
THE EFFECT OF INNOVATION AND TRANSFORMATION ON NIGERIAN SCIENCE SECONDARY EDUCATION

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Abstract

The paper examined the effect of innovation and transformation on Nigerian science secondary school education. It focuses on the present nature of science and technology, its goals, reforms and problems of technological manpower development. It is recommended that government agencies should make more provisions to science development in secondary schools in areas of both the teachers and the taught.

Innovation- is the act of introducing something, or something newly introduced. While transformation simply means to change in form, appearance, or structure, metamorphose in form or appearance.

Changing economic, social and political situations in both developed and developing countries have combined to create need for constant innovations and reforms in education. As Durkheirn (1938) argued. "Educational transformations are always the results and the symptoms of social transformations in terms of which they are to be explained in order for people to feel at any particular moment in time of the need to change its educational system. It is necessary that new ideas and needs have emerged in which the former system is no longer adequate" (Durkheim 1938:167). While Paulston (1976) viewed innovation as a "relatively isolated technical or programmatic alterations or as low level change, whereas reform involves a normative national and broad structural change".

Journal of Resourcefulness and Distinction, Volume 10 No. 1, May, 2015, ISSN: 2276 - 9684

This is more so in developing countries where from the late 1950s to mid 1970s independence from colonial administrators and in some cases, new found wealth based on natural resources have contributed to a redefinition of social priorities and objectives. As Fagerlind and Saha (1982) contended, although it is difficult to pinpoint when strong links between education and social, economic development began, nevertheless, “It is certain that by late 1950 and early 1960s there was general agreement awaking politicians, educational and social planners and schools that education was a key change agent for moving societies along the development continuum” (Fagerlind and Saha 1982:39).

Changes in education often come about when the current practices are challenged and questions are being asked about the way things are done. The search for a more efficient way of achieving educational objective may lead to proposals for either a new way of doing the same thing or restructuring current provisions to enable achievement of the same set of goals.

The main innovation in Nigerian post-independent educational development was the national policy on education commonly referred to as the 6-3-3-4 education system which replaced the previous 6-5-2-3 system. As explained in September 1980 during a seminar on the new system in Bagauda, Kano state;

“The new senior secondary school proposed in the federal Republic of Nigeria National Policy on Education is an innovation, indeed a transformation of the present system which is a five year course followed by 2 year higher school certificate course neither of which is employment oriented. Both aspects appear to prepare for the higher institutions in a number of disciplines. Providing University graduates with no supporting intermediate personnel, therefore limiting their productivity. Further, the range of discipline the student could pursue in the University is equally restricted and particularly deficient in mathematical, scientific, technological and agricultural disciplines. To redress the situations both at the higher institutions and the secondary schools, the 3-3 structure has been proposed to channel Junior secondary school as well as into teacher training and craft.” (NERDC, 1981: 29).

The main objective is to diversify educational services for Nigerian children. The curriculum for the secondary schools, especially the Junior section is more technical and vocationally oriented, while the senior secondary schools curricula is more academic. Students who passed the junior secondary schools will then be admitted to the senior secondary schools.

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As usual, attempts to first of all identify, then attempt to solve the problems inherent in the old system were not made. The new system was supposed to have started operating in 1982. When the products of the previous six year UPE course would have finished the primary schools. But in 1985, only Kano and Anambra, out of then 19 states in Nigeria have actually started the new system of education,' almost all the other states have either delayed the take-off of the policy or altered its format as a result of shortage of funds, teachers, workshops and equipment.

The Nigerian Educational Research council which was in charge of the implementation of the policy was optimistic that shortage of science equipment, teachers and funds can be overcome in short time.

The Nature of Science and Technology Education Presently in Nigeria

Nigeria at present is regarded as being in the age of science and technology. There have been development in the acquisition of educational facilities e.g computer, introductory technology materials, specialization among subject teachers and the location of schools, curriculum development influenced by educational happenings in other lands which spread through mass media, tourism, studying abroad, Journals, professional organizations, academic exchange programmes, explosion in information technology e.t.c. have made significant changes in the curriculum in recent years. New, untraditional approaches in teaching secondary school science have emerged and more are being developed in all areas of science (Ekpo,1985). Science Teachers Association of Nigerian (STAN), Comparative Education Study and Adaptation Centre (CESAC), Nigerian Educational Research and Development Council (NERDC) to mention a few, improved science by introducing integrated science at the Junior Secondary level and other related science subjects like agricultural science. Also science programmes like: Science fairs, clubs, workshops, lectures, seminars, books, exhibitions. Where all introduced

Computer Simulation

Again, according to Joe and Jennifer (2009). Computer simulation are representations of something analogue, they represent the real world by use of a computer program. it can be a valuable tool in the science classroom. Kara and Yesilyurt (2007) also showed that computer simulation have increased science learning. Assessment results have shown that instructional software programme had significantly higher effect than CG (control group). These results show that computer simulation increases students learning and gives the teachers ways to reach a new generation of learners. These are some of the recent and modern ways of bringing reforms in science education in Nigeria.

The Goals of Science and Technology in Education

Science and technology education is closely linked with national development. The attainment of self-reliant and self-sustaining economy can only be achieved through technological development. The country is in dire need of industrialization and one of the vehicles to it, is development of technology education.

The National Policy on Education (2004) reviewed, stated the nature of science education to be achieved as follows:

- a. Science Education shall emphasize the teaching and learning of science process and principles. This will lead to fundamental and applied research in the sciences at all levels of education.
- b. The goals of science education shall be (i) cultivate inquiry and national mind for the conduct of a good life and democracy, (ii) produce scientists for national development.
- (iii) Service studies in technology are the cause of technological development (iv) provide knowledge and understanding of the complexity of the physical world; the forms and the conduct of life.
- c. Special provisions and incentives shall be made for the study of the sciences at each level of the national education system. For this purpose, the functions of all agencies involved in the promotion of the study of sciences shall be adequately supported by government.
- d. Government shall popularize the study of the sciences and the production of adequate number of scientists to inspire and support development.

Science Education Reforms in Nigeria

Since the policy was put in place, a lot of reforms have taken place in the Nigerian science and technology education and it follows thus:

During the 1960's a wide spread concern about science education, started gathering momentum. The main complaint was that our curriculum in science was irrelevant to the world of work in which our children were brought up. Thus they pinpointed gross imbalance, tremendous wastage and lack of proper articulation of our education objectives Balogun, (1985). Perhaps, it was this crises among other reasons that motivated and provided the background for a new national policy on education 6-3-3-4 system of Education. Whereby the two levels of Secondary Education were broken into Junior and Senior secondary schools of three years each which necessitated the review of the O'level science syllabus.

These reforms were to go further to ensure that the teaching methods to be employed de-emphasize the memorization and regurgitation of facts, encourage exploratory as well as experimental methods.

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At the secondary school level, more reforms have taken place using the broad aims of secondary education as its base. Stated briefly, the broad aim of secondary education in Nigeria are preparation for useful living within the society and preparation for higher education.

On adopting the national policy on education, science subjects were grouped as core subjects and subjects like wood work, metal work, electronic, mechanics and Home economics were grouped as prevocational subjects at the junior secondary school level. The core science subjects are taught to enable students offer science in higher education.

The essence of an introductory course in science at the junior secondary school level is to teach students what science is all about and how scientist work. On university education, a greater proportion of expenditure shall be devoted to science and technology education. Not less than 60% of places shall be allocated to science and science oriented courses in the conventional universities and not less than 80% in the universities of technology (National policy on Education 2004)

Basic Education

The present civilian government also initiated a number of reform programs in virtually all sectors of the economy including education. So, by an act of the National Assembly, the Universal Basic Education (UBE) Programme came into being. It is meant to be of 9 years duration comprising 6 years primary education and 3 years of Junior secondary education. It shall also include adult and non-formal Education programs at primary and Junior secondary education levels for the adults and out of school youths.

The specific goals of basic education shall be the same as the goals of the levels of education to which it applies (i.e Primary education. Junior Secondary Education and adult and non formal education). The IJ3E as a reform programme has many basic features which include:

- Emphasis on curriculum diversification and relevance to effectively and adequately cover individual and community needs and aspirations;
- Individualized teaching methods;
- Introduction of rudiments of computer literacy;
- Appropriate continuous teacher professional development etc. (Kpangban, 2007);

Popularizing Science and Technology Education in Nigeria

Okoye (1997) stated that successive governments realizing the importance of science and technology education have done a lot to popularize science and technology in Nigeria. Among the many steps already taken are:

1. The introduction of science fairs and science clubs in schools. In the larger society there are trade fairs where new products arising from the applications of new technologies are displayed.
2. The introduction of Junior engineers, technicians, scientist (JETS) competitions in secondary school.
3. The establishment of special science secondary schools in some states of the federation.
4. The pegging of the approved quota for admission into Nigerian Universities of sixty percent (60%) for science and science related subjects and forty percent (40%) for Arts.
5. The establishment of specialized institutions in the areas of science and technology by the federal government e.g
 - a. Federal universities of technology
 - b. Federal university of agriculture
6. Award of scholarships to students studying science (including science related) and technology subjects.
7. Establishment of polytechnics, technical colleges and Colleges of education (technical) in many states of Nigeria.
8. Organization of regular annual in service and short—term training to enhance the competence of science, mathematics and primary school teachers across the country.

A combination of these efforts and investment have gone a long way in promoting the growth of science and technology education in Nigeria.

Science and Technology Curriculum Innovation in Nigeria

According to Uduogie (1997) science and technology education has undergone strains and stresses in Nigeria. The cooperative arrangement between the science teachers association of Nigeria (STAN) and the defunct comparative education study and adaptation centre (CESAC) now merged into the Nigerian Education Research and Development Council (NERI)C heralded the national effort at science curriculum Development to improve science education in Nigeria in 1968. Consequently, two major projects, the Nigerian integrated science project, (NISP) and the Nigerian Secondary school Science Project (NSSSP) emerged. Later, the national project science and mathematics project (NPSMP) was developed. Thus an important sector of the education system—the primary and secondary schools was produced.

The innovation introduced centred on the integration of theory and practical in the student activities based science curricular for schools.

Problems of Technological Manpower

Despite the efforts made by the government and science association bodies to promote the growth of science and technology education in Nigeria, the 6-3--3-4 education system was bedeviled with all sorts of problems ranging from the poor quality of teaching staff, poor teaching facilities, managerial instability, secret cult activities, poor funding to low moral of teachers both in the primary level, secondary level, and tertiary institutions worsened the brain — drain syndrome. The result is that the highly qualified and experienced Nigerians are daily migrating to the overseas countries where they are better paid, even first class students from our universities are no longer interested in taking up teaching careers either in the universities or secondary schools.

Conclusion

In this paper, the writers have dispassionately discussed the meaning of innovation and transformation, as they apply to the Nigerian secondary school education system, the reforms, nature of science and technology education presently in Nigeria. its goals and problems of technological manpower development in Nigeria.

Recommendations

Based on the foregoing, the following recommendations were suggested:

1. NERDC should not relent in their effort to promote science education.
2. Government should make more provisions for secondary school science development.
3. Science teachers should be given enough attractive incentives to encourage them.
4. Science students and teachers should be given scholarship to encourage them to take up and remain in science disciplines.
5. Science curriculum planners should design worth while programs that will cater for both global and African settings.

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