



Historical Development of Science and Technology Education in Nigeria: Issues, Challenges and Prospects

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Abstract. This paper examines the historical development of science and technology education in Nigeria. In the process it examines pertinent issues, challenges and prospects. The rationale of the paper derives from the understanding that science and technology education is of immense benefit to the nation's development. The paper uses both primary and secondary data. The data are subjected to periodic and thematic analyses in order to arrive at historicised conclusions out of which recommendations are drawn. It was found that science and technology education in Nigeria has been in existence since the commencement of private education in 1842. However, its progress has not featured great incorporation in the manufacturing and industrial sectors of the economy. It is, therefore, recommended that science and technology education be given greater emphasis in real life situations in the Nigerian socio-economic milieu.

Keywords: STEM; Curricula reform; Development.

1 Introduction

Science has been defined differently by various people. According to the Science Teachers Association of Nigeria (STAN, 1988) science is part of human culture and social institution. It refers to some form of organized knowledge, on which we can ascribe a sort of prescribed esoteric procedure through which nature is unravelled (Shaibu, 1973:132). Shaibu stated that the term science cannot be used in isolation without associating it with technology.

Technology on the other hand, is an integrated activity, which draws on many different disciplines (Brown, 1980:31-32). Hornby (2015:1609) Oxford Advanced Learner's Dictionary defines technology as the scientific study and use of mechanical arts and applied sciences, e.g. engineering, and the application of this to practical tasks in industry. Technology is a systematic

application of manufacturing methods and industrial arts to enhance efficiency in human activities. It can simply be described as the result of man's efforts to do things more efficiently and effectively (Anyifite, 2007:117-119).

Education refers to the totality of experiences to which an individual is exposed, which makes him to be useful to himself and the society in which he lives during his lifetime. Thus, education is a basic human need without which personal or national development is inconceivable. Since science and technology education portray a somewhat symbiotic relationship to education, the nature or quality of science education can be judged only with reference to its enabling capacity to fulfil personal and social aspirations (Ahmed, 1979: 109).

Science and technology education can therefore be seen to be important for educational and societal development in Nigeria. Moreover it can be seen that science and technology education is given great emphasis in Nigerian education (FRN, 2013:55). However the emphasis does not appear to translate to great scientific and technological development of the Nigerian socio-economic happenings (Buhari, 2016:2, 3, 45). It is therefore important to examine the history of science and technology education in Nigeria, with the view to see the features of the education, and thereby consider the challenges and the prospects of the education. This is important because science and technology education need attention from all aspects of education, including history of education, for the development of education and the nation; and by implication the development of Africa and the world.

The study follows a historical approach. This is because the study is historical in nature. The study would therefore employ primary and secondary sources of data including: diaries, log book, reports, minutes of meetings, policies and other related materials. The data would be subjected to periodic and thematic analyses in the fashion of historical research in order to arrive at historical conclusions and sound recommendations.

2 Global Antecedents of Science and Technology Education

Anyifite (2007:117) stated that the trends in science education had for long centred on personal pupils involvement. Prior to the curriculum reform projects initiated in the late 1950's in the United States of America, emphasis on science education had been on the acquisition of factual knowledge. According to Brown (2015:34), this was followed by the Physical Education Committee (PSSC), Chemical Education Materials Study (CHEM Study), Chemistry Board Approach (CBA) and Biological Science Curriculum Study (BSCS) in the United States of America. This was followed by Nuffield projects in the United Kingdom, and then a host of other projects around the world including Nigeria.

A major aim of the aforementioned projects was to give a pupil the opportunity of becoming a scientist and to be well versed in how a scientist looks for evidence and how he tests hypothesis. Brown (2015:34) stated that this approach dominated the various curriculum reforms up to the early 1970s. The development of science education was suggested by Booth (1975:22-25) to include science for citizen, science for action, and pure science.

Brown (2015:34) making reference to Edward and Levner (1975) indicated that the Educational Policies Commission of the National Education Association and the American Association of School Administrators emphasised seven basic values underlying science:

1. Longing to know and to understand;
2. Questioning of all things;
3. Search for data and their meaning;
4. Demand for verification;
5. Respect for logic;
6. Consideration of premises and
7. Consideration of consequences.

These values indicate that the study of science should be among the principal goals of education. This is because education is interested in knowledge and the detail processes of acquisition of knowledge; which as can be seen from the list above are the preoccupation of science.

3 The Formative Period of Science and Technology Education

The teaching and learning of science in Nigerian schools and colleges started with the arrival of the earliest Christian missions that introduced western education in the country. Following the advent of these Christian missions, especially the Church Missionary Society (CMS), Roman Catholic, Wesleyan Methodist, Baptist, Presbyterian, and Qua Iboe, elementary schools were established in the country and elementary education began (including science education).

The establishment of the first set of secondary schools in Nigeria, beginning with the CMS Grammar School, in Lagos, in 1859 made the teaching of science subjects a feature of secondary school education in the country. Some rudiments of science education including Arithmetic, Algebra, Geometry and Physiology, Vocational Studies, and Agriculture were taught. The Hope Waddell Institute Calabar, founded in 1861; St Andrew's College, Oyo, 1876; Baptist Training Centre, Ogbomoso, 1899; Wesleyan Training Institute, 1905; and others had science subjects in their curricula too (Brown, 2015:37).

It is important to note that before 1932, there were no post-secondary institutions for the teaching and learning of science in Nigeria after the only specialized institution, the Medical School attached to the CMS Theological School, Abeokuta folded up. Thus science education started realistically at the post-secondary school level in Nigeria with the establishment, in 1932 of Yaba College, Lagos.

4 Science and Technology Education Curriculum Development

The major curriculum development in science education in Nigeria commenced in 1932 with the establishment of Yaba College. The college was upgraded in 1963 to become Yaba College of Technology, to run courses in Engineering, Agriculture, Medicine, Surveying, Science, and Teacher Training to help in filling existing vacancies in relevant government departments (Brown, 2015:37). Yaba College of Technology was reputed to have produced the first set of graduates who taught science in secondary schools and played significant role in setting the pace for the development of appropriate science education curriculum in secondary schools in Nigeria.

The introduction of Higher School Certificate (HSC) in 1951 marked a turning point in the history of curriculum development with reference to science education in Nigeria. Schools had the opportunity of offering science subjects such as Biology, Chemistry and Physics at the higher school certificate level with particular emphasis on laboratory work to meet the practical requirements of science subjects. This led to the establishment of an examination board with its headquarters in Accra, Ghana, following Jeffery report of 1950. The board later metamorphosed to become the West African Examination Council (WAEC), which reviewed the curriculum of school subjects including science, with its first examination in 1955.

The science curriculum of WAEC 'O' Level and Higher School Certificate (HSC) underwent a review in May, 1968 by the Science Teachers Association of Nigeria (STAN), established in 1957. Furthermore, the Federal College of Arts, Science and Technology located at Ibadan in 1950, Zaria in 1952, and Enugu in 1954, had a fairly comprehensive curriculum in science education and science related fields of architecture engineering, pharmacy and so forth. Anyifite (2007:119-120) and Brown (2015:38) stated that during the early 1960's, science curriculum in Nigeria was geared towards fulfilling overseas examination requirements such as those of Cambridge School Certificate Examination and the London General Certificate in Education. A recent trend of science project development however, has been the integration of subjects from the fields of science and technology for primary and junior secondary

education. At the senior secondary school level, emphasis has been on inquiry and problem solving activities (FRN, 2013:30-33).

The historic National Curriculum Conference, held between 8th and 12th September, 1969 could be said to have spurred various bodies and agencies of government to developing science curricula for both primary and secondary education levels part of which brought about the National Policy on Education (NPE) 1977, revised 1981, 1998, 2004 and 2013. The NPE (1977) and its subsequent editions ushered in the 6-3-3-4 system of education and the current 9-3-4 system of education which placed a lot of emphasis on science and technology education.

Educational technology could be said to have started in Nigeria with the visual era (i.e. the use of simple teaching aids like apparatuses and lesson note preparation (Shaibu, 1973:132-133; Nash, 1987:11-13). During the visual era, emphasis was placed on the preparation of simple and low cost instructional materials in schools and colleges, particularly, Teacher Training Colleges.

Ogunranti (1982:70) stated that the visual era was followed by the era of radio media in education which started in the early 1940s and mid 1950s. The first educational radio programme was in English language broadcast by the Radio Distribution Service under the Post and Telegraphs Department (Brown, 2015:39). The education programme of the station was taken over by the Nigerian Broadcasting Service (NBS), established in 1951 incorporated into the Nigerian Broadcasting Corporation (NBC) in 1957.

A significant landmark in the development of educational technology took place on 1st January 1958 when the Western Nigerian Ministry of Education's Audio Visual Centre, Ibadan and the Nigerian Broadcasting Corporation (NBC) broadcast their first educational programme. This premier attempt was followed by other regional ministries of education which opened audio-visual centres in their regions in which broadcasting to schools was emphasised. The educational radio broadcasting later metamorphosed into Nigerian Educational Broadcasting unit in 1960. In 1982, the Federal Radio Corporation of Nigeria (FRCN) educational service, Ibadan was established.

The era of radio media was followed by the audio-visual era in the 1970s. According to Booth, (1975:22-25); and Brown (1980:39-40), it was during this period that audio-visual centres were established by all education ministries in the country with the assistance of United States Agency for International Development (USAID). A unit of the audio-visual centres in a region was to liaise with broadcasting house for the broadcast of recorded programmes. A new dimension in Nigerian education technology resources was introduced in the country, following the establishment of the first television station in Ibadan, the first of its kind in sub-Saharan Africa, in 1959 (that was Western Nigerian Television). Education programmes formed an integral part of the television activities from inception, even though the establishment of the education unit of

the Western Nigerian Television (WNTV) was targeted only at Secondary Grammar Schools and Teacher Training Colleges, to achieve the following:

1. Reduce Teaching Deficiencies In Science Subjects;
2. Provide Examples Of Good Teaching In Order To Upgrade The General Quality Of Instructional Activities In The Classroom;
3. Enrich Learning Contents (Ogunranti, 1982:12-14).

It is important to note that the philosophy of science teaching was to prepare the young ones for useful living; and to provide solid foundation for those intending to proceed to higher education. At this stage, emphasis was more on the acquisition of scientific concepts and process skills (Nwachukwu, 2012:4-6). Nwachukwu (2012) stated further that the Federal Ministry of Education in the late 1970s convened a meeting of Nigerian science educators with a view to designing a modern science curriculum in line with the new National Policy on Education. This effort witnessed the emergence of the core curriculum for primary science, Integrated Science for Junior Secondary schools, and Biology, Chemistry and Physics curricula for Senior Secondary Schools (SSS) in Nigeria. The new Senior Secondary School curriculum replaced the New Senior Secondary Science Project (NSSSP) in order to meet the demands of the 6-3-3-4 system of education.

The contributions of the Nigerian Educational Research and Development Council (NERDC), the WAEC, National Examination Council (NECO), National Business and Technical Education Board (NABTEB) and other bodies cannot be under-estimated in the development of science and technology education in Nigeria. According to Nwachukwu (2012:4-10), the aforementioned factors mainly constitute the features of historical development of science and technology education in Nigeria.

5 Challenges Confronting Science and Technology Education

This part of the paper considers briefly some challenges confronting Science and Technology Education in Nigeria. Various aspects of science education occur knowingly and unknowingly during formal, informal and non-formal education. This is because science is linked in several ways to various happenings in the society, especially through its technological application (Nwachukwu, 2012:5). According to Ziman (1980:16-18), the basic need in science education is to teach about Science, Technology and Society (STS) and the various ways in which they interact with one another. He observed further that this seems not to be so much emphasised in Nigeria. The students are not given the level of encouragement that would make them explore their various latent scientific abilities to the fullest, because many of the little discoveries

they make are not pursued to great heights by their teachers and the society to the extent that the ideas behind their discoveries could be bought by factories and industries for utility in large scale industrial activities.

Moreover there are the challenges of erratic supply of electricity, inadequate internet access, and inadequate laboratory facilities. In addition teachers do not use adequate method of teaching in many cases. Finally government policy on science education and technology education appears to be inconsistent. Amodu (2011) stated that at a time, the policy makers in Nigeria gave Technology Education (TE) autonomy, and separated it from Science Education. But at present, the new education policy merges Technical Education (TE) with Science Education to become Science and Technology Education (STE) (FRN, 2013). This trend of inconsistency has negatively affected the image and performance of Science and Technology Education in Nigeria. Thus there is need for consistency in policy and for greater encouragement of learners in the process of discoveries, and for the promotion of indigenous discoveries in the manufacturing and industrial sectors of the Nigerian economy.

6 Prospects of Science and Technology Education

The National Policy on Education (FRN, 2013) is favourably disposed to the acquisition of appropriate skills and competencies as veritable instruments for the individual to live and contribute to the growth and development of his society. This is because science and technology education offer a wide range of programmes in science and technology. For example, programmes such as Auto-mechanic, Metal Work, Building, Wood Work, Electrical and Electronics Engineering, Plumbing, Carpentry and so forth are meant to provide knowledge and skills that would make the learners functional members of the society. When such skills are imbibed by the learners they would be able to participate gainfully in the development process of Nigeria, and of Africa, and the world at large.

Thus what is left is the promotion of the culture of acquisition of scientific and technological disposition by the learners and the society at large, such that the efforts of the up-coming learners are rewarded with the processing of their inventions till the stage of utilisation in Nigerian factories and industries for the improvement of the Nigerians society, and eventually other societies. This is what is done in developed nations. They encourage their up-coming scientists and technologists in the process of their inventions (by granting them recognition through utilisation of their inventions at industrial scale in the manufacturing and industrial sectors of the society). The developed nations are the better for it today. They look inward first, before looking outward for acquisition of inventions. This helps them to promote their indigenous

discoveries and improve the lot of their indigenous inventors and their societies at large. Nigeria, and indeed other developing nations can learn from them.

7 Conclusions and Recommendations

It can be concluded that Nigeria lacks the required science and technology education culture to make her great in the comity of technologically advanced nations of the world. Also, this paper has revealed that development process in Nigeria seems not to have recognised the critical role of science and technology education, in terms of recognising indigenous efforts in the development of science and technology disposed nations. Moreover the study reveals the need for policy consistency in the National Policy on Education on matters of science and technology education.

It is recommended that there is need for policy consistency with regard to policy statements on science and technology education in the National Policy on Education.

The learning of science and technology should be further encouraged by the society such that up-coming learners would be encouraged in the process of exploration for discoveries and innovations.

Educational facilities in the learning of science and technology in the schools should be improved such that the learning could be enhanced. Such facilities include regular supply of electricity, adequate access to internet, and adequate laboratory.

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