

THE ROLE OF SECONDARY SCHOOL ADMINISTRATORS IN ENHANCING SCIENCE AND TECHNOLOGY EDUCATION IN NIGERIA.

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One of the problems that have plagued Secondary Education in Nigeria for upwards half a century, is the absence of a viable Science and Tehnology Education (STE). A historical overview of secondary education reveals that Liberal Arts and Social Sciences were for a long time given a more than proportionate emphasis to the neglect of practical STE.

Although, the National Policy on Education (1981) has made provision for a comprehensive STE curriculum as a basis for "equipping the students to live effectively in an age of science and technology, there is a general feeling by teachers and students that STE are not properly implemented in most secondary schools.

Against this background, the objectives of this paper are to examine the concepts of science and technology education as significant perspectives of the 3-3 educational system in Nigeria and to identify the various constraints towards their smooth implementation.

The paper discusses and analyses the major role which secondary schools administrators can play in order to promote an efficient and effective STE in Nigeria.

The importance of Science and Technology Education (STE) in the total development of an individual or nation is increasingly being recognised in most parts of the world. It is therefore not surprising that some individuals and governments are developing keen interest in the development and advancement of STE in primary, secondary and tertiary educational institutions. The Federal Government of Nigeria (FGN) has, in its National Policy on Education (NPE, 1981) made provision for a comprehensive and functional STE at the secondary school level, in keeping with its objective of, "equipping students to live effectively in our age of science and technology" (NPE, 1981). The policy document has also indicated that science and technology will continue to be taught in an integrated manner in secondary schools in order to provide trained manpower in sciences and technology; to train such people with the scientific and technical knowledge and vocational skills necessary for agriculture, industrial, commercial and economic development. In the past, when most schools were owned and controlled by individual proprietors and missionary voluntary agencies, principals (administrators) were mere figure heads, with no power to control the school affairs. Whatever actions taken by the principal must meet the approval of the "manager" (who was appointed by the school owners) whose administrative authority had pre-eminence over his own (Udoh and Akpa, 1987). At that time, a senior teacher with academic qualifications and good personality could be appointed a principal.

However, since the government take-over of schools in the early 1970's principalship has assumed wider responsibility and managerial complexity. Increased student enrolment coupled with corresponding increase in the number of school personnel and government involvement in matters as staffing, finance, control of teachers and admission of students are major factors which reinforced the administrative and leadership status of the modern principal. Consequently, principalship at present requires some professional training to enable the role-incumbent cope effectively with the task of appreciating and transmitting the edu-

cational policies formulated by government to his personnel and be in a position to organise, control and co-ordinate school activities in a manner that will facilitate the achievement of goals. Today's school administrator constitutes a bridge between the policymakers and the staff and students. He interprets policies and sees to the execution of instructional programmes. In the words of Hughes (1974), "if the heart (the administrator) of the school is sound the details of government will come right".

Against this background, the purpose of this paper is to:

- a) examine the concept, "science and technology education";
- b) review the historical development of science and technology education in secondary schools and discuss some constraints to the development of STE, and
- c) examine the role of secondary school administrators in implementing STE in Nigeria.

Science and Technology

The Lexicon Webster Dictionary (1977) defines Science as "any branch of knowledge which deals with a body of facts or truths systematically arranged and showing the operation of general laws". Science is a branch of knowledge which has been ascertained by observation, experiment, critically tested, systematized and brought under general principles. It is therefore knowledge derived through the use of scientific mode of enquiry problem identification, data gathering, analysis, synthesis and generalisation. Subjects which tend to adopt the scientific method of learning include Biology, Geography, Mathematics, Physics, Chemistry and Agriculture. Technology was defined by Fashola (1976) as "The scientific study of industrial arts through the study of subjects as woodwork, electronics, automechanic, welding, and local crafts.

Science and Technology are related to the extent that no meaningful and enduring technological feat can be achieved without the systematic application of scientific knowledge. The symbolic role which science and technology play in any country can be maximally appreciated in a system which has well articulated and co-ordinated science and technology education. STE as used here therefore, implies a conscious educational policy aimed at educating the populace in science and technical subjects within the school system. The purpose of STE is not only the increase of knowledge but also the improvement of the quality of life of the people.

(2) Historical Development of STE in Nigeria Schools

The teaching and learning of science and technical (vocational) subjects date back to the colonial days. Most of the early secondary schools which were established during the colonial period offered some science subjects (eg. Mathematics, Physics, Chemistry and Biology) alongside the Arts subjects (eg. History, Religious knowledge and English Language). Such schools include Methodist Girls High School, Lagos (1879), Abeokuta Grammar School (1908) and St.

Patrick's College Asaba (1944). Others which offered Sciences, Arts and Technical subjects include Hope Waddel Institute Calabar (1895) and Eko Boys High School Lagos (1913). It should be noted that the curriculum of STE in these early schools were predominantly theoretical and not rich in the practical skills necessary for evolving functional and self-reliant professional men and women.

The Science departments suffered greatly from poor-staffing, inadequately equipped laboratories and insufficient instructional aids. Few secondary schools taught technical and commercial subjects while majority did not. According to Fafunwa (1980) and Okoro (1983), the study of technical and commercial subjects were scorned due to the following reasons. First, it was erroneously believed that the subjects were for students who could not cope with academic courses; consequently, technicians earned lower wages and salaries than those engaged in white-collar jobs. Second, vocational education was conceived of as something to be learned in few and special schools. Third, it was considered that since technical education involved working with one's hand, it was for the less intelligent people.

The entire structure, content and methodology of secondary school curriculum during the colonial days were designed in harmony with those of the British schools.

The curriculum was fashioned not necessarily to serve the interest of the Nigerian people but to satisfy the yearnings of the British colonial administrators and their Nigerian surrogates whose needs for clerks, administrative assistants, pastors, catechist, teachers were steadily growing.

Even immediately after political independence in 1960, attempts at curriculum reviews did not bring about marked changes in the quality of secondary education.

It was in recognition of the weaknesses of the traditional 5-year secondary education that the National Policy on education (1981) brought in some curriculum innovations which gave functional STE a pride of place. The new educational system (usually referred to as 6-3-3-4 system) has a two-tier secondary education, namely - Junior Secondary School (JSS) and Senior Secondary School (SSS) each spanning three years. The new system has laid strong emphasis on acquisition of appropriate skills, abilities and competencies to enable the learner live in and contribute effectively to the development of his society. As indicated below, a number of features reflect great improvements on the traditional curriculum of secondary education. First, the JSS is both prevocational and academic in course contents. The prevocational subjects are woodwork, metal work, electronics, home economics, local crafts and business studies while the core academic subjects include amongst others, mathematics, english language, integrated science, social studies, Art and Music. The purpose of the JSS is to expose students to a comprehensive basic education preparatory to more advanced skills in the SSS or technical apprenticeship or any other out-of-school vocational training. The SSS consists of both core and elective subjects. For instance, the core subjects include mathematics, one of chemistry, physics, and biology and any one vocational subject while some electives are additional mathematics, commerce, Geography and Economics.

Second, the new curriculum is very comprehensive and versatile because it has a wide range of theoretical and activity-based subjects - a situation which offers students the opportunity to choose subjects in which they have special aptitude. Third, in recognition of the importance of teaching equipment to effective learning, the FGN had procured and allocated Introductory Technology equipment to all secondary schools in Nigeria and equally emphasised the need for teachers to improvise some teaching aids from local resources. In response to the FGN's call, the Science Teachers Association of Nigeria (STAN) and the Mathematics Association of Nigeria (MAN) to mention a few, have organised special workshops on "Teaching Aids Improvisation" and related issues on teaching methodology. Finally, the new system of education encourages the greater proportion of students to enrol for Sciences and technical subjects. This is intended to meet up the FGN's approved University admission quota of 60% for Sciences and Technology and 40% for Arts and Social Sciences.

(3) The Role of School Administrators in Enhancing STE In Nigeria Schools

This section is intended to examine the role of School administrators (Principals or Vice Principals and Senior teachers who assist principals in the day-to-day running of school in fostering STE in Nigeria. Recent researches conducted by Fagbamiye (1985), Ogunu (1989) and Yalokwu (1990) amply agree that School administrators by virtue of their position as chief consultants motivators, counsellors, supervisors and community liaison officers, play a major role in promoting teaching, learning and day-to-day school management. It is the candid view of this writer that the following eleven points constitute the key role which every school administrator should play in order to enhance STE in Nigeria.

(i) Appreciate the New National Policy on Education and master its implications for STE:

The principal should have a good mastery of the basic philosophy and aspirations of the STE as provided in the 3-3 system. Otherwise, he would be incompetent to explain to his staff and students, parents and local community members some issues of scientific and technological importance in the new programme. To be able to appreciate the full import of the programme, the principal should always strive to obtain and study up-to-date published materials on the new education system in general and STE in particular.

(ii) Understand and master his role as leader and administrator: The principal is both a leader and administrator. As the key administrator he should use all existing government approved procedures to achieve organisational goals. Since he is the chief establishing force in the school, he should ensure that all government regulations with regards to the day-to-day operation of the school are adhered to. In addition, the principal should understand his role as a leader and endeavour to initiate, where necessary, new strategies for accomplishing the objectives of STE in his own school. In the process of performing his managerial function, he should communicate effectively with every staff, students and school community members and give all a feeling of belonging.

- (iii) Create a school climate that is conducive to learning: The School administrator has a duty to establish cordial relationship with both staff and students. He should encourage all parties under his jurisdiction to get the best out of the available human and material resources. He should create a suitable learning environment by working with and through individuals and groups in order to develop an intellectually stimulating learning environment.
- (iv) Promote staff in-service courses: The school administrator should encourage all science and technical personnel whose pedagogic foundation is weak, to undertake in-service training. For instance, teachers whose highest professional qualification is not above Nigeria Certificate of Education (NCE) should be allowed to undertake further studies up to at least B.Ed degree. For teachers with university degrees, they should be allowed to undertake periodic refresher courses in the teaching of their subjects. Periodic workshops should be organised not only for teachers but also for science and technical support staff.
- (v) Manage school plant and equipment; The principal should manage the school buildings in such a way that it will present a clean and stimulating place for intellectual work (Ogunu, 1989). As a matter of fact he should:
- determine the physical plant needs of the school and the resources which can be harnessed to meet the needs.
 - develop a comprehensive plan for the orderly growth and improvement of the school plant facilities.
 - develop an efficient programme of operation of maintenance of the physical plant.
 - conduct periodic inspection of the physical plant and take steps to improve, modify and/or effect repairs and
 - work with staff to develop and implement a safety programme for the school including procedures for reporting and handling emergencies and accidents.
- (vi) Encourage participatory decision-making: According to Dill (1964) many groups (such as teachers and students) in organisations want more chance to participate in making decisions that affect their activities and opportunities. The encouragement of group participation in decision making helps administrators to secure the co-operation of organisational members. It also helps to improve the quality and implementation of decisions. The principal should see himself as one occupying a position which requires balancing acts of individuals who should be imbued with mature scholarship, technical competence, goodwill and wealth of experience which should be at the disposal of entire staff and school community (Fagbamiye, 1985).
- (vii) Provision of guidance and counselling services: Perhaps one of the strong weaknesses with which most secondary schools are grappling is inadequate counselling services. It has been observed that some of the teachers currently teaching science and technical subjects were not adequately counselled before they settled to study the subject. This is reflected in the quantity of job they are ready to do in schools. Such teachers often exhibit poor attitude to work and lack of commitment to work. To avoid a situation whereby

some students end up reading subjects for which they have no aptitude, the principal should secure the services of a guidance counsellor for his school. He should procure funds, supplies and equipment needed for effective guidance and counselling. Finally, he should ensure that students receive proper career counselling so as to enable them utilize opportunities within the school and the labour market.

- (viii) Regular supervision and judicious evaluation of staff and students performance: The school administrator should undertake regular supervision of teachers' and students' work. Otherwise, he may discover in the end that some assigned tasks have not been performed effectively. He should procure and assign the equipment and other resources required by staff to accomplish school objectives. Continuous Assessment (CA) should be adopted as a method of student evaluation. The principal should arrange periodic workshops on techniques to be used by the teachers to conduct C.A. He should monitor accurate records of performance. To foster effective supervision and evaluation of staff performance, the principal should delegate some of his roles to subordinate staff, for example, Vice-principals and Heads of Departments. Principals should design course evaluation forms which will enable them evaluate teachers in each subject. Students are to be given the opportunity to rate classroom instruction by teachers and teachers should rate students through the CA and end-of-year examinations. Against this background of the analysis of the reports submitted to him, coupled with his own personal observations and assessment, the results arrived at eventually should give a fair and balanced evaluation report on every staff and student.
- (ix) Participate in curriculum planning and development: Every school leader should participate in the planning and periodic review of science and technical subjects. The principal should, on the basis of genuine reports from his teachers (on such things as students' performance in CA and examination), the socio-economic needs of the students and current development in the discipline, call for a curriculum review. In as much as the frontier of knowledge is ever expanding, reviews should be seen as a continuous process rather than a one-shot incident.
- (x) Prudent management of school finances: In these days of global austerity and Structural Adjustment Programme (SAP) in Nigeria, no school can afford to look down on efficient management of funds. In the face of acute competition with other sectors (eg. Defence and Agriculture) for funds, the amount of money allocated to education subsector from annual budgetary sources is getting smaller and smaller relative to needs. The implication is that school administrators have to look for alternative financial resources such as organising of science clubs, exhibition of scientific and technical innovations and production and sale of magazines to generate fund.
- (xi) Allocation of subjects to qualified and competent teachers: One of the handicaps of STE is paucity of highly qualified teachers and technical-support staff. As nobody can afford to give what he has not got, the principal should allocate subjects to only teachers who, by virtue of their qualifications and exposure can deliver the goods. He should organise induction courses within the school to educate, induct and orientate teachers on the details of the new

STE curriculum. It is sad to note that some secondary schools which have already received freely the introductory technology equipment provided by government, have not got the requisite teachers. In order to justify the huge public expenditure on the said equipment, government should step up the training of more teachers in addition to appropriate categories of laboratory technologists and attendants. In the interim, however, school heads should enlist the services of local artisans and craftsmen to teach basic skills in technical courses e.g auto-mechanics.

Conclusion

From the foregoing sections of this paper, it is clear that the FGN has designed a viable and comprehensive STE curriculum. What is needed now is concerted efforts by education officers, school administrators, teachers, students, other members of the community and all lovers of STE, to ensure that adequate resources are mobilised towards the effective implementation of STE. In particular, principals and teachers must recognise the important role of STE in nation building and take appropriate steps to prepare students to organise their knowledge in order to become practical scientists and technologists of the future. This inevitably calls for a programme of incentives (eg. science and technical teachers allowances) to make STE challenging, meaningful and purposeful. Students who have demonstrated special aptitude in STE should be given encouragement and incentives (scholarship) to engage in further studies and acquire appropriate scientific and technological skills that are of practical value in academia, industry, agriculture and other sectors of the Nigerian economy. If school administrators are to be able to meet the growing challenges of managing STE, they need to undergo a short inservice training during which they will learn the basics of educational administration and planning. As a matter of policy, the Departments of Educational Administration and Planning in our universities and colleges of education should incorporate, "Essential Elements in Management of Science and Technology Education" in their curriculum. This will not doubt, help the future school administrator to make his plans objectively and his decisions confidently.

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