

## IMPLEMENTATION AND SUSTANABILITY OF FUNCTIONAL SCIENCE EDUCATION IN NIGERIA

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### Abstract

The paper examined implementation and sustainability of functional science education in Nigeria. It traced the historical background of science education in line with National Policy of Education (NPE) in Nigeria from the early 1970s till date. It examined the noble goals and objectives of science education as well as some reforms carried out in science education in Nigeria. It also considered the progress made so far and gaps yet to be covered in the implementation of the programme. Some of the factors responsible for the low impact of the programme were identified which include lack of political will by policy makers, poor funding and corruption among other things.

The way forward as suggested among other things in the paper is that priority attention should be given by stake holders to science education in terms of funding, adequate planning and with genuine commitment at the level of implementation in order to maximize the gains of the programme. Also, there is need for sustainability of any effort geared towards revitalizing science education programme to make it functional both for the present and the future.

**Keywords:** Functional, Implementation, sustainability, Science Education

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### Introduction

Science education is an integrated field of study which considers both the subject matter of science disciplines such as biology, chemistry, mathematics, geography physics, agriculture etc., as well as the process involved in the learning and teaching of science. It also means exposing learners or prospective teachers of science to scientific and technological knowledge, science process, attitudes and equipping them with scientific professional skins (Bilesanmi-Awoderu, 2012).

According to Aina (2013), science education is concerned with sharing of science content and process with individuals who are not considered traditionally to be member of the scientific community. The field of science education includes work in science content, science process (scientific methods) and teaching pedagogy. Thus, among other things, science education focuses on the teaching the science concepts, method of teaching and addressing misconceptions held by learners regarding science

concepts.

### Historical background of science education in Nigeria

The teaching of science started in Nigeria at about 1875 when missionary schools were established in Lagos. Then subjects like arithmetic, nature study were taught in primary schools. Following the establishment of Africa Education Commission in the 1920s, general science teaching was introduced into the Nigeria educational system. The general science curriculum was designed to reflect the desire and aspiration of the British government (colonial master) and not meet the needs of the people (Sulaiman, 2012). The general science later evolved to elementary science at the primary level of education. Following the curriculum conferences and workshops which held between 1969 and 1975 after independence, a science curriculum for both primary and secondary schools were produced as encapsulated in the National Policy on Education in 1977.

Furthermore, the over reliance on expatriates for teaching of science subjects after independence and increase in enrollment in schools necessitated some reforms in Nigeria educational system. Notably among these reforms is the inauguration of West African Examination Council (WAEC) and the Science Teachers Association of Nigeria (STAN) in 1952 and 1957 respectively. The collaboration between

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STAN, the Ministry of Education and Comparative Education Study and Adaptation Centre (CESAC) in 1968 introduced Biology, Chemistry and Physics into Nigeria schools (Aina, 2013; Adeleke, 2006).

As part of the effort to develop science education in Nigeria, the Nigerian Secondary School Science Project (NSSSP) was drawn up by CESAC between 1970 and 1972. The NSSSP was trial tested up to 1978 and the first revised edition of the instructional material was published in 1980 and integrated into the secondary school system. The organization of science content at the secondary school level as a result of the NSSSP formed the foundation of science education in Nigeria schools today. Over the years, science education curriculum have been developed and integrated at all levels of education. The aims of science education curriculum reforms have been to help students to develop informed and enriching understanding of science and promote science learning as joyous experience that promote critical and creative thinking through various Innovative methods like learning by doing, learning by inquiry method, and discovery method (Babalola, 2004).

### Goals and Objectives of Science Education in Nigeria

The goals of science education as spelt out in the National policy on education (2014) document are as follows:

1. Science shall cultivate inquiring, knowing and rational mind for conduct of a good life and democracy.
2. Science education shall produce scientists for national development.
3. Service studies in technology and the cause of technology development; and
4. Provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

While the objectives of science education includes;

1. Acquisition of the rudiments of number, letters, colour shapes and forms
2. Providing a solid foundation in mathematics for everyday living
3. Developing competence in the basic skills and understanding for dealing with numbers
4. Laying a sound foundation for scientific and reflective thinking

5. Equipping students to live effectively in our modern age of science and technology
6. Providing trained manpower in applied science, technology and commerce.

According to the European Commission of Expert Group on Science Education (2015) and the American Association for the Advancement of Science (2009) document proposed a framework for science education identifies some key objectives which can help bring about systemic changes required to generate a sustainable effect across societies.

1. Science education should be an essential component of a learning continuum for all from pre-school to active engaged citizenship.
2. Science education should focus on competencies with an emphasis on learning through science and shifting from Science, Technology, Engineering and Mathematics (STEM) to Science, Technology, Agriculture and Mathematics (STEAM) by linking science with other subjects and disciplines.
3. The quality of teaching from induction through pre-service preparation and in-service professional development should be enhanced to improve the depth and quality of learning outcomes.
4. Collaboration between formal, non-formal and informal educational providers, enterprise and civil society should be enhanced to ensure relevant and meaningful engagement of all societal actors with science and increase uptake of science studies and science based careers to improve employability and competitiveness.
5. Greater attention should be given to promoting Responsible Research and Innovations (RRI) and enhancing public understanding of scientific findings and the capabilities to discuss their benefits and consequences. Based on the foregoing, some notable reforms and innovations in science education in Nigeria are discussed as follows.

### Reforms and Innovations in Science Education in Nigeria

The reforms and innovations that took place in science and technology education from the early 2000 among other things include the establishment of National open universities to foster among other things e-

learning and virtual library, the establishment of national commission for universities, polytechnics, colleges of education and technical education board and re-vitalization of science education, technical and vocational education and computer studies at all levels of education (Nigeria Education Research Development Council, 2010; Nwachukwu, 2012).

Another dimension to the reforms in science, technology education was emergence of the Millennium Development Goals (MDGs) and Education for All (EFA) goals championed by United Nations (UN, 2008; UNESCO, 2014). The need to achieve the MDGs in Nigeria led to the adoption of the National Economic Empowerment Development Strategy (NEEDS, 2010; Ige, 2014). This led to the adoption of the review of the 6-3-3-4 to 6-9-3 system of education. As result, there was massive review of content of existing science education curricula in Nigeria. Notable among these is the introduction of introductory technology and basic science into junior secondary school science to promote teaching and learning of science and technology education in Nigeria (National Policy on Science and Technology (NPST), 2014).

Recently, there was the introduction of Science, Technology, and Engineering & Mathematics (STEM) and of Science, Technology, Engineering, and Agriculture & Mathematics STEAM content across all levels of education which is the basis for solid foundation for emerging technologies in the 21<sup>st</sup> century crucial to the development of the nation (Smith, 2019).

### **Areas for Sustainable Innovations in Science Education in Nigeria**

The need to achieve Sustainable Development Goals (SDG) proposed by the United Nations in 2015 has led to the call for sustainable innovations in science education programme in Nigeria. According to Webster, (2015), sustainability is the desire to meet the needs and aspirations of the present without compromising the ability meet those of the future. It is the process of starting and continuing a thing. On the hand, innovation is concerned with creativity, risk taking and experimentation which must be a part of the education system (in this case, science education (Aina, 2013). It is worthy of note that for any innovation to be functional (in this case, science education programme), it requires sustainable efforts.

Such sustainable efforts must be solid base (that is, anchored on the socio-cultural realities of the beneficiaries), backed by a strong political will of leaders and backed by the people. Thus, areas that require innovations include; research, information, communication, technology (ICT), skilled personnel/ entrepreneurship, collaboration, funding and new technologies among other things.

### **Research/Pedagogy**

This is about current practices or approaches as it is being practiced in other parts of the world. There is the need to adopt best practices like innovative teaching methods, standard curriculum, assessment techniques, content, materials and quality control mechanism etc.

### **Information Communication Technology (ICT)**

There is the need for improvement in the present ICT level especially in Nigeria. This will enable educators in the field of science education keep abreast with current information with their counterparts in other countries.

### **Skilled Personnel/Entrepreneurship**

There is need for skilled persons in any field of life as no nation can rise especially above the literacy (in this case, the scientific literacy) level of her citizens. This calls for training and retraining of persons saddled with the responsibilities of science teaching or implementing the science subjects curricular.

### **Collaboration/Globalization**

Scientific knowledge does not exist in isolation. Science educators must promote collaboration or cross-fertilization of ideas through regular participation in conferences, workshops, seminars and symposia both home and abroad in order to keep abreast with the rest of the world in the field of science education.

### **Funding**

There is need for steady improvement in funding of existing science education programme. This will go a long way in ensuring that the programme keep abreast as it is in other parts of the world.

### **New Technologies**

There is the need to adopt or apply latest technologies



like cloning and robotic technologies to improve efficiency or productivity in the field of science education. Among other things STEM and STEAM should form the basis for emerging technologies in the 21<sup>st</sup> century which all nations must embrace (Chesky, & Wolfmeyer, 2015)

### **Challenges Facing the Implementation of Science Education Programme in Nigeria**

It is needful to point out the success or failure of any programme like the science education programme among other things depends on the implementation and sustainability of the programme. Hornby (2012) defined implementation as the process of carrying out a laid down plan. Sustainability in relation to programme implementation is necessary as a requirement of the present to manage an enterprise in way that the quality of life that is enjoyed in the present can be enjoyed by future generation (Osinem, 2000). In spite of the effort of federal government in introducing science education in schools, the programme did not readily make much impact because of the following factors.

#### **Lack of Political Will**

Despite the noble objectives of the science education programme in Nigeria, there is problem of lack of political will on the part of our policy makers and implementers to ensure proper implementation of the programme in schools in Nigeria. Even when implementation attempts was made; the programme did not readily make much impact because there was no proper follow up and supervision.

#### **Problem of Corruption**

The problem of corruption has affected nearly every facet of the society in Nigeria. The implementation of the science education programme was not exempted. Despite government efforts to equip schools with facilities for teaching science based programmes, many of these schools did not get the equipment as corrupt government officials made away with money meant for installation of equipment in such schools.

#### **Problem of Assessment**

Some contents of science education courses are too voluminous and boring as a result difficult for teachers and learners to cover. This trend hinders the achievement objectives of science education

programme. Science examination should link both theoretical and experimental knowledge to the realities of life. Thus, this can only be achieved when content on which these assessments are based are narrowed down to a well define and specific objective. This will provide a new standard for students and enhance the achievement set goals.

### **Low Level Sensitivity of Citizens to Science Education Programme**

The sensitivity of the citizenry in Nigeria to science education is still low compared to developed countries. This account for why many people do not show interest in science education programe in the country.

#### **Inadequate Facilities**

In most schools in Nigeria, the facilities meant for science teaching is grossly inadequate. This problem is even more pronounced in the rural areas. It is either the facilities are not available or insufficient.

#### **Under Funding of Science Education Programme**

Lack of commitment on the part of the government and poor awareness on the part of educational administrators of projects in our intuitions. Problem of underfunding is traceable to conflict of interest by different administration. For instance, the Olusegun Obansanjo led government made some significant investment in science education programme through the “petroleum education trust fund” initiative while successive regime after did not properly follow up the gains that were achieved.

#### **High Cost of Facilities**

The cost of facilities meant for teaching biology is high. Most schools rely on internally generated revenue from school fees which is used to run day to day affairs of the schools. As such, many schools are unable to afford these facilities.

#### **Problem of Maintaining Facilities**

Even when these facilities are provided through special funds like the Education Trust Fund (ETF), there is still the problem of maintenance of these facilities. This because there is no sustainable follows up in management of these facilities. Example is in the tertiary institutions where obsolete facilities for teaching science based subjects are not being replaced.

### **Poor Perception of Science Education Programme by Educational Administrators**

Majority of our educational administrators have little awareness about science education programme. This account for apathy towards science education in our schools. Hence, the programme is not given the attention it deserves.

### **Electricity Interruptions**

Epileptic power supply has been the bane of the Nigeria society. This problem has affected every sector. Science teaching cannot be effectively implemented where power supply is irregular as electricity is required to carry out certain practical aspects of the curriculum.

### **Lack of Adequate Consultation**

According to (UNESCO, 2018), the challenges affecting the progress of science education in African countries is due to lack of technical and management capacity in carrying out the said objectives, conflict of interest inadequate consultation. Other challenges facing the implementation and sustainability of standard of science education programme include; poorly motivated teachers leading to poor performance in teaching, frequent strikes by teachers leading to distortion in academic calendars, deficiency in curriculum content and delivery resulting in lowering of performance level of students in school and public examinations and inadequately professionally qualified teachers in the school system (Osokoya, 2002; Okebukola, 2005; Okoroma, 2006; Obioma, 2012).

### **Strategies for Improving the Implementation and Sustainability of Science Education in Nigeria**

Based on the previous discussion on problems facing the implementation of science education the way forward is to adopt the underlining strategies in order to ensure that the programme contributes towards achieving it's objectives and goals in Nigeria (Alome, & Umaru, 2019)

1. Presently, there has been haphazard implementation of science education programme. As such, there is need to adopt a long/short term well defined policy for the implementation of the programme that will be suitable to Nigeria setting.
2. The government should increase funding of

science education programme and ensure adequate provision of up-to-date facilities like well equipped 'state of the art' laboratories our schools and monitor their use.

3. The government should increase admission quota into science education based courses in tertiary institutions, with incentives like scholarship to ensure production of well-trained science teachers.
4. To ensure un-interruption in power supply the federal ministry of mines and power should work towards stabilizing electricity supply required for smooth operations of science equipment in schools in Nigeria.
5. Comprehensive home grown science education programme should be developed. Existing curricula should be reviewed to keep a breast with currents trends in the world.
6. A technologically advanced work force will lead to economic growth in Nigeria. Therefore, government agencies like the media should be used to promote public awareness campaign on the need for literacy in science education among the country's citizen.
7. Government in collaboration with educational administrators and experts both home and abroad should explore ways of cross-fertilizing ideas on ways to move forward science education in Nigeria. Among other things, such individuals and NGOs should explore ways of setting up training centers and facilities across the country.

### **Conclusion**

This paper discussed implementation and sustainability of functional science education in Nigeria. The issue in question is implementation and sustainability of functional science education in Nigeria. From the discussion, it is evident that Nigeria has a long way to go in terms of implementation of science education programme. The implementation of the programme school is still heavily burdened with a lot of setbacks ranging from policy formulation to curriculum implementation among other things. The issue is not formulating policies but empowering the implementers to successfully execute the policies. There is need for values reorientation so as achieve the noble objectives and goals of the programme in Nigeria.

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