

SCIENCE AND TECHNOLOGY EDUCATION FOR MEANINGFUL NATIONAL DEVELOPMENT IN THE 21ST CENTURY

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Abstract

Education has been described as a veritable tool for the socio-economic and political transformation of the society. That is to say that national development cannot take place without education. In particular, the desired socio-economic and political transformation desired in the 21st century must be such that can make the citizens of any society, even Nigeria, frightened because of its competitive nature. Thus, Science Education has been identified, as one of the basic tools for the production of knowledgeable and skillful citizens who can best be equipped for the competitive world of the 21st century. It is through Science Education that technological advancement can be facilitated. Thus, a meaningful Science Education programme that can lead to the realistic technology for the production of Engineers, Technologists, Technicians, Scientists, and people with technical skill has been advocated. This recommendation is being made in view of the present Science Education Programme, and Science and Technology Policy with the attendant problems in Nigeria.

Introduction

The issues of vision and mission of science education in the 21st century are very timely and relevant in contemporary Nigerian society especially with due respect to the following provision of the National Policy on Science and Technology: science and technology have become critical factors of economic and social development. Through the application of science and technology the resources of nature have been transformed into goods and services for better quality of life. Thus, in spite of the tremendous growth of world population, the application of science and technology to agriculture has sustained the population. In fact, the advances in science and technology have assured man of comfortable living, improved process and very importantly conserved his energy for other¹ activities. This paper is based on the firm belief that Science Education is an outcome of any meaningful science and technology policy. This is to say that there must be a development to take place. Also Science Education is a requirement for any proper national development in the 21st century.

Science Education and National Development

Let us briefly discuss what education is, education and national development and how science education can be used as a veritable tool for facilitating national development.

According to Imogie (1998) education is a complex subject and a basic force for the socio-economic and political transformation of the society. Education is a vital instrument for nations, development especially as it is central to human capital development. It is clear today that physical capital development for our nation depends essentially in the human capital development, which ordinarily means the process of increasing knowledge, the skills and capacities of national population. This is not to say that education should not go beyond national development to include serving as a vehicle for self-reliance and national integration etc.

All said and done, it is clear that no nation can grow and develop without education. More importantly, no nation can grow and develop without technological education, which has the potentials of helping people to absorb new ideas in the context of the central role of education for national growth and development that this paper shall focus on Science Education within the Nigerian education system, where we want it to be in the 21st century and how it can get there.

It was in the context of Science education the National Curriculum Conference (1969) rightly pointed out that Nigeria is blessed with natural resources but that what we are short of is skilled manpower. In order to develop and adapt to changes for utilization of better and more efficient techniques, machinery and equipment, we need professional and technical know-how. That means; that we need more qualified and dedicated teachers, managers, doctors, scientists, technicians,

mechanics and maintenance workers of all kinds. We need skilled engineers to design, install new equipment and technically skilled personnel to plan and manage production, to maintain expensive and perhaps automatic equipment. We need scientists and technologists to conduct research for newer and better products in science and technology and economic growth generally. Science and technology have been used in many literature and particularly in the National Policy on Science and Technology, booklet as either two concepts that must occur together so that when we talk of one, we must talk of the other (contiguity) or as one (science) that leads to the other (technology) that the latter can not be reached without passing through the former (Ezewu 1992). The relationship between science and technology

with regard to national development is clear, that is why if national development in Nigeria must be nationally carried out in the 21st century, the vision and mission of science and technology must be clear.

For example, the Vision 2010 Committee which was charged with the responsibility of providing the vision and mission for education in the 21st century, in its final report has the following summary of the education generally: -

- (a) Education is a vital aspect of human capital development embracing in particular educational services, population issue and social services general but education is central to human capital development.
- (b) Traditionally emphasis had been placed on accumulation of capital in the process of economic growth and development.
- (c) It had now become acknowledged that education also serves as a vehicle for self-reliance and national cohesion.
- (d) Education is not only for the acquisition of literacy or other skills or the preparation of the individual for the employment market but also entails a life-long formal/informal process of equipping the individual to be fully aware of his environment and exploit it.
- (e) Education fosters in the individual good citizenship, better appreciation of his cultural traditions and national development.
- (f) Education in its widest sense must train the individual to absorb new ideas for resolving the constantly changing problems of the environment, train the individual to relate to and interact with other individuals in pursuit of national progress and creative ability (Final Report of the Education Group of Vision 2010 Committee, 1997).

The foregoing roles have serious implications for technological education in Nigeria, in view of the fact that Vision 2010 provides a conceptual and strategic planning for education in general and especially for taking a far-view of Technological Education into the 21st century through a realistic appraisal and radical transformation of the present system (Imogie, 1998).

What is Technology Education?

Technology Education is treated under Technical Education in the National Policy on Education. Technical Education is defined as "that aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge" (NPE, 1981; 28).

The importance of Technical Education lies in the fact that adequate supply of technological manpower is a sine qua non for national technological, development and industrialization and consequently accelerated economic growth and development. This statement is derived from the objectives of Technical Education which include:

- (a) To provide trained manpower in applied science, technology and commerce particularly at sub-professional grades.
 - (b) To provide the technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.
 - (c) To provide people who can apply scientific knowledge to the improvement and solution of environmental problems for the use and convenience of man.
 - (d) To give an introduction to professional studies in engineering and other technologies.
 - (e) To give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant.
- (f) To enable our young men and women to have an intelligent understanding of the increasing complexity of technology (NPE, 1981: 28).

Science and Technology Education in Nigeria

The foregoing objectives can hardly be achieved without a pragmatic Technological Education Programme with sound foundation in the secondary schools where Technical Education depends on technical teachers to a very large extent.

It is important to state at this point the quality of life, the standard of living and the well-being of people depends on how far the people are free from disease, squalor, vagaries of nature, the drudgery of daily living and material poverty. The methods adopted in tackling these problems, usually consist of the hardware and the software. The hardware is the tools and equipment used, and these constitute the technology. The software, which is the knowledge and know-how of the method; adopted is science.

There cannot be technology without science. Science is, therefore, a discipline that explains actual events, processes or phenomenon in nature and gives solutions to problems of everyday living through research. Science and technology are therefore critical factors of economic and social development.

The 1986 Science and Technology Policy document is explicit about the service role of science to national development:

- (1) Increasing public awareness in Science and Technology and their role in national development and well-being.
- (2) Directing Science and Technology efforts along identified national goals.
- (3) Promoting the translation of Science and Technology result into actual goods and services.
- (4) Creating increasing and maintaining an endogenous Science and Technology base through research and development.
- (5) Motivating and strengthening theoretical and practical science base in the society.
- (6) Increasing and strengthening the technological base of the nation.

Consequently, Science Education Has the Following Aims and Objectives

- (a) To make students self-reliant in terms of self-employment opportunities after graduating.
- (b) To adequately prepare students to participate effectively in the individual development of the nation for self-efficiency.
- (c) To disseminate, promote and advance the growth of scientific knowledge and to explore the use of this knowledge resources (minerals), fauna and flora of the country at large for the advantage and advancement of the citizenry.

A critical question at this stage is how far is Science Education in the scheme of things in our national education system? This question is best answered from the perspectives of: i. Number of Science and Technological institutions, ii. Enrolment in Science Technological courses, iii. Number and quality of staffing in Science and Technology, iv. Facilities in Science and Technology, v. Funding of Science and Technology, vi. Attractiveness of Science and Technology.

The situation as per the foregoing elements of Science and technology shows that many things are wrong with science teaching and learning in Nigeria (Ezewu, 1992; Imogie, 1998; Dienne, 1990). Some of the things wrong with Science Education, which are therefore affecting negatively on technology in Nigeria, include the following:

1. Very poor teaching learning environment occasioned by lack of science laboratory equipment and materials.
2. Inherent deficiencies in the science students occasioned by poor attitude to the subject, poor language etc.
3. Poor teaching of science by teachers with poor knowledge, training and mastery in science occasioned by poor science Teacher Education programme.

4. Poor funding of science and technology programme, especially as a result of the non-implementation of the Science and Technology policy and the non-existence of Science and Technology fund.
5. Low enrolment in Science and Technology when compared with the Arts, Law and Social Sciences which many students have high preference.
6. Lack of sustainable incentives to attract and retain students and teachers to take to Science as a technological course.

Recommendations

One is forced to believe that such strategies would include the following:

1. The present secondary school (3-3) segment of the 6-3-3-4 education system should be reviewed to allow for the:
 - i. Creation of secondary schools which will offer courses in JSS1-SSS3 in the Arts, Social Sciences and Science leading to the award of the general SSSC.
 - ii. Establishing of science Senior Secondary Schools at SSS1-3 levels, leading to the award of the General SSSC.
2. Government should give a balanced funding of all sectors of education, giving adequate consideration to the capital-intensive nature of science and technology.
3. The 1986 National Policy in Science and Technology document should be fully implemented, especially as it has great potential for funding Science and Technology Education as follows:
 - i. Federal Government to fund Science and Technology development programme up to a level of five percent of its annual budget. The State Government shall contribute to research projects.
 - ii. Fostering in-house of local contractual research and development activities in public and private enterprises by making such investment tax-deductible.
 - iii. Establishing a National Science and Technology Fund (NSTF).
 - iv. Requiring every industry as deemed appropriate to:
 - a. Establish and equip an in-house research and development fund.
 - b. Make contributions to the National Science and Technology Fund.
 - c. Give grants and endowments to institutions- for research and development activities.
 - v. Promoting philanthropic contributions to NSTF by individuals and groups for specified research and development projects
 - vi. Procuring external funds by participating in bilateral and international schemes for Science and Technology co-operation.
 - vii. Encouraging the establishment of high-risk venture capital companies,
 - viii. Encouraging the participation of research organization in programme of compensated transfer of technology.
4. Proper attention by way of better funding should be paid to the training and retraining of Science Teachers.
5. Efforts should be made to attain the prescription 70:30 and 60:40 enrolments ratio for Polytechnics and conventional Universities respectively in favour of Science and Technology.
6. Proper attention by way of better funding should be paid to the training and retraining of Science teachers.

Conclusion

For the nation to move forward and develop technological, science and technology education must be adequately advanced. Vision 2010 Committee is no doubt very conscious of this fact and hence it has preferred strategies for achieving this desire.

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