

Science and Technology Education in Nigeria: A Historical Perspective

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Abstract: *This study examines science education in Nigeria, its trends, origin and development. It analyzes the science curriculum in Nigeria, the new approaches of science education, ways in which science education can be refocused in Nigeria. We utilized the interdisciplinary approach. We observed that curriculum innovative experiment in Nigeria of science curriculum development before and after independence in 1960 were characterized by so much defects until the Comparative Education Studies and Adaptation Center of the University of Lagos and other reforms used experiments to improve on it.*

1. Introduction

Science, according to the Concise Oxford Dictionary, is the pursuit of systematic and ordered knowledge. Yet, there are almost as many definitions of science as there are scientists; and there are certainly as many as there are philosophers of science. While the Science Teachers Association of Nigeria, STAN (1988), view science as part of human culture and social institution. All around us are the products of science and their application to practical situation are clearly evident. Indeed, no one talks of science without mentioning its social functions, just as no one can live the good life these days without the application of science. However, Brown (1980) looks at science as a process of social activity in which we seek to discover and understand the natural world not as we would prefer to imagine it as it really is. Shaibu (1993) also view science as some form of organized knowledge on which we can ascribe a sort of prescribed esoteric procedure for unraveling its nature and maintained that the term science cannot be used without associating it with technology.

Technology, however, is an integrating activity, which draws on many different disciplines. It has practical and experimental elements. It depends on fusing the qualitative and the quantitative aspects of designing. It is through this activity that we have fashioned our world and determined much of our quality of life (Dodd, 1986). Henschke (1984) sees technology from three perspectives: as an artifact or article, e.g., a computer, abacus, laser beam or stone axe, as progress, that is the application of knowledge and skills in solving practical problems, which is the knowledge and skill applied in using artifacts and processes. Science and Technology education can be looked at as a human activity related to social, economic and political welfare, a focus on a window for looking at many different issues like social change (Ameh and Gyuse, 1989).

For some, the essence of science is objectivity; for others it may be creativity, reliability, its public availability, the fact that it is a social activity, or a revolutionary one, or, indeed, a

cultural one. Perhaps it might be thought that in a world where human well-being is so obviously and closely related to scientific and technical knowledge, it is not important to enquire into exactly why scientific knowledge is so valuable or into how it differs from other forms of knowledge. Thus, the term “science and technology education” portray a somewhat symbiotic relationship. A definition of education is therefore necessary so as to marry them together.

Education is a basic social and human need. Without it or with inadequate education, national development is inconceivable. Therefore, the nature or quality of science education can be judged only with reference to its enabling education to fulfill personal and social aspirations (Ahmed, 1978:109).

2. Trends and Origin in Science Education

According to Anyifite (2000), the trends in science education in the last 30 years have centred on personal involvement by the pupils. Before the curriculum reform projects were initiated in the United States in the late 1950s, the emphasis on science education was on the acquisition of factual knowledge. Then came Physical Education Committee (P.S.S.C.), Chemical Education Materials Study (CHEM Study), Chemistry Board Approach (CBA) and Biological Science Curriculum Study (BSCS) in the United States followed by Nuffield projects in the United Kingdom and then a wealth of other projects around the world including Nigeria. The aim of these projects was to give pupil the opportunity to be a scientist for the day-to-day, to experience how a scientist looks for evidence, how the scientist tests hypothesis. The approach dominated the curriculum reform up the early 1970s. Booth (1975) suggested the development of science education to include science for citizen, science for action and pure science. While Lewis (1979) explains that in democratic societies, citizens will have to make decisions which will ultimately affect their lives and many of these decisions will have a strong scientific components. Preparation for this kind of decision-making inside the circle which is called “science for citizens”.

Records show that social relevance of science to gain recognition as far back as the 17th century when science and technology made their first significant contributions to navigation, agriculture, industry, and of course, warfare. Edward and Leyner (1975) has observed in the report of the Educational Policies Commission of the National Education Association and the American Association of School Administrators that the following seven basic values underlie science:-

1. Longing the 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

The Commission states that to communicate the spirit of science and to develop people’s capacity to use science, its values should be among the principal goals of education.

Today, according to STAN (1988) values in Science Teaching is entirely different because of the following:

1. The pursuit of science is being accorded the status of an institution;
2. Scientist owe intelligence to the organization or agencies that fund their research projects;
3. the academic pursuit of science no more enjoys the premium it did in the olden days.

Science has value dimension. Anytime it induces conflicts in our thinking, modifies the culture or makes demands on society most of the time. While science does not directly impose values, it creates conditions which demand the re-interpretation of old values or the formation of new ones.

Teaching science with value focus, provides students with a means for interpreting what they have learnt within their own experience. This kind of learning makes it possible for students to become self-adaptive as science-related social conditions change. The specific objectives as spelt out by Hurd (1975) are as follows:-

1. To provides opportunities for students to think about and clarify their own value and to compare them with those of others;
2. to respect value pluralism in our society and to recognize that all people will not respond to problems in the same way, but at the same time to recognize the need for enough commonality to preserve society;
3. to understand that valuing is also a way of thinking;
4. to recognize human action as something more than a statistical expectation.

While the curriculum reform projects have done a magnificent job getting students to think for themselves and come to a better understanding of other sciences, there is a growing feeling that the sciences have failed to be popular as their relevance in the society has not been felt. By that, the teacher merely imparts factual knowledge without the students feeling personally involved.

Nash (1987) crowns it all by saying that lack of social context in the physical science especially has been blamed for girls' (students) lack of interest in the subject. Our science teaching must be made more relevant and must reflect more of those issues concerned science in the society. We have to move away from the convergent thinking of the past in order to move into the divergent thinking that is necessary. It is no longer admissible to practice or teach physical science without taking into consideration the profound consequences of science on human society.

Perhaps, our science teaching in the past has been too inward looking and we ought to be taking a wider look at science, not just integrating the basic science into the curriculum but should also relate it to our everyday activities inside and outside the classroom.

3. The Development of Science Curriculum in Nigeria

Mkpa (1987) observed that one of the most significant curriculum innovative experiment in Nigeria is the science curriculum development experiment being undertaken by the Comparative Education Studies and Adaptation center based in the University of Lagos. The science curriculum in Nigeria, before and after independence in 1960 was characterized by so much defects that there was strong need for improvement.

The curriculum was inadequate and incapable of producing for the for nation quality of youth with the right orientations capable of salvaging the nation from the adverse economic effects of inadequate production of goods and services. The purposes of science teaching seemed

to be merely to satisfy the demands of the external examination syllabuses. Soon after independence, the need became more acute for the nation to have many more Nigerian trained personnel in several areas of the nation's life. Educational opportunities gradually began to expand especially at the secondary school level. But one major handicap was the serious shortage of trained teachers both at the secondary schools and teacher training institutions.

Such defects were identified in the contents and organisation of the science curriculum. The contents were a combination of disjointed topics in each of the science subjects with no unifying concepts to make both teaching and learning easily attainable. The general science taught in the lower forms of the secondary schools was a mere selection of some topics so selected. In most cases, the general science course degenerated into a course in biology with little of chemistry and hardly anything of substance, if at all, in physics. There was no attempt to show the relationship of some topics to the others; no effort was made either to relate the learning experiences of the students to their immediate environment and life encounters. When these students got to the upper classes, there was very little evidence of their exposure to science. The teaching of the general science was in most cases handled by a teacher with interests in biology. In some cases, a person interested in chemistry took the courses; interest in physics was least considered. The interest of the teacher thus dictated the scope, content and emphasis of the course. Yet the general science course was supposed to be a preparatory course to the science subjects of the school system.

In the upper classes of the schools, the topics were in obedience to the stipulation of the examination body. The science curriculum at this level did not appear to meet the needs of the society which the schools served. As stated earlier, the science subjects were designed for a small fraction of the school population. Except for those who went further in the sciences on leaving school, the learning experiences acquired served little or not put pose in the students' interaction in the society. No proper scientific skills and attitudes were acquired by the students. The orientation of the science courses and the teaching was the interaction of students with teachers, blackboards and textbooks. Learning was accomplished by recitation in majority of cases; but recitation violates sound learning principles.

In 1967, the Ford Foundation, through the Federal Ministry of Education, helped to establish the Comparative Education Study and Adaptation Centre (CESAC) at the University of Lagos. The main purpose of this center is to study the nation's system of education, identify its defects and devise original solutions. These solutions must be dynamic to match the changing needs: and would be continually adapted to be responsive to the identified needs of the country. To do this involves a comparative study of past experiences and current practices within and outside the country. These must also be judiciously adapted to the identified needs and objectives of the nation. So far, the Centre has concentrated on curricula development for secondary schools. This is because of the crucial role which secondary education plays in providing a basis for further education and for the development of skills and attitudes so vital for the produced innovations in science education at the secondary school level. It has also done similar work in social studies and home economics: and is doing same in technology and mathematics. At the government level, the new National Policy on Education has provided clear objectives of our education. Attempts are now being made to translate these into practical guidelines through, principally, the implementation committee on the National Policy on Education.

In the science, the Science Teachers Association of Nigeria (STAN) which identified the inadequacies of our secondary school science programme had brought ideas at improvements but was seriously handicapped by lack of finance. Through the cooperation between STAN and CESAC, a Science Curriculum Development committee was formed in 1966. This formed the basis of the only known positive curricula plans aimed at providing a better more purposeful and utilitarian science education for the country. Documents published by these two bodies and the Aiyetoro group have stimulated curriculum reforms in science at the Secondary School level. These have led to the production of the STAN Nigerian Integrated Science Project (NISP) and the Aiyetoro Basic Science Programme (later revised as CESAC Basic Science for Nigerian Secondary schools - BSNSS) for forms one and two of our secondary schools; and the CESAC Nigerian Secondary Schools Science project (NSSP) in Biology, Chemistry and Physics for forms three to five. These innovations have so far emphasized widely held views about how science should function in our secondary school curriculum. It, however, still remains for an all out support in terms of copious financial investment to be given for the full realization of this and similar projects.

The teaching of science in Nigerian schools dated back to the era of Christian missionaries, who brought the western education into the country (martinslibrary.blogspot.com). With the establishment of church missionary society (CMS) grammar school in logos in 1859, roman catholic missionary (RCM), Wesleyan Methodist mission, African mission of south Baptist convention, united Presbyterian church of Scotland mission, the qua Ibo mission, some rudiments of science education were injected into the school's curriculum including arithmetic, algebra, geometry and physiology. Missionaries also established other schools namely; grammar, teacher training, pastoral, vocational, agricultural and introduction of rudiments of science in school, curricular and teaching of them. The curriculum consisted of 4RS namely, reading, writing, arithmetic and religion. The Hope Waddell institute in Calabar founded in 1861, St. Andrews College Oyo 1876, Wesleyan training institute of 1905, Baptist training centre, Ogbomoso of 1899 etc had science subjects in their curricular.

Up to 1932, there was no post secondary institution for the learning of science after the only specialized institution, the medical school attached to the CMS theological institute founded at Abeokuta in 1961, folded up. The teaching of science gained a better footing about 1920 because of the recommendation of an African education commission toured the British west African colonies under the sponsorship of the Phelps stokes fund of America.

The period of 1883 -1930 marked the beginning of colonial government participation in the development of science in secondary education. The education ordinance of 1980 marked another phase in the development of science teaching in schools, which made nature study mandatory in both primary and secondary schools, which latter gave way to science.

The major development in science curriculum took place in Nigeria starting from 1932, the establishment of Yaba College of upgraded 1963 to Yaba college of technology, to run courses in engineering, medicine, science, agriculture, survey and teacher training college fill vacancies in relevant government developments. It also produced first set of graduates who taught science in secondary schools and played major role in laying the

foundation for the development of appropriate curriculum for science in the secondary schools

The establishment of the university college Ibadan in 1948 as college university of London following the report of the Elliot Commission Higher education set up in 1943, which reloaded the establishment of a university in Nigeria. It remained with status of university of London up to 1960 and started awarding its own degree and became university of Ibadan in 1962.

The introduction of higher school certificate (HSC) in 1951 gave schools the opportunities to offer Chemistry, Biology and Physics at higher level, with emphasis on laboratory work to meet the practical requirements of science subjects. In 1952, an examination board was set up with its headquarters in Accra, Ghana. This followed Jeffrey report of 1950. The board later became the west African examination council (WAEC), which received the curriculum of school subjects including science , with its first examination in 1955.

The Science Teacher Association of Nigeria (STAN), established on the 30th November, 1957, revised the science curriculum of WAEC and HSC in May 1968. The Federal colleges of arts, science and technology at Ibadan in 1950, Zaria in 1952 and Enugu in 1954 administered a fairly comprehensive curriculum in science education and science related fields eg architecture, engineering, pharmacy etc. these college latter became O all in 1962, Abu Zaria in 1962 and UNN in 1960 respectively.

The launching into space of the satellite “sputnik” by the soviet union (RUSSIA) in 1957, sparked off science curriculum development efforts in the western world. This led to the awareness as regards the need to re-examine the school science curriculum objectives, content and evaluation. In Nigeria , during early 1960’s science curriculum was geared towards the fulfillment of overseas examination requirement example Cambridge school certificate examination or the London general certificate in education. In recent times, a clear pattern for science project development at the primary and junior secondary school levels has been the integration of subject from the field of science and technology. At the senior secondary, the emphasis has been on inquiry and problem solving activities.

Several science curricular were developed in many countries such as those of the physical science study committee (PSSC), chemical education materials study (CHEM. Study), biological science curriculum (BSC), all in the US and the Nuffidd science projects in the UK. For Nigeria, the historic national curriculum conference held from 8th -12th Sept 1969 spurred various bodies including government agencies to develop science curricular for both primary and secondary levels of education, which brought about the new NPE of 1977 revised in 1981 which ushered in 6-3-3-4 system of education with the
Following

1. The Nigerian secondary schools project (NSSP) by the defunct comparative education study and adaptation centre (CESAC), now part of NERDC.
2. The Nigeria integrated science project (NTSP)
3. Basic science for Nigerian secondary school (BSNSS) by CESAC and Stain
4. Primary Education Improvement Project: Northern States Primary School Project (NSPSP) by the Institute of Education, Abu, Zaria

5. Science is Discovering: Mid-Western State Primary Science Project (MSPSP) by Abaraka College of Education.
6. Primary Education Improvement Project: Northern States primary science project (WSPSP) by the faculty of Education OAU.
7. African Primary Science Project (APSP) by the African Development Council
8. Lagos State Primary Science Project (LSPSP) by the Lagos State Ministry of Education.

Educational technology in Nigeria began with the visual era that is the use of simple teaching aids like apparatus and the preparation of lesson notes. Emphasis was placed on the preparation of simple (low cost) teaching aids in school particularly in Teacher Training Colleges. It was in 1932, under colonial Britain, that the first form of communication media appeared in Nigeria. A Radio Receiving Station was constructed in Lagos. Since then, the development of media has been rapid following the technological development in various parts of the world which have contracts and relationship with Nigeria.

The visual era is followed by the Era of Radio media in Education which occurred between early 1940s and 1950s according to Ogunranti (1982). The first educational radio programs were for English language and were broadcast by the Radio Distribution Service under the Post and Telegraphs Department. The Nigerian Broadcasting Service (NBS) was established in 1951 and it took over the educational programme of the station.

In 1957, the NBS was instituted into the Nigerian Broadcasting Corporation (NBC). Another landmark for Educational Technology in Nigeria was 1 January 1958, when the Western Nigerian Ministry of Education's Audio Visual/Centre at Ibadan, and NBC broadcast their first educational programme. Other regional ministries of education took the clue and opened audiovisual centres in which broadcasting to schools was established. In 1960, the educational radio broadcasting quickly develop into NBC'S School Broadcasting unit, and later in 1982 the Federal Radio Corporation of Nigeria (FRCN) Education Service was established with the headquarter in Ibadan.

The Radio media was followed by the Era of Audio Visual which was in 1950s. During this era, audio- visual centres were established by all Ministries of Education in the country with the assistance from United States Agency for International Development (USAID). Each unit of the Audio-visual centres in the region liaised with broadcasting houses for the broadcast of their recorded programmes.

In October 1959, the first television sub-Saharan Africa was established. This introduced a new dimension to resources and education in Nigeria. Education programmes were part of the television experience from the beginning even though the establishment of the TV (then WNTV) was aimed only at Secondary Grammar Schools and Teacher Training Colleges to:

1. Reduces teaching deficiencies in subjects such as sciences
2. Provide examples of good teaching to help upgrade the general quality of classroom instructional activities.
3. Enrich contents.

In the tertiary institutions, the first official support for educational technology was directed towards both pre-service and in-service training of teachers and audio-visual loan services (Imogie 1984). Apart from the development in the areas of schools broadcast, there were the sponsored projects of the United Nations Educational Scientific Cultural Organization (UNESCO) in 1962 at the Institutes of Education, University of Ibadan. The audio-visual Unit was established in the Institute. Through this, UNESCO introduced New Methods and Techniques in Educational Practices. Moreover, programmed learning method and its application was introduced.

In 1964, three workshops were held to this effect, two of these were in Nigeria (University of Ibadan and Ahmadu Bello University, Zaria), and the third was in Accra Ghana, at the institute (which later became the Research Centre for Programme Instruction Techniques). Many programmes were designed and tried out in science, biology and mathematics.

Apart from Ibadan where Educational Technology began, other universities like ABU Zaria, Nsukka, Benin, Ife, Ilorin etc. now have Departments of Educational Technology or/and Centre for Educational Technology. Lastly, in 1977, the National Educational Technology Centre (NETC), Kaduna was established.

4. Conclusion

There is a need, therefore, to imbibe the science culture in every Nigerian so as to have the proper and requisite foundation on which to develop our science and technology which will in turn develop the country. This is why great emphasis should be put on effective science education to help lay the needed foundation starting from the primary to, at least, the first year of the tertiary level for students of humanities. The government must design specific policies on science and technical education which must be implemented and sustained to promote science and technology curricula at each level of education. This, of course, must include increased funds which should be provided and properly utilised in the educational system.

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