

THE FUTURE OF SCIENCE EDUCATION IN OUR SECONDARY SCHOOLS IN A DEMOCRATIC DISPENSATION.

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ABSTRACT

The future of the child is entirely dependent upon the educational development of a nation's citizenry. The teacher plays very significant rôles in this development, especially in the learning process of the child. He influences not only the cognitive and effective growth of the child but he also affects the psychomotor outcomes of science instruction. It is in this regard that the paper takes a look at the trend in science education in Nigeria as it affects the future of the Nigerian child in a democratic setting. In 1920 the Phelps Stokes funded Education commission discovered that the state of science education was grossly deficient and recommended the inclusion of science subjects in the secondary school curriculum. Despite the formulation of policies on science education. Science and technology and the purchase and distribution of science equipment to schools, among others, by the Nigerian government, the failure of secondary schools education in Nigeria still remains bleak. The paper concludes by recommending some measures that may improve science education in secondary schools if adopted by the government.

INTRODUCTION.

It has been difficult for as country to forge ahead without a sound and solid science education. But, can there be any meaningful, sound and solid science education without a good system of government? From the look of that, it appears that the growth of science education in our secondary schools will depend upon a sound policy bestowed upon a good system of government.

This paper intends to look at the trend in science education in Nigeria, science education curriculum development, national policy on education and objectives of science education, goals of science teaching and government involvement in science education in Nigeria.

To render justice to the above, this paper will first of all take a look at the definition of the terms science, education and democracy

SCIENCE.

Mc.Graw-Hill (1979). Encyclopedia of Science and Technology defines science as characterized by the possibility of making precise statements that are susceptible of some sort of check or proof, for example exact measurement and methods of description or classification that will permit precision of reference to the subject matter. Daramola (2001) sees science as an organized system of explanations of nature through the process of experimentation. The Federal Republic of Nigeria (1986) defines science in the National Policy on Science and Technology as the generation of knowledge about life. Hornby (1998) defines science as the study of the structure and behaviour of the physical and natural world and society, especially through observation and experiment. Ango (1987) simply defines science as an attitude of inquiry, of observation and reasoning with respect to the world. From the above definitions, science can then be said to be a body of organized knowledge that has been subjected to scrutiny through

scientific experiments and have been accepted worldwide for the technological advancement of the society.

EDUCATION

According to encyclopedia Americana International (1995), education is any process by which an individual gains skill. Hornby (1998) defines education as a process of training and instruction especially of children and young people in schools, Colleges and so on, which is designed to give knowledge and develop skills. Lar (1997) sees education as "giving free scope to the development of the inherent impulses and character of the boy and girl.

DEMOCRACY.

Hornby (1998) gives three definitions of democracy as follows:

- a. A system of government by all the people of a country, usually through representatives whom they elect, thought of as allowing freedom of speech, religion and political opinion e.g. parliamentary democracy, student-led democracy movement etc.
- b. Control of an organization by its members, who take part in the making of decision e.g. industrial democracy.
- c. Fair and equal treatment of each other by citizens without social class divisions.

Supreme authority is exercised for the most part by the representatives elected by popular suffrage. The major feature of modern democracy includes individual freedom, which entitles citizens to the liberty and responsibility of shaping their own careers and conducting their own affairs, equally before the law.

TREND OF SCIENCE OF SCIENCE EDUCATION IN THE NIGERIAN SECONDARY SCHOOL

Science was taught in schools in Nigeria prior to 1859. Between 1859 and 1929, a member of secondary and teacher training institutions were founded. It was then that subjects like astronomy, Chemistry, Physiology and botany feature in the schools curriculum.

Arithmetic, Algebra, Geometry and Physiology were introduced into the school curriculum at the establishment of the first secondary (C.M.S. Grammar School Lagos) in Nigeria in 1959 (Omolewa 1977 in Awolola 2001).

When the Phelps-Stokes/Funded Education Commission visited West Africa in 1920. It found that the state of science education was deficient. Consequently a strong recommendation for the inclusion of science subject in the curriculum of the secondary school was made. Before then few competent science teachers were available in few schools for a long time, and the provision for and method of science teaching were very unsatisfactory (Awolola 2001).

Before 1960, most secondary schools in Nigeria emphasized classics and arts subjects. At the lower forms of secondary schools General science was taught and only few privileged schools (Like government and Mission schools) taught Biology, Health Science was taught and taken at the school certificate examination in the final year of the secondary school course. The science content in schools was dictated by external examination bodies (Cambridge and London Universities Examination Syndicates). Later, the Ministries of Education inspected and recommended schools for West African Examinations Council's approval for them to present candidates for science subjects at the certificate examinations. Prior to independence, education in Nigeria was mainly aimed at acquiring a general education with no particular orientation towards a vocation. The alternative was teaching, clerical or other vocation for which the pupils were not prepared. Teaching and learning styles laid too much emphasis on teacher's authority; consequently rote learning of facts predominated.

The secondary school laboratory facilities were scanty, science personnel were few and the content and context of science courses left much to be improve upon.

After independence, the educational background started improving. Curriculum development conferences and workshops were held between 1968 and 1975 culminating in the production of science curriculum materials for both primary and secondary levels and the national policy on education documents.

Having identified the need for science education in Nigeria, the various governments had, at different times, taken a number of measures aimed at boosting and improving science education. These include the payment of science allowance to science teachers, the establishment of special remedial courses in selected schools and even in tertiary institutions, the founding of a Federal Science School in Lagos. The deliberate policy of University intake to reflect preference to the science (60%) of student in science-based programmes, intensified training of science teachers special scholarship for science courses at the Higher School Certificate level, deliberate preference for science in the award of University scholarships, the establishment of science centers and science secondary schools, local production of science equipment and the teaching and learning of science at all levels of education.

The science policies are as follows (Awolola 2001):

- i. Science shall be taught to all children at primary and secondary school levels
- ii. The teaching and learning of science shall be done in such a way as to develop the child in the three domains (cognitive, effective and psychomotor) of educational objectives.
- iii. Equal opportunity in terms of the provision of curriculum materials resource persons and laboratory facilities shall be giving to all.
- iv. Every child should take at least one science subject at the end of the secondary school course examination.
- v. Local production of science equipment and the practice of improvisation shall be pursued vigorously.

SCIENCE EDUCATION CURRICULUM DEVELOPMENT.

The first curriculum development was made at the Comprehensive High School, Aiyetoro in the early 1960s. A basic science book for forms one (1) and two (2) in secondary schools was produced. This later served as a reference material for use in 1968 and 1959 by the Science Curriculum Development committees formed in 1968 under the agreement between the Comparative education study and Adaptation Center (CESAC) and the Science Teachers Association of Nigeria (STAN). Membership to these committees were drawn from bodies, the Universities and Ministries of Education. They produced new syllabuses in Integrated science, Biology, Chemistry and Physics. The syllabuses attempted to restructure science curriculum content and suggest strategies for teaching (Ivowi 1979,1982). With the production of these syllabuses, both CESAC and STAN developed science projects which radically proposed changes in the contents, context and sequence of teaching science in secondary schools. Another important feature of these projects is the use of conceptual approach in structuring curriculum content. By this process, greater and better generalizations are expected to be achieved. Through the activity-oriented nature of the courses, a better opportunity appeared to be provided for the intellectual development of the learners. CESAC, STAN and Ministries of Education have regularly organized training workshops for science teachers on methodology and on familiarization with content and structural changes in the relevant areas.

PERSONNEL

The quantity and quality of science teachers have been inadequate. Many science teachers appear not professionally well trained to handle the teaching of the subjects in our

secondary schools (Awolola 2001). It is now that efforts are geared up to improve on the number of qualified teachers at the secondary school level.

The non-professionally trained teachers have knowledge of subject matter but are not trained to teach. The training of the professional science teachers appear defective as adequate exposure seemed not provided for with respect to educational technology, improvisation and instrumentation (Awolola, 2001). At the Colleges of Education and Universities, efforts have been centered on producing science teachers for senior and junior secondary schools. Despite the efforts being made to produce science teachers for the school system, a recurring factor in our system is the low number of science graduates from the institutions and the equally low number of students performing well in the science subjects at the ordinary level examination. The vicious cycle of a few students qualifying for admission into universities to do science and few science graduates returning to the schools to teach science to an increased population of students had made matters worse.

In the past years, science teaching in the schools experienced an acute shortage of laboratory assistants. The few science teachers available to teach large classes of students often find themselves having to organize the management of their laboratories, all alone (Capel and Turner, 1999). The effect of this will be shown on the science teachers and possible reduction in their effectiveness as they try to combine laboratory management with high work load. The situation can adversely affect teachers readiness towards improvement in schools.

NATIONAL POLICY ON EDUCATION AND OBJECTIVE SCIENCE EDUCATION IN SECONDARY SCHOOLS.

The five main national goals of Nigeria, as stated in the National Policy On Education (3rd Edition 1998) and as necessary foundation for the national policy on education, are the building of:

- a. a free and democratic society
- b. a just and equalitarian society
- c. a united, strong and self-reliant nation.
- d. a land full of bright opportunities for all citizens.

In Nigeria's philosophy of Education, Nigerians believe, among others, that:

- (a) education is an instrument for national development; to this end, the formulation of ideas, their integration for national development, and the interaction of persons and ideas are all aspects of education.
- (b) education fosters the worth and development of the individuals, sake and for the general development of the society.
- (c) there is the need for functional education for the promotion of a progressive, united Nigeria; to this end, school programmes need to be relevant, practical and comprehensive, while interest and ability should determine individual's direction in education.

There are contained in number 7 of section 1 of the 3rd edition (1998) of the National Policy on Education. The national education goals, which are derived from the philosophy, are:

- (a) The inculcation of national consciousness and national unity.
- (b) The inculcation of the right type of values and attitudes for the survival of the individuals and the Nigerian society.
- (c) The training of the mind in the understanding of the world around,

- (d) The acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for the individual to live in and contribute to the development of his society.

The broad goals of secondary education as contained in section of the National Policy on Education, shall be to prepare the individual for:

- (a) Useful living within the society and
 (b) Higher education
 In specific term, secondary education shall among others:
- (a) Provide all primary school leavers with the opportunity for education of a higher level, irrespective of sex, social status, religion or ethnic background:
 (b) Provide trained manpower in the applied science, technology and commerce at sub-professional grades.
 (c) Inspire its students with a desire for self-improvement and achievement of excellence.
 (d) Raise a generation of people who can think for themselves, respect the views and feelings of others, respect the dignity of labour, appreciate those values specified in our broad national goals and live as good citizens
 (e) Provide technical knowledge and vocational skills necessary for agricultural, industrial, commercial and economic development.

The relevance of the subjects to society in terms of application is to be stressed, selection of topics in each case is to be carefully done to avoid irrelevance and to ensure adherence to the dictates of concepts. Since learning is an activity, the student's mind needs to be actively engaged in order that learning might take place. Therefore, a specific approach which calls for active student's participation through experimentation and discussion is required.

In all, the objectives of Science and Mathematics education include to:

- provide a preparation for further training in science and Mathematics
- provide basic Mathematics and scientific literacy for everyday living.
- Provide essential skills and attitudes as preparation for technological development.

In order to achieve these objectives, there will be the need to have a highly activity-oriented course, which emphasises on skill formation and broadly based principles and concepts.

GOALS OF SCIENCE TEACHING

- (a) To develop in students an awareness of the happenings within their environment.
 (b) To help students develop positive attitudes towards the scientific enterprise
 (c) To lay foundations for effective study of the more advanced science knowledge of which commerce, agriculture can be applied meaningfully in industries and can be used in solving other problems, which require technological dexterity.
 (d) To prepare individuals to be aware and appreciate the tremendous impact of science on society.

According to Daramola (2001) the mentioned goals of science teaching may be broken down into specific school related science activities as indicated below:

- i. To acquaint learners with the various aspects of scientific knowledge,
- ii. To stimulate interest in science and in science related activities.
- iii. To be familiar as much as possible with the interdependence of the various branches of science.

- iv. To develop students abilities' to distinguish between scientific facts and uncertainties in science.
- v. To help learners to develop manipulative skills in the laboratory and to encourage learners to develop proficiency in writing reports of observations and drawing conclusions from such observations.
- vi. To prepare learners for higher education in science.
- vii. To acquaint students with the contributions of science to the development of mankind
- viii. To prepare learners for useful living with the society.

GOVERNMENT'S INVOLVEMENT IN SCIENCE EDUCATION IN NIGERIAN SECONDARY SCHOOLS.

The significant roles of science and technology education in national development made the Federal Government of Nigeria (1985) to:

- (a) see the need to expand science education at the secondary school level ,
- (b) formulate the National Policy on Education in 1979, making science and technology the core school subjects.
- (c) formulate a National Policy on Science and Technology in 1980 and by establishing a full-fledged Ministry of Science and Technology in 1979 charging it with the responsibilities of promoting and developing scientific and technological research in the country.
- (d) Put in place a 60:40 of science to humanities admission policy to guide university admission.
- (e) Purchase and distribute technical equipment and machinery to secondary schools.

THE FUTURE OF SCIENCE EDUCATION IN NIGERIAN SECONDARY SCHOOLS

The future of science education in secondary schools in Nigeria in a democratic setting seem to be bright if government will adopt some of the underlisted measures:

- (a) Government should professionalize teaching so that only those with a background training in Education should be employed to teach science in our institutions. For those without formal training in Education such as those with Bachelor of Science or related qualification that are already teaching should be made to undergo post-graduate studies in education leading to the award of the Post-graduate Diploma in Education.
- (b) The Federal Government should formulate a policy making it mandatory for the various tiers of government to make available science equipment and manpower to our secondary schools.
- (c) Government should equip the existing science and technical laboratories and workshop with standard facilities and where laboratories are not existing, Government should provide such for scientific advancement.
- (d) Research Institutes for specialized areas and special observatories should be created for science and technology teachers. These will help our teachers to come out with recent and useful scientific findings for science and technology development.
- (e) Teachers should be motivated through the provision of handsome salaries and allowances.

- (f) Nigerian government should encourage science and technology advances through invention. For instance whoever dares to invent a prototype should be encouraged and supported.
- (g) Government should encourage science teachers to attend seminars, conferences and workshops to enhance science and technology advancement.

CONCLUSION

The launching of sputnik spaceship U.S.S.R. 1957 made many nations to rise and initiate policies that supported science education. This also made Nigeria to rise up to the challenges of science education by looking into the development of science curriculum. This paved way to determine the National Policy on Education and objectives of science education; goals of science teaching, the role of Government in science education in our schools and the quantity and quality of science teachers needed in our schools in Nigeria.

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