a skilled worker is a man who has achieved a high degree of proficiency and recognition in his vocation. To Legge (2000), skilled performance has to do with production of appropriate responses to a particular problem. Sometimes, the responses are discrete and do not warrant rigorous level of accuracy.

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This study support the findings of Adeyemo (2009) which say, skills and principles are in-built in the nature of science and technology subject. To Baiyelo (2010), the holistic approach to Science and Technology is capable of describing a student's disposition to school instruction which makes them to acquire skills that will inturn be useful to them and the society while Alebiosu (2017) affirmed that learning with hands-on involves all the senses and will help the learner develop fine and gross motor skills, it improves concentration and coordination, and builds critical problem-solving strategies.

CONCLUSION

From this study, it can be concluded that universal Basic Education has been developed for a positive impact on the society. Nigeria as a developing country is presently enjoying the implementation of Basic Science and Technology but the need to improve on the teaching and learning of the subject in order to meet up with the developed countries like China, United Kingdom, America etc is inevitable.

- Financing adequate and appropriate resources for Basic Science and Tehnology is a must.
- Teachers should teach with adequate and appropriate resources for skills acquisition, creativity and innovation and make sure that non of the curriculum content is left out untouched before the end of a particular programme.
- Parents should encourage their children to embrace science and technology education in all spheres of life.

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