SCIENCE, TECHNOLOGY AND MATHEMATICS EDUCATION POLICIES AND IMPLEMENTATION: AN OVERVIEW OF THE NIGERIAN EXPERIENCE

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Abstract

Education in Nigeria is regarded as one of the largest industries, cherished and protected by both Federal and State governments. Consequently, it has witnessed progressive government intervention and participation utilising it as an instrument. A situation, which has called for the formulation and reformation of educational policies and programmes, all these years of post independence Nigeria. Looking at the entire educational system in Nigeria, one can easily notice a mismatch between educational policies and their implementations. Why is this so? To what extent has this affected the educational inputs and outputs? This paper is therefore an attempt to identify the lapses, which existed between policies, and implementations in our educational industry and to some extent suggest ways of remedying the situation. Specifically this paper will look at the gap between manpower development and utilization in science, mathematics and technology (S.T.M.) within and outside the education industry and see if our vision for economic reliance in the year 2010 will be a reality.

Introduction

The history of Nigeria as a country is recent but the history of the people who live in Nigeria is very old. Sir Alan Burns, both a recognised historian and past Colonial Administrator in Nigeria once remarked that “There is no Nigerian nation, no Nigeria language... and no Nigerian tradition”. The very name of Nigeria was invented by a medley of formerly warring tribes with no common culture and united only in so far as they are governed by a single power. Nigeria as a country had been formed by the gradual incorporation of different contiguous areas into the British Empire from 1861 onwards, taking its final shape by 1914 with the celebrated Amalgamation by Lord Lugard.

The period of Colonial rule in Nigeria witnessed various constitutional changes. Similarly the period of self rule (1960-1966) also witnessed various instabilities and these subsequently led to the military take over of the first regime and remained a regular feature of the Nigerian political scene. The Nigerian educational policies and implementation like those of the defunct Soviet Union, is a reflection of these factors and ethnic diversities. However, underlying the problem of social, economic and political development is the need to develop the educational system in such a way as to provide a satisfactory flow of men and women, capable of acquiring the skills necessary to exploit to the fullest, the natural resources of the country, for the benefit of the community as a whole and to be able to obtain the understanding cooperation of all the people in the development of the country. To what extent is this true in Nigeria of today is a question yet to be answered by scholars of History.

Before the arrival of the Western system of education, every cultural area in Nigeria had its own method of socializing the youths. Emphasis then was generally placed on functionalism with attention to the development of specific skills aimed at integrating the individuals with the demands of the local community. Consequently, children had to learn the skills, which helped them, cope successfully within their environments and lived effectively and efficiently in their own cultural environments. With the arrival of the Western influences, the informal systems of education became inadequate and were replaced by the formal western system of education. Consequently, the teaching of science was introduced into the school curriculum, at all levels of education in Nigeria.
 Policies On S.T.M. Curriculum Development And Implementation

Since the end of the Second World War, science education in Britain and America have had a profound influence on the type of science education development in Nigeria. School science has grown especially in Britain out of a tradition of formal academic science, which was up till about 1950 the prerogative of the able or the privileged. The goals of curriculum reforms and policy implementation has been generally on the acquisition of skills and attitudes related to processes and products of science. Since independence, both the State and the Federal Governments of Nigeria have attempted to invest in science education as a means of bridging the technological gap that exist between her and the developed nations. By and large these investments have been by adoption-or adaptation of ready made programmes of the people of the developed worlds. So many educational policies have been developed with regard to S.T.M. teaching in our schools for Primary through Secondary to Tertiary levels. In policy, emphasis was placed on the acquisition of practical skills and would be used for smooth technological transfer, at the tertiary level while at the lower levels emphasis was on the acquisition of science principles that was expected to lay the necessary foundations for subsequent levels, with anticipated increasing sophistication as students progressed from primary to secondary levels.

In the late 1980s there was a genuine need and a burning desire for technological transfer by both federal and State governments. Curriculum materials at secondary levels were reviewed and introductory technology was introduced into the Junior Secondary School (JSS) curriculum. Consequently, the federal Government of Nigeria went into massive importation of introductory technology machinery, for use in the JSS levels. Perhaps, it might be pertinent to observe here that these materials were distributed to schools and colleges without considering the suitability of these colleges and secondary schools with respect to personnel and even infrastructure facilities needed to automate them, in order to enable them function adequately. Today some of these items could be seen vandalized in open fields, and corridors of schools and colleges of the benefiting communities. This is a clear case of bad planning and implementation, by both Federal and State Governments. There is therefore a mismatch between policy and implementation of the vocational training programmes of the junior secondary school.

In policy, it was expected that students who were unable to follow the rigours of the normal academic demands of the senior secondary school (S.S.S.) would have to branch into the vocational programmes. They were expected to acquire the basic vocational skills which would have enabled them function adequately and effectively in a growing nation. Today, these expectations were never materialised as every graduate of the J.S.S., successful or not found their ways into the S.S.S. programmes. Whereas, it might not be wrong in totally absolving the dropout s of J.S.S.3, of their failure to proceed into the vocational programmes as expected and acquire some sort of vocational skills that would have permanently classified them as second class individuals, while their counterparts could progress into universities and pursue career choices of their own, the implementers of their policy should be held responsible for not implementing it as designed. The failure of government to establish designated centres for vocational training in practical terms is the base of our avocational pursuit, problems and prospects in Nigeria. At present we have some centres which are run with limited resources by Federal, individual and State Governments. The disparities, which exist in terms of provision, could be better imagined than described as you move from one to another. Inspite of the high hopes of those expecting that establishment of Federal Universities of Technology and Polytechnics would equalize access and provision, there are enough evidences from the various accreditation reports to suggest that such schools have not been the expected panacea. Brian Holmes (1985) maintained that the speed and completeness with which education system in Britain became comprehensive or remained selective do not explain the degree to which the universities and other institutions of higher learning expanded. If access to schooling is a measure of equality of opportunity as manifested by the establishment of universities and polytechnics in every state in Nigeria, what curricula are offered to the undergraduates in these schools is a measure of equality of provision. The core curriculum approach introduced into our educational system was an attempt to provide equal opportunity to all and its intention was to select and illuminate the problems the young undergraduates likely to meet when they graduate from school.
While it is true that political and ethnic backgrounds of those in policy making and implementation can influence changes in structure and organisation in an attempt to promote equality of opportunity and access to the Federal and State Universities and Polytechnics, the lecturers have almost exclusive control over the content of science, technology and mathematics, how it should be taught and to whom it should be offered. Writing about the quality of school, Glasser (1990) drew an analogy with management in industry and argued that whilst productivity in educational terms depends on classroom lectures as the first level managers, it also depends on how well they in turn are managed by the “middle and upper level” managers above them. Just as the students should feel good about the quality of work which they are doing so lecturers too should enjoy a sense of being valued for their competence. In Glasser’s words any shortage of effective lecturers in these universities and polytechnics is caused not by any lack of individual merit but by how well lecturers are remunerated and managed.

The failure of our curriculum content materials to produce the desired result in S.T.M. is partly due to the policy makers inability to match policies and implementations together in practical terms and also their inability to reward those who adequately execute the curriculum in practical terms.

Training Policies And Their Implementation In Science, Technology And Mathematics

If one were to take a census among secondary teachers of mature experience of the major problems that face S.T.M. teaching in Nigeria, they would probably come with a list which contains at least the following short comings - inadequate supply of trained manpower, the rigid adherence to external syllabus, the worship of paper qualifications and learning by rote.

The poor S.T.M training is a legacy of the past, but it is also made worse at present by the explosive expansion of the secondary and tertiary educational institutions in this country, on one hand and on the other hand by the frequent interruption of academic calendar of our universities and colleges of education, as a result of the gap between policy statements and their implementation in matter affecting teachers' welfare.

These inadequate trained and overworked S.T.M. teachers therefore try to face up to their responsibilities by at least learning up the themes that they are supposed to cover in the allotted time. This leads to a close adherence to the scheme of work handed to the teachers and lecturers as well. The adherence to the syllabus is not only aggravated by the overwhelming desire for students to pass their examination in order to graduate from the system but also to make room for fresh intake of students into the system. Consequently the pursuits of S.T.M. and the gaining of an understanding in them are seriously hampered for the students.

Fayiga (1972) opined that S.T.M. teaching at any level should aim at satisfying the immediate and long-term intellectual, aesthetic, cultural and utilitarian needs of the child and prepare him for adult life. At present, teaching and learning in S.T.M., remain predominantly didactic, teacher centered and teacher directed.

Consequently, all programmes for training in S.T.M. at any level lack the essential ingredients that is expected to invigorate (both the teacher and students) and match with substantial motivation in order to propel the individual quest for break through in S.T.M.

A fundamental question facing S.T.M., in Universities and Polytechnics in Nigeria is the extent to which consensual arrangements and assumptions that generally worked well during the early 1970's of its expansion can cope with the more stringent conditions now prevalent in the last decade of the last millennium. In the-past, we used to have a sizeable number of different kinds of aid from the developed countries. At present, such aids are no longer forth coming because of our university calendars and policies, which are at variance with those of the developed world. The academic calendar of our universities leaves much to be desired because of conflicting policies, interests and needs, from both the government and the university communities. Is there sufficient common purpose amongst the various institutions and interest groups that constitute the higher education system in Nigeria to permit the development of a viable long term policy objectives for S.T.M? Or must higher education policy increasingly become merely the outcome of a struggle for survival and dominance among conflicting interests and ethnic rivalries? S.T.M., policy formulation itself is the business of the civil servants in the
Federal Ministry of Education. Policies on S.T.M., may have been originated in a variety of ways, but they must have been at some stage been developed and implemented by the permanent officials of the federal Ministries of Education and that of Science and Technology. These civil servants and sometimes politicians are in position to influence policy and their influences usually outlast their tenure or the life of a government. This raises several questions. How far has the individual civil servant or politician influenced education policy and implementation in Nigeria? Does the Federal and State Governor share a corporate view on policies towards S.T.M., Education?

Although individual ministers are not often personally identified with particular policy proposal, however, the attitudes and values of the individual senior civil servant or minister remains an important part of the policy making process in Nigeria because of their diversities in both cultural, ethnic, social and religious background. For example, by recognising different types of institution either administratively or by legislation, the Federal government has exercised financial discrimination between the Federal and State owned universities, polytechnics ad colleges of education. This does not however preclude discrimination within the institutions on ethnic background, but such discriminations tend to be more difficult to defend academically and politically as often experienced by the various academic unions demand’s on issues affecting them.

Consequently our policies and objectives of S.T.M, teaching are much more elusive than was previously assumed. The capacity of S.T.M. education to act as an independent variable has been overestimated. Instead of the anticipated fruits, we have witnessed in the last decades increased political instabilities, large scale unemployment, under utilization of manpower, depopulation of rural areas and overpopulation of urban areas; just to mention a few. These have collectively affected the teaching of S.T.M., as cash productive in this country. Taken together, these arguments present a powerful case for educational reform in S.T.M.

**Have We The Zeal And The Potentials For Educational Reforms In S.T.M?**

Educational reform is a term that can be used here to describe a wide range of activities. At minor level S.T.M, reform can imply curriculum adaptation. More fundamental reform in S.T.M. will involve the restructuring of the entire S.T.M, education, the Nigerian economy and the society itself. S.T.M's educational policies and their implementations in this country have encountered obstacles of three types. The first concerns limited capacity of and resistance from the education system itself, the second relates to resistance from influential sectors of the Nigerian society and the third concerns the basic relationships between S.T.M. education and the Nigerian economy.

With increase in number of state and federal universities coupled with brain-drain to greener pastures, of those lectures with the technical know how in S.T.M., one would probably argue that the majority of the academic staff therefore lacked both the experience and the self confidence required to embark on innovative techniques in S.T.M. Most of them relied on the methods and materials with which they had themselves been taught and it would have been naive to have expected them to do otherwise. Similarly, the Federal Government, because of its administrative policies have concerned itself with the problem of establishing Federal Universities of Technology here and there to satisfy the regional and ethnic demands, for equal opportunity of the extent that few resources are spared for more fundamental matters, which at least in the short terms, would probably have brought even more upheaval. Apart from the limited capacity for change, within the education system, there is also a built in resistance to change. More often, the university dons resist what they see as incursions into their tertiary. The Ministers of Education and the lecturers prefer the society to regard them as experts in planning and implementations. They wish to be accorded respect and authority and neither of them is usually very pleased when existing ways of operating the institutions are challenged. An example is the case of the universities’ autonomy and its implications to both parties.

Fundamental reforms in S.T.M. are often resisted by influential sectors of society, for while changes may be very desirable for the majority they are usually to the detriment of a minority. In this case, we must realise that government are composed of individuals who are themselves members of a social elite and may be unwilling to cede power to other groups.
The World Bank Report (1973) shows that the Nigerian governments of the late 1970's were more concerned with short-term political ends than with longer term economic or social ones and their successors found it hard to take a different line. This indeed is perhaps the most important reason for the observed mismatch between policies and implementations in S.T.M., with regards to resources available to them.

Mark Bray et al (1986) noted that the Nigerian economic stratification cannot be easily bridged, partly because the modern sector is linked to the world economy which has its own standards and that those who are gaining from the present situations will strongly resist any reform in S.T.M.

Fundamental education reform may be obstructed by the needs of the economy and its links with the education system. It is here that the Chinese experience is particularly instructive. It was called the ‘Cultural Revolution” and led by Chairman Mao. In his reform, emphasis was on work and study, as positions of influence in society were allocated less according to skills and more on the basis of attitude (Prince, 1979). Today, with all the initial set backs China is gradually becoming a military power to be reckoned with in World Affairs.

**Conclusions and Recommendations**

This paper has been able to identify a mismatch between policies and implementations in S.T.M. teaching in Nigerian schools and this has greatly affected the quality of graduates of S.T.M. produced from these universities and polytechnics. The mismatch has been caused by several factors among, which are finance, political, social and poor attitude to change. Most governments have always budgeted huge sums of money to S.T.M. in their annual budgets, yet only a fraction of this is actually disbursed to S.T.M. teaching at all levels of education.

Education in S.T.M. in Nigeria is properly planned but poorly executed. Emenajo (1992) remarked that “Education, properly planned and executed leads to self realisation and self actualisation”. Poorly planned and executed, it leads to chaos and stagnation. There is therefore the need for the federal and state governments to stop paying lip services to S.T.M. teaching in their schools so as to achieve the desired results.

This paper has identified that the S.T.M teaching in our schools falls below our expectations, if we are to achieve our visions for the year 2010. It has failed to develop the technological skills and their applications in industries. Nwagwu (1992) opined that “What constitutes relevant and quality education can never be an exhausted educational controversy”. However, the goals covered by quality education in S.T.M. covers the acquisition of technological skills and their applications, which are absent in our present disposition. There is therefore the need to suggest a total change in our implementational strategies with attention to practical, than theoretical and cosmetic approaches on issues bordering S.T.M.

The Universities and communities have been identified as not working in harmony enough to promote effective developments in areas of S.T.M. By bringing together responsibility for the universities, public sector, higher education under the Federal Ministry of Education and that of Science and Technology the government could create the opportunity for closer co-ordination of policies on dual funding of research and their applications in industries to enhance development in S.T.M. In the words of Aminu (1985), “Not only should our universities endeavour to be the symbol of the spirit of the community... they also need to strive by their demonstrated commitment to the development of this nation... Regardless of the undoubtedly special position of the universities as self perpetuating centres pursuing academic excellence and cherishing academic freedom, the principles of their management are surely the same as those governing management else where”

The above calls for a reciprocal relationship between the government and those in the Ivory Tower to enhance meaningful learning and teaching in S.T.M.
References

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