

CONTEMPORARY ISSUES IN SCIENCE AND TECHNOLOGY EDUCATION IN NIGERIA

Ewesor, Stella E. (Mrs.) and Dr. Umeoduagu, J.N.

Abstract

This paper briefly examines the meaning of science and technology cum its educational system in Nigeria. Also herein, research products are considered to result into cultural changes in society by either "discoveries and inventions" or borrowing and diffusion". The tool needed for such change is orientation of the people using scientific innovations and its concepts. This should be directed at aims and objectives of education. The curriculum pressures are reflected as one of the contemporary issues in science and technology education in the outmoded 6-3-3-4 system of education. One of the elements of these pressures is the curriculum overemphasizing examinations. The researcher proffers useful recommendations in the forms of employment and in-service education programmes for Scientists/Technologists. Also, re-orientation of relevant stakeholders in science and technology education is essential to be in line with the 9-3-4 system of education to be started in September, 2006.

Introduction

Nigerians are gradually benefiting from the products of science and technological development as a result of the gains accruing to the transition process through its educational developments over the last two decades.

According to Fafunwa (1971), "we are living in a world where science and technology have become an integral part of the world's culture and any nation that overlooks this significant truism does so at its own perils". For the realization of the great importance of science and technology in National development cum economic growth, the Nigerian government embedded in the country's constitution (Section 18:2), that it shall promote science and technology. This is only practicably possible in pursuance of its noble objectives by instituting adequate provisions for the education of people in science and technological concerns.

Moreover, science and technology education is aimed at improving all levels of education in Nigeria as posited in the National policy on education with the overall goal of creating rational minds for the conduct of a good life and democracy for the people toward National development at large. For this simple reason the government had mandated the universities as matter of policy to give priority of sixty percent (60%) to students opting for science and technology courses as against forty percent (40%) for others in aspects of humanities.

Consequent to Nigerian's recent efforts towards science and technological development like in most developing countries of the world, the inquiry into the future of science and technology education growth in Nigeria cannot be over-emphasized. Therefore, it is on this premise that this paper would be discussed under the following sub-headings:

- 1) What is science and technology?
- 2) Meaning of science and Technology Education.
- 3) Some elements of science and technology in 6-3-3-4 system of education in Nigeria.
- 4) The curriculum pressures confronting science and technology education in Nigeria.
- 5) Transition towards the 9-3-4 system of education in Nigeria and its relevance to science and technology.

What Is Science and Technology?

Science can be said to be a body of knowledge and process of acquiring and refining knowledge. According to Gbamanja, (1991), science can generally be conceptualized as a process of thinking, a means of acquiring new knowledge and a means of understanding the natural world, also, the National policy on science and technology (1986), defined science as the generation of knowledge about life.

Technology may be defined as the process and product of man's quest for solutions to his

daily problems or finding workable solutions to them methodically. In other words, technology as a study and utilization of manufacturing and industrial methods in a problem solving process with the aim of improving the quality of life for the people generally.

Technology is not all about machines, but a complex system involving the principle of integrated organization of manpower and machines cum ideas of procedures and management. It also involves design, gadgetry and aesthetics (Avbenagha et. al., 2006:12).

The Meaning of Science and Technology Education

Education is defined as the process by which ones mind develops through learning at school, college or university. This could be said to be the knowledge and skills that one gained from being taught (Longman Dictionary of Contemporary English, Third Edition) (1987).

The acquisition of knowledge and skills from teaching brings about the transformation of a larger society when these are further practically demonstrated.

Science education had been defined as "a discipline concerned with the study of the interaction of science and society, that is the study of the impact of science upon society as well as the impact of society on science" (Okafor, 1990:43), Technology like science is said to have its own process, product and ethics, therefore any of these has to be learnt or taught to effect the transfer from generation to generation so as to allow for continuity in the system(s). In other to bring about improvement on produces and/or products, science and technology had been dramatically undergoing several transitional processes based on research. And, research products are often resulting into cultural changes by either "DISCOVERIES" and INVENTIONS" or by "BORROWING" and "DIFFUSION" which are basically of extrinsic influence. Since cultural change refers to the changes in the social relationship and social structure of the society, it means that there is a need for changes in orientation of the people. The tools necessary for this orientation must be the innovation(s) and its concepts, which usually grow out of scientific and technological enquiries (Umudhe; Kori-Siakpere, 1997:162).

A weak foundation for science and technology education will spell doom for any unguarded entity or sovereign state in the world today. This is because education they say is the sovereign remedy to the problems of any given society.

It could be said categorically that "no science no technology" and vice versa. It has been informed therefore, that science and technology are agents for rapid social and societal development. Science and technology education is therefore, expected to give or provide support for the nation by the following approaches:

- 1) Generating widespread public understanding about science and technology through enlightenment process.
- 2) Supporting science and technology as agents of change in the Nigerian system(s).
- 3) Training the required manpower for science and technology.
- 4) Ensuring a sound foundation in science and technology in the elementary level of the 9-3-4 educational systems.
- 5) Encouraging and promoting publications in science and technology.

For science and technology education to be able to achieve the above fits, it has to work towards or rather in consonance with the UNESCO (1975) recommendation, which says that, "if science is to be learned effectively, it must be experienced. Science is so close to the life of every boy or girl that no teacher need ever be without first hand materials for the study of science".

According to Inomiesa (1997), if science education must actualize its expectations as regards societal development, there should be:

1. Up to date and relevant curricula;
2. Appropriate teaching and learning materials in terms of quality and quantity;
3. Standard laboratories and laboratory equipments; and
4. Properly trained and well-equipped science teachers.

Contemporary Issues in Science and Technology Education in Nigeria

With the peripheral information already given hitherto about the need for science and technology education in Nigeria, it is appropriate to examine what the contemporary issues signify? What angle of these dictates does the presenters wish to exploit with special interest in science and technology education in Nigeria?

CONTEMPORARY refers to somebody or something belonging to the same time, which could be of past or present affairs. It could be used to denote occurrence(s) in the modern time or rather portraying the reflection of current affairs in terms of styles, fashion, music, dance, politics, sports, education etc. (Oxford Advanced Learners Dictionary, 6th Edition). While, issues had been viewed as a multi-dimensional subject by many lexicographers in such meanings as certain topic of discussion, problem(s) of somebody or people with something, matters relating to publications, etc. The presenters would want to see the word issues from two perspectives (i.e.) as topic of discussion and problems relating to the subject under discussion for the purpose of this paper. Therefore, as the case may be, CONTEMPORARY ISSUES here within would be viewed and examined as the reflection of current problems facing the developmental aspects of science and technological education in Nigeria. It is often said that good planning brings about easy implementation or execution of decision. It is imperative that certain contingencies are inevitable in planning processes which might be chaotic in its nature, hence the need to seek for possible leeway(s) in case of emergence. This would lead us to the nucleus of this discuss about the contemporary issues in science and technological education in Nigeria that would be centered on its planning processes called the curriculum, and the pressures so far faced in the system generally.

Some Elements of Science and Technology in the 6-3-3-4 System of Education in Nigeria

The 6-3-3-4 educational system which started implementation in 1982, till date specified six years for primary school, three years each for junior and senior secondary schools, while four years for higher schools such as university.

This educational policy of 6-3-3-4 system is tailored on the belief that education should be a functional tool and serve the goals of social transformation and the development of the Nigerian people. Advancement from one class to another is intended to be based on continuous assessment which will finally translate into primary school leaving certificate. Moreover, pupils are required to take common entrance examination for admission into the federal and state government owned secondary schools.

The proposed two tiers for secondary school education being splitted into three years for junior stage and three years for the senior stage, it is expected that, the junior stage of secondary education will be compulsory and its Curriculum comprehensive with subjects like woodwork, metalwork, electronics, local crafts, technical drawing, integrated science etc. The integrated science subject taught at this junior stage is meant to be the pivot for science and technology education in the secondary school curriculum. STAN (1971), as cited in (Umudhe 1998: 82), indicated that in Nigeria, the subject is aimed at training the student to be able:

- i. To develop the motivation and ability to work and think in an independent fashion;
- ii. To device schemes for solving problems;
- iii. To apply previous knowledge to novel situations; and
- iv. To relate his experience in each subject area to other areas and relate same to life in his society.

It should be noted, that at the end of these three years, the students in the junior stages are to take the junior secondary school (J.S.S. 3) examination to be conducted by ministry of education, which is a qualifying examination for the senior stage of the secondary education. The senior secondary school examination is to be taken in the last year of the high school (S.S. 3) as a prerequisite for admission into any tertiary institution of learning. Furthermore, it is said that government shall popularize the study of the sciences and the production of adequate number of scientists to inspire and support national development.

Unfortunately, the aims of the 6.3,3.4 educational system in relation to science and technology have been uncomplimentary due to certain deficiencies as follows:

- (i) Free and compulsory education is not practiced as planned,
- (ii) The science teaching and learning suppose to be of its process and principles (i.e.) being practical oriented, but the theory of science is given priority over practical in Nigerian system, (iii) Enlightenment on the study of science which is the sole function of the government is not adequately pursued,
- (iv) Special provisions and incentives promised as government duty to promote sciences education at all levels has failed,
- (v) The necessary integration of information and communication technology (ICT) into educational system in Nigeria had been lacking.
- (vi) Basic infrastructural facilities needed for science and technology teaching are lacking and, where present they are not adequately equipped. For example, laboratories needed for practical, exploratory and experimental methods of teaching are poorly equipped in Nigeria schools.

The Curriculum Pressures Confronting Science and Technology Education in Nigeria

In spite of the re-assuring and holistic attention given to science curriculum as shared by the aspect of technology since 1968, it appears that many ingredients of it had been left in the winds. But, it could be observed that the present situation of science and technology education in Nigeria is still much entangled by multifarious problems which had kept about 95% of students in the country to mere reading and not doing of science nor technology. The situation is seen as very much in line with FASE conference resolutions, Harare (1985), which states that the present form of science and technology being taught in the Nigerian schools does not prepare students to function well in the society undergoing transition from a rural economy to a developed typed economy.

Most painfully, our government often times institute far reaching changes in curricula of educational system at relatively short notice and sometimes without cognizance of profound opinions. *Contemporary Issues in Science and Technology Education in Nigeria*

The following are the major curriculum pressures confronting science and technology education in Nigeria:

- a) **Shortage of Qualified Science Teachers:** Teachers are meant to implement the content of the curriculum, and it is therefore, imperative that these people should have been well acculturised in science and technological concern and its pedagogy to function effectively. It is regrettable to note that most of our science and technology teachers are those with mere reliance on their first paper qualification. Most of these teachers teaching sciences and technology in Nigerian schools are a "monkey see, monkey do types" because, they are not innovative or creative hence, ready-made knowledge which reflects stereotyped characteristic are built into our science and technology educational system, Bajah (1975), Ogunniyi (1985), Okoye (1993), etc.
- b) **Lack of Practical/Teaching Materials, and Equipments:** Science and technology as subjects that are activity-oriented, therefore demands the active participation of the students to develop a well-formed minds for concepts and sterling tendencies for inquires into the nature. Most of our schools today especially the government approved privately owned secondary schools do not have laboratories for practical learning and where existed at all, are lacking necessary equipments and utilities with which concepts of these science and technologies could be well demonstrated and explained.
- c) **Curriculum Over Emphases Examination:** "Talk and chalk, pen and paper" has so much characterize our learning and teaching system while therefore the examination had become the ultimate end for evaluation of students in Nigerian schools at all level. It is saddening that most considered brilliant students in schools are never found as best performers in work life. It is necessary to note that this over emphasis on examination had shut doors against those who would have been scientists and technologists that finds themselves as artisans who are still those that show case products in most of the Nigeria trade fairs today.
- d) **Inadequate Textbooks, Research Materials, Libraries and Basic Information and Communication Technology (ICT) Facilities:** In a well developing educational system, the

availability of relevant literature materials for referencing and further probe into knowledge or ideas cannot be over-emphasized, because of the needs for guidance towards a proper base. But, most unfortunately, in Nigeria much encouragement is not directed toward this angle as the scientists/technologists are rendered handicapped due to lack of funding by government who is the employer of a larger number of these people. The private bodies also lack the awareness to fund researches, establish (ICT) centres and libraries of science and technology in the country.

e) ***Improper Monitoring and Feedback Mechanism:*** The various curriculum development

documents of different bodies for example, amplified that the most appropriate mode of ensuring the doing of science in schools is to integrate both theory and practical. It is said that to pave way for creativity and contribute to improvisation, the above integration had to be adhered to. It is unimpressive to state that there is no proper control and monitoring to serve as a check and balances in the arrangement. The curriculum once reviewed, it is necessary to sought for feedback from the implementation circles so as to know or rather recognize the possible areas where there might be need(s) for change or modification.

f) ***Over Population of Students Relative to Teacher's Requirement:*** According to National Policy on education (2004), in pursuance of the goals of science, it is stipulated that the teacher — student ratio should be kept at 1:20 for effective participation of students in practical work. But, a reverse is the case with Nigeria schools where there are students over population, which creates difficulties in the implementation of the curriculum for science and technology education. Therefore, effective teaching and learning process is usually jeopardized in this kind of situation.

Transition Towards the 9-3-4 System of Education and Its Relevance to Science and Technology Education

The curriculum pressures are associated with the present 6-3-3-4 educational system in Nigeria. Since it is at the verge of being modified, it becomes necessary to envision what the alternative holds for development. Therefore, the Universal Basic Education (UBE) commission proposed 9.3.4 system of education for replacement of the former. It shows that, the basic education shall be of free and compulsory nature for the first time (9) years in the programme. Prof. Godwill Obioma, the Executive Secretary of the Nigeria Educational Research and Development Council (NERDC), stated that the common entrance examination had been abolished. This is in conformity with the 9.3.4 educational system arrangement whereby the transition from primary to junior secondary schools would be 100 percent. This policy reflected the decision of the of the National Council on Education (NCE) at its 52nd meeting in Ibadan, where it approved that continuous assessment "shall be the dominant instrument for evaluating learning achievement". The design of the new programme is to accommodate the provision of school uniforms and books for pupils or students up to the junior secondary school (JSS) level.

The major difference between the 6.3.3.4 and 9.3.4 system(s) of education is that the latter would be completely free and compulsory from primary to junior secondary school level. The signals this would generate in the society are:

1. Psychological development of every child would be well stimulated, as the tension created by expulsion from school for non-payment of fees are removed.
2. Some incapacitated parents would be encouraged to bring out their wards for learning process in schools.
3. Societal value, dignity and respect would be won for students, as their uniform provision by government would bring about true uniformity in appearance and cleanliness can be controlled.
4. The pupils or students' emotional stresses would be removed through the provision of these basic necessities. This would engender equality among students to some reasonable extent.

Also, the issue concerning the final examination for the end of the nine (9) years basic programme (i.e.) JSS III examination shall be treated to have uniformity. According to the Executive Secretary of the Universal Basic Education Commission (UBEC), Prof. Gidado Tahir in an interview said that the commission was considering several options to ensure uniformity in the JSS 3 examination in the programme.

The options he presented for consideration along this pursuit are:

- (i) National Examination Council (NECO) or West Africa Examination Council (WAEC) to conduct the JSS 3 final examination.
- (ii) Both NECO and WAEC to collaborate in conducting the examination,
- (iii) Only NECO to conduct it. (iv) Government is also thinking of setting up a new body outside NECO and WAEC to effect the function.

Furthermore, the UBEC is determined to use the 9.3.4 system to ensure qualitative basic education programmed. This would give room for qualified products as graduates who would be able to defend their certificates.

There is arrangement for regular capacity building programmes for teachers and the support staffs involving in the continuous assessment activities, while intensifying action on evaluation programmes that would focus on the learner and the school. The mechanism set in motion to actualize these above dictates in the 9-3-4 system of education is the fifty (50) unity schools as pilot in different parts of the country.

The ultimate aim of the 9.3.4 approach as in transitional process in our system of education is its universality at the first tier. And, if this is tactically approached with sincerity of purpose by the implementators, it would bring about a scientific transformation of all facet of the economy. Consequently, this proposal is viewed as going to be better than the 6-3-3-4 type as science education would be well positioned or rather endeared to prospective scientists/technologists in Nigeria.

Recommendations

- 1) **Scientists/Technologists Re-Education Programmes:** These are programmes meant to subject the teachers in the fields of science and technology to further training such as pre-service and in-service training where pedagogical factors would be given much attention.
- 2) **Employment and Scholarship Provision for Science and Technology Educators; The 9.3.4 system of education coming into play should be empowered through employment programme.** Also various forms of scholarships should be arranged for educators as incentives to motivate them for good works. Students with vigor for brilliance in science and technology in schools should equally enjoy scholarship privileges to ginger them for further performance.
- 3) **Generation for Integrated Science Specialists (Teachers) Should be Given Priority:** More specialized teachers in area of integrated science for junior secondary schools is necessary in the 9.3.4 system of education. This can be achieved by making it compulsory for all universities and colleges of education to run degree and certificate programmes in integrated science.
- 4) **National Examination Council (NECO) is to Conduct J.S.S III Examination:** It is important to note that (NECO) being a national board of examination understands the country's interest on education. Therefore, (NECO) would be determined to protect our national integrity, and the sovereignty of our nation would be better protected. Also, this mentioned body already must have been well engrossed with our curriculum in science and technology education. Moreover, the body should be used as a true indicator for the transition into 9.3.4 system of education. It should be noted that if WAEC is allowed to conduct this examination, the elements of Nigeria sovereignty is tampered with. Again, WAEC in Nigeria takes directives from its headquarter which, decision might conflict with our educational interest on science and technology.
- 5) **Re-Orientation of Relevant Stakeholders of Science and Technology Education:** The erudite in Nigeria has it as a duty to re-orientate our political class who are mainly in the corridors of power about the needs to fund science and technology education well to better our tomorrow. If the above becomes well achieved, other stakeholders would be better enlightened by the government who would become an indicator to remedy some of the challenges so faced in the sector.

Conclusion

It has being a memory lane in the review of some activities of science education so far in Nigeria since 1968. And, the major constraints reflected in the researchers' view, are some curriculum pressures facing science and technology education. The researchers opined that if re-education of the

teachers and re-orientation of relevant stakeholders are given utmost attention, majority of these constraints would be remedied.

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