

NATIONAL EDUCATION RESTRUCTURING AND SCIENCE, TECHNOLOGY ENGINEERING AND MATHEMATICS EDUCATION: IMPLICATION FOR TEACHER EDUCATION IN COLLEGES OF EDUCATION IN NIGERIA

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Abstract

Following the Federal Government's plans in 2008 and 2009 to restructure Nigeria Certificate in Education (NCE) teacher education programme in Nigeria in which the following objectives were stated: to evolve a responsive Nigeria Certificate in Education (NCE) Minimum Standards that will take cognizance of the 9 year Basic Education Curriculum, to produce high quality Nigeria Certificate in Education (NCE) graduates for effective delivery of the Universal Basic Education programme and to develop new structure, content and strategies of the programme implementation, stakeholders were consulted on how to actualise the plan. Documents were released on the guideline for the restructuring of the teacher education programmes. However, the author wishes in this paper to X – ray some grey areas that need urgent national attention in the area Science, Technology, Engineering and Mathematics (STEM) education, most particularly in Basic Science and Technology Curriculum for Nigeria Certificate in Education (NCE) programme. Thus, this paper shall lay emphasis on the meaning of Restructuring in Science, Technology, Engineering and Mathematics (STEM) education and what must be done to make the restructuring in education a permanent reality in Nigeria.

The development, revision and reform of Curriculum and Instruction occur within a dual framework. On one hand are the agent of reform and on the other are the objects of

reform. At any given time, there is within a country a system of education in operation. This system is one framework, and the other is the structure within which the actual development, revision and reform activities take place (Mauritz, 1973).

According to Omolewa (2007), education reforms emanate from the basic conviction that considerable progress can be made in a nation by its people through careful engineering of the education process.

This citation from a learned scholar tells in a sentence what educational reform/restructuring is all about, that it is periodic review of programme and structures in education in order to meet current national and global educational challenges. Nigeria has witnessed several educational reforms which started at pre – independence. It was to the credit of Nigerians notable agitators for self – rule that led the British Colonial rulers to change the educational system in operation in 1954 from 8 – 6 – 2 – 3 system (i.e 8 year Primary, 6 year Secondary, 2 year Higher School Certificate (HSC) and 3 year University) to a new system then of 6 – 5 – 2 – 3 (i.e 6 year Primary, 5 year Secondary, 2 Higher School Certificate and 3 year University). The change resulted in reducing the number of years at the Primary and Secondary School levels. Nigerians then were more concerned about education. It is viewed as a patriotic struggle to effect a change in the educational structure for the general good of the country (Bello, 2008).

The hope in the education reforms according to Bello (2008) continued to rekindle

after independence. The freedom of self – rule Nigeria was enjoying had to match with educational progress. In September, 1969 there was a National Curriculum Conference in Lagos. Participants at the conference were eager to see Nigeria chart a new course in her educational system. Such a system was reasoned to be able to empower the country towards the path of Scientific and Technological development. The Colonial Education System was criticized as lacking in vitality and relevance and the conference recommended changes in the system from 6 – 5 – 2 – 3 system to 6 – 3 – 3 – 4 system (i.e 6 year Primary, 3 year Junior Secondary, 3 year Senior Secondary and 4 year University Education), (Igwe, 1988). The recommended new system which is purely American system of education was what Japan ably copied after the 2nd world war in 1945 (during which Hiroshima and Anagasaki were worst hit) and succeeded; successive high degrees of earthquakes and tsunamies in 2001 notwithstanding.

(USA Study Guide 2007, Japanese Education 2007)

The product of the curriculum conference was beautiful especially to a country that is hungry for development, for a country that wants to brighten her future. But when political authority picked up the document and showed interest in it, it was interpreted differently. They failed to realize that the document was a proposal produced by academics and interest groups. To put a proposal into practice needs careful planning, but this was not done rather the far – reaching proposal was implemented with a military dispatch which later backfired and the result of a well – articulated proposal was muddled up, then finally was never achieved (Bello, 2008).

Crisis that Emanated from Educational Reforms in Nigeria

Crisis in education started manifesting itself when Government went all out to implement 6 – 3 – 3 – 4 system without adequate planning being put in place. According to Adesina (1981), planning is the process of applying Scientific or Rational procedures to the process of educational growth and development so as to ensure the efficiency and effectiveness of the educational system. The lower education specially Primary education was the first to suffer the effect of inadequate planning with the sudden launching of the free Universal Primary Education (UPE) in 1976 while the policy on education itself appeared in 1977 i.e. one year after implementation of the programme has started. In this kind of situation where implementation is ahead of policy, confusion, uncertainty in programme execution were inevitable; though they emerged but their effect still reflect directly or indirectly in our educational system today hence the series of reforms, refocusing, restructuring, road mapping, consolidations and mergers and even plans to sell unity schools etc. (Bureaucrat, 2007). As at the time of the launch of Universal Primary Education (UPE) in 1976, needs assessment (i.e stating what was needed) were not properly done, the result was absence of adequate statistical data (Akpa, 1988). For example, on the launching of Universal Primary Education (UPE) three million children showed up as against 2.3 million prepared for a 30percent underestimation. This has implications for classroom spaces, teachers and equipment (Akpa, 1988). The exercise according to Bello, (2008), triggered phenomenal rise in pupil population from 8.7 million in 1976/1977 to 12.5 million in 1979/1980 and reaching 15 million in 1982.

The picture of what is seen in Universal Basic Education (UBE) today is not quite different in some states in Nigeria especially in

the Niger – Delta region where Junior Secondary classes in the urban/towns have up to 150 to 180 students per class under the control of one teacher who may be a female. Notwithstanding the absence of correct data to implement the Universal Primary Education (UPE), Federal Government went ahead and took over all voluntary and mission schools and assumed full financial responsibility of running the scheme throughout the country.

Ismaila (1988) commented that 1975 – 1983 witnessed the launching of the gigantic educational programme in Nigeria due to oil boom. Above all it was a period of unprecedented financial imprudence, irrational planning, large scale corruption that culminated in a steep decline from boom to doom, thus, the enormous responsibility Federal Government of Nigeria took in respect of the UPE programme could not be sustained. The financial burden became too great that government began to shy away from its undertakings which led to the placement of Primary education under joint control of states and Local Governments in the 1979 constitution. To worsen the situation some states in the Federation started reversing the policy by returning back voluntary and mission schools to their former owners. The falling prices of petroleum in the International market passed a death sentence on the UPE programme. State and Local Governments could not fund Primary education and as such they began to charge fees; UPE programme then became neither free nor Universal. The final exit of Universal Primary Education (UPE) was made public in the revised National Policy on Education 1998, pp. 15 which states as follows:

“Government welcomes contributions of voluntary agencies, communities and private individuals in the establishment and management of primary schools alongside

those provided by the states and local governments as long as they meet the minimum standards laid down by the Federal Government”.

The ripples of this foundational crisis that emanated from the reforms swept across Secondary and Tertiary Education. Efforts at returning to the good old days of high quality education through series of restructuring, conferences and summits have been very difficult.

Restructuring Science, Technology, Engineering and Mathematics (STEM) Education in Nigeria

One of the most important goals of education is for it to be functional and utilitarian, preparing the individual for life in the community and reforming the society for relevance, adequacy and competitiveness, (Oriaifo, 2002). Education is known to hold the key to the economic, political, sociological and human resource development, and well – being of any society. The concept of Science, Technology, Engineering and Mathematics (STEM) education is that which can improve man’s ways and means. By this definition, STEM education can enable people provide those essential requirements that make life comfortable and worth living. The basis of STEM education is to put man on the high way towards accomplishing some of those basic tasks that keep the society healthy, productive and progressive. Consequently, the STEM education as conceptualized is satisfactory and relevant in this context and must be able to raise the benefiting society to a position of self – sufficiency where it can provide such basic needs as: sufficient food and satisfactory shelter, transportation and communication that are cheap and easily available, medical care that is commonly available and obtainable by all, electricity and water supply in sufficient and uninterrupted quantities and other fundamental

and yet indispensable needs of people (Oriaifo, 2002).

STEM education that falls short of such expectations will be largely theoretical and not fulfilling the important requirement of being a reliable index of the potential for the overall development of the individual and the nation. Under that circumstance, such STEM education needs to be restructured to meet the needs of the society.

According to Oriaifo (2002), STEM education in Nigeria has always been one of the subjects of much thought and debate over the years whenever reforms are carried out in Nigeria. Issues have been raised, problems identified, prospects examined, trends delineated and suggestions made – all towards the reformation/restructuring of STEM education for effectiveness and efficiency. Review efforts and initiatives have always come from various stakeholders in education including committee of Vice Chancellors, Provost, Rectors, Union Leaders, Individuals and Institutions. In all the consultations, there is a consensus that STEM education has continued to experience a systematic decline in quality within the last two decades despite brilliant suggestions and recommendations by the review mechanisms. This, according to Bello (2008), is as a result of lack of zeal by Institutions and Regulatory Agencies to ensure strict implementation of reform agenda in the past and serious neglect of the Inspectorate Services of Ministry of Education and Agencies that would have enforced strict compliance to reforms. Rather, documents containing lofty ideas for reforms are dumped for other personal interest by successive Ministers of Education as in the case of consideration/merger of Tertiary Institutions and sale of Unity Schools, education road map of Dr. Sam Egwu etc. According to Bello (2008), Inspection is indispensable to acquisition of quality

education. No educational programme will function and succeed effectively without a quality Inspectorate Service.

Recently, the need for restructuring of NCE programmes and Institutional framework came to fore again following the observed missing link between the existing programmes and the new subjects and curriculum design in Universal Basic Education (UBE) programme. According to NCCE, (2011); the restructuring is to be carried out in such a way that the new graduates of NCE will be able to blend effectively with the 9 year Basic Education Curriculum.

Restructuring of NCE Teacher Education Programmes and Institutional Framework in Nigeria

The summary of the consultations with Provosts of Colleges of Education in 2008 and 2009 on the issue of restructuring of NCE teacher education programme as reported by Abdulkareem, 2011 had the following objectives:

- i. to evolve a responsive NCE minimum standards that will take cognizance of the 9 year Basic Education Curriculum;
- ii. to recommend the type of NCE graduates to be produced for effective delivery of the Universal Basic Education Programme;
- iii. to advise on the structure, content, strategies and the time lag of the programme implementation.

Resolutions reached in order to attain the stated objectives include:

- (a) that the time of implementation of the restructuring is now in view of the urgent need to produce quality teachers for National need and Global competitiveness.
- (b) that the current NCE minimum standards are not adequate for the implementation

- of the 9 year Basic Education Curriculum.
- (c) that in the short term, the “generalist approach” should be allowed to continue with the infusion of the 9 year Basic Education Curriculum into the present NCE minimum standards, which is now in the form of 4th Edition of minimum standards currently in use in the Colleges of Education as a bridge gap.
- (d) while in the long – term, the “Specialist approach” which would produce a teacher who is equipped to teach in any of the levels of Basic Education Programme: Viz: Early Childhood Education, Adult and Non – formal Education, Special Education, Primary Education and Junior Secondary Education (NCCE, 2011).

The essence of this restructuring is to place emphasis now on specialist teachers in the new National Teacher Education Programme (NTEP) and the UBE Act 2004 and to address the inadequacy of the “one – size – fits – all” model currently being implemented by Colleges of Education.

This according to NCCE report 2011 can be done by:

- i. the reforming and restructuring of the Teacher Education Curriculum to focus training on existing teacher needs at Early Childhood and Care Education, Primary Education, Junior Secondary Education, Special Education, Adult and Non – formal Education.
- ii. the development of minimum standards for Institutional Management to ensure that Colleges provide the appropriate resource – base for the delivery of quality teacher education.

- iii. the development and institutionalization of performance Norms and Standards in Science and Technology Teacher Education.
- iv. the mainstreaming of Gender and Human Immuno-Deficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) issues in the teacher Education Curriculum as well as scaling up Early Childhood and Care Education (ECCE) programmes in collaboration with United Nations International Children’s Emergency Fund (UNICEF).

For effective implementation of the new NCE programmes that will cater for the introduced UBE subjects, new Institutional structure/framework was also developed. The new Institutional structure of schools and departments has been designed for the three categories of NCE – awarding Institutions. The purpose of the restructuring is to enable the Institutions to implement the new programmes. This would also promote the production of professional teachers for each of the different levels of Basic Education.

Below are the Schools and departments expected in the new structure in the three categories of Colleges of Education.

Category A (Conventional Colleges of Education)

School of Early Childhood and Care Education (ECCE)

1. Department of Early Childhood Communication.
2. Department of Health and Nutrition.
3. Department of Early Childhood Science and Technology.
4. Department of Arts and Culture.

School of Primary Education (PED)

1. Department of Language and Literacy.
2. Department of Primary Science; however, the author is of the opinion that the department should read: department of Basic Science and Technology so that it will be in line with UBE subject and Act 2004.
3. Department of Arts and Social Sciences.
4. Department of Vocational and Technical Studies.

School of Junior Secondary Education

1. Department of Languages and Communication.
2. Department of Sciences.
3. Department of Arts and Social Sciences.
4. Department of Vocational and Technical Education.

School of Adult and Non – formal Education (ANF)

1. Department of Life Long Education.
2. Department of Community Development.
3. Department of Extension Services.
4. Department of Open and Distance Learning.

School of Special Education (SPED)

Departments:

1. Education for the learners with Hearing Impairment.
2. Education for the learners with Intellectual Retardation.
3. Education for the learners with Visual Impairment.
4. Rehabilitation Education.
5. Education for the Gifted and Talented.
6. Education for learners with disability.
7. Education for the learners with physical and Health Impairment.

School of Education

1. Department of Educational Foundation.
2. Department of Educational Psychology.
3. Department of Curriculum and Instruction.
4. Department of General Studies.

Category B: (Colleges of Education (Technical)) School of Junior Secondary Education (Technical)

1. Department of Automobile Technology.
2. Department of Building Technology.
3. Department of Electrical/Electronic Technology.
4. Department of Metalwork Technology.
5. Department of Woodwork Technology.

School of Junior Secondary Education (Vocational Education)

1. Department of Agricultural Education.
2. Department of Home Economics.
3. Department of Fine and Applied Arts.
4. Department of Business Education.

School of Junior Secondary Education (Science)

1. Department of Integrated Science: which the author is of the opinion that it should be termed department of Basic Science to be in line with the UBE subject at the upper basic level.
2. Department of Mathematics.
3. Department of Computer Science.

Category C: Colleges of Education (Special)

1. School of Special Education.
2. School of Junior Secondary Education.
3. School of Primary Education.

Source: NCCE Restructuring of NCE programmes and Institutions Document 2011.

Implication for Science and Technology Teacher Education

The restructured department in the School of Junior Secondary Education (Science) in which departments like Biology, Physics and Chemistry are now Integrated as Basic Science Department implies that the new Curriculum would be designed in such a way that all the isolated learning experiences given to students in the past will be brought together with a full reflection of the components of Chemistry, Physics and Biology that make up Science. This also means that instead of an individual being exposed to only the details of one or two subjects (e.g Chemistry/Biology) at NCE level which does not exist at upper basic level where he/she is expected to teach, the student is now exposed to the details of all that make up Science without option of Isolation. This will enable him/her function fully as a science teacher teaching basic science.

The current minimum standard used for Integrated Science should therefore be phased out immediately and a new and all inclusive basic Science minimum standard developed for proper implementation. Infrastructurally, the unit representation of laboratories should be sustained (i.e Chemistry Laboratory, Physics Laboratory and Biology Laboratory) and not muddled up as one Basic Science Laboratory. This will give room for choice of specialization as the student decides to proceed to degree programmes where he/she may opt for Chemistry, Physics or Biology in order to be able to take up opportunities available in Senior Secondary School or continue with degree in Basic Science (Integrated Science as it is called now).

This new approach is advantageous in the sense that the Specialist Science Teacher Education Model is more likely to improve the quality of Service delivery, as trainees would be exposed to the *scope and depth of knowledge and skills* as well as the frame of

conduct/mind that would enhance performance in a chosen level.

The Specialist NCE teacher would have a relatively easier career progression and will be able to specialize at higher levels (if provision is made for this in Nigerian Universities). There would be much recruitment flexibility, as recruitment officers can target particular specialists according to needs. Specialization will also make it easier for Institutions to respond to and accommodate new areas, such as the inclusion of HIV/AIDS Education, Health and Family Life Education, Environmental Education etc.

Conclusion

Restructuring Education is not an easy task, it has to take all the relevant parameters such as; National needs, wider consultation, Commitment, reliable statistical data, practicability, sustainability and quest for development that would make reform desirable and useful to the society. Process of education reforms must match modern scientific and technological innovations for it to remain relevant to the learner and the nation. It also takes years for any meaningful educational reform to yield fruits, therefore Nigeria must learn to plan her education, implement it with commitment and sense of direction and constantly monitor implementations instead of constantly changing programmes. Once this is done, education in Nigeria will be for the greater good of all her citizenry.

Recommendations

The Basic Science Curriculum should be well fine – tuned to meet the needs of the trainee. There should be full utilization of Information Communication and Technology (ICT) methodology along with abundant locally

adapted teaching aids to boost the effectiveness and efficiency of STEM teaching – learning process. Government should establish Secondary Education Commission so as to give Secondary Education the deserved priority that aims at making our youths armed with sellable skills and knowledge to continue with their studies. Policy haste in Education never gives desired result. It would be better if policies are made in such a way that changes can be accommodated without disturbing the overall system in operation.

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