



SCIENCE EDUCATION AS A TOOL FOR EFFECTIVE SERVICE DELIVERY IN THE 21ST CENTURY

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Abstract

Science education is the application of educational (learning) theories to the never-ending pursuit of knowledge, resulting in the development of the cognitive, emotional, and psychomotor domains through a variety of methods. Systematic processes comprising thorough observation, deduction, and empirical testing are a sure tool for promoting any state's development. This is because its recipients would be able to solve the ever-present issues of living in society by applying their knowledge. Because of the importance of science education to national development, the Nigerian government has made it a priority in both its Constitution and National Policy on Education. In spite of this, its proper development in the country appears elusive due to the government underfunding of the entire education sector resulting in the non actualization of the its science education dreams in the country. In light of the foregoing, it is recommended, among other things, that priority attention be given to science-based education in the country's educational planning, as well as that such plans be followed up with genuine commitments at the implementation level, so that Nigeria, like other countries, can maximize the benefits of a well-planned, funded, and executed science education programme for the stimulation of the country's development, particularly with a Vision 20:20.20 in mind. The developed countries of the globe pay attention to this section.

Keywords: *Science, Education, Effective, Service & Delivery*

INTRODUCTION

The act of providing services to clients is known as service delivery. The concept of service delivery, on the other hand, can only be fully grasped if the definition of service is first established. Because a service provider might vary his or her style of delivery based on emotions, changes in working conditions, or professional level, service as an action is neither definitive nor objective. Any valuable activity, deed, or effort made to meet a need or fulfill a demand, according to Kotler (2015). Service delivery is effective if it is valuable, dependable, authentic, reliable, extensible, and available in a timely manner. To buttress the above point, service, for Cordella and Tempini (2015), may be conceived as something that the public needs such as transport, hospitals, energy supplies, security, education and counseling, which are provided in a planned and organized way by personnel, staff of organisation, an official body or the government.

The word "delivery" simply means "supply." It is the act of taking things to people, households, and other such places in a more everyday sense. As a result, service delivery refers to an official body, personnel, government or university employees providing public necessities such as education, security, transportation, and energy sources (Matthew & felix, 2016). Individuals from many walks of life agree on the importance of science education and service delivery as revealed in earlier studies (Egessa & Musau, 2016; Onobrakpeya, Nana, & Odu, 2018). Given the advancements in science education, individuals are expected to be technological competent and should be able to apply it efficiently in the process of service delivery. As regards to the study, Service delivery is seen as the provision of services to national development, information exchange, documentation, security and health services by members of a nation. Thus, service delivery in effective delivery has to do with effectiveness with which national growth and development in order to achieve certain services to the growth of any nation. Service delivery also defines growth and development of any nation (Akpan, 2014).

Effective service delivery determines a country's economic, health-care, and educational progress, among other things. In this context, national development, according to Ntui Iyang (2015), can be defined as any country's growth. This has already been established as the country's goals. Every reasonable individual should provide some benefit to those who are recruited or employed.

According to Ikoku (1984) in Okoro (2013:2), the period 1500-1960 witnessed the fragmentation of African culture, particularly as it related to services given in science. It was the very historical period when Europe experienced its industrial revolution at the expense of Africa's own development. Africa was rather deliberately disallowed participation in the development process except as supplier of raw materials of European industries. The continent was tied to the white man's apron strings. In view of Okafor (1988) captured the essence of the scenario painted above, when he pointedly argued in Okoro and Chigbo (2001) that the education system, which was in vogue in this country up to the early 1980's, was largely bequeathed from our erstwhile colonial masters and patterned with a lopsided emphasis on the famous 3'Rs. This system has tended to ignore contemporary worlds meaningful responses to science and technology.

This explains why, prior to the era of self-rule, science education had no significant positive impact in Nigeria at the request of colonial overlords. Onwuka and Onuoha (1983) posited in Okoro and Chigbo (2001) that "any education system that follows the ideals and patterns of alien culture and values cannot be effective" enough to encourage an in-depth study of its core-curriculum in order to inculcate in the citizenry the desirable knowledge needed for the achievement of its aspirations and needs.

Concept of Science Education

Science, a derivative of a Latin origin *scire*, means "to know", that is to have knowledge about a phenomenon. To have the knowledge about nature is not haphazardly pursued but approached through a scientific method. A scientific method is a logical, rational and systematic process by which knowledge in science is pursued and conclusion about nature around them derived (Eze, 2013).

The study of nature or knowledge of nature is science, a field with unique characteristics. Okeke (2007:12) stated that science education is an integrated field of study that "can be said to embody all education processes aimed at providing unlimited opportunities for learners to understand and utilize necessary knowledge, skills, and attitudes required to operate effectively in a scientific and technological society." Balogun (UNESCO, 1995) stated that a

good science education should enable us to develop science process skills, as well as understand the conceptual.

Certainly science as sound mind trainer has some in-built practical values which aid individual recipients who are exposed to its study to acquire the scientific knowledge, sine qua non for development in all aspects of life and in one's profession.

Role of Science Education in the 21st Century

The Nigerian government like all other governments in the world realizes the role of science and its by product-technology in issues of national development. It is for this reason that their promotion is enshrined in section 18(2) of the 1999 Constitution of the Federal Republic of Nigeria. The goals of science education in Nigeria according to the National Policy on Education (FRN; 2004: 29) are to

- i. Cultivate inquiring, knowing and rational mind for the conduct of a good life and democracy;
- ii. Produce scientists for national development,
- iii. Service studies in technology and the cause of technological development;
- iv. Provide knowledge and understanding of the complexity of the physical world, the forms and the conduct of life.

Ataga (1997:11) in discussing the role of science in the development of a nation argued that "Science gives man the power to foresee and judge the consequences of his own actions in reflection to the natural world in which he is. It is a social activity that serves human needs for it is a foundation for technology since it provides knowledge and technology provides a way of using this knowledge".

In a similar vein, Iheoma (1983:15) concluded that ".....science (had) laid the foundation for modern technology, which has enabled modern man to achieve unprecedented control of his environment and to enjoy a high standard of living unknown to his ancestors" while eulogizing the role of science in the development of a nation. According to Fubara, Pandit Nehru, the Prime Minister of India from 1946 to 1964, was a natural science graduate of Cambridge University and is widely regarded as the architect of modern India

because of the solid foundation he laid in emphasizing the role of science in a country's developmental agenda, stated that sciences alone that can solve the problem of hunger and poverty, insanitation and illiteracy, of superstition and deadening custom and tradition, of vast resources running to waste, of a rich country inhabited by starving people. Who could afford to ignore science today? At every turn we have to seek its aid. The future belongs to science and those who make friend with science.

Science, therefore, is the foundation of man's knowledge of life and the universe. As previously said, the incorporation of science in national life is what separates the developed and impoverished countries of the world. The creation and implementation of scientific knowledge is, in essence, the fundamental source of the competitive gap between Nigeria and the industrialized countries of the globe. The rule of competitiveness nowadays is far more reliant on natural capacities to use resources, rather than simply boasting about having them. This, according to Ekpiwhre (2008) is exemplified in the fact that many of the industrialized countries of the world today are poorly endowed with natural resources and less friendly weather conditions. Yet they have attained leadership in the world economy, essentially through the effective application of scientific knowledge got from science education. Ironically, the least developed countries are those with favourable climatic endowments but due to less genuine emphasis on the development of science education, such countries have found themselves in the backwaters.

India used to be a crucial member of the club of backward economies, but that is no longer the case. India's transformation is the outcome of the country's leadership vision of science education as a gateway to the growth of its human resources. India is also doing very well in the medical arena, thanks to the country's sincere commitment to science education by its leaders. It is common knowledge that India is currently one of the leading countries in the Information and Technology (IT) revolution that began in the 1990s.

Countries like the United Kingdom and France benefited immensely from the Industrial Revolution of the 19th century due to their commitment to science education in their school curriculum. The USA emerged from an agrarian economy into an industrial superpower in the 20th century through the effective application of science education. In all these countries, heavy investment was made on their human resources and factories and their successes were based on

carefully designed scientific plans and strategies. These are lacking in the Nigerian case as it is common with most African states.

A country's innovative capacity, that is, the ability to create and/or apply new knowledge to solve practical problems according to Ekpiwhre (2008) greatly depends on four indices namely

- i. The country's level of technological capability;
- ii. The formal and informal institutions, as well their supporting systems;
- iii. Physical infrastructure; and
- iv. An advanced knowledge infrastructure.

According to Ekpiwhre (2008), Nigeria ranks 71st out of 75 countries in a comprehensive assessment done in 2008 by a Nigerian, Professor Banji Oyelaran-Gyeinka, who leads UN-HABITAT in Nairobi, Kenya, using the aforementioned criteria. Nigeria has a long way to go, as the message makes clear. Surpassing 70 countries, including South Africa, China, Israel, and Malaysia, is no easy task. Nigeria cannot afford to remain stagnant while other countries continue to advance.

This is because countries that have a genuine interest in the advancement of science education have reaped enormous benefits in terms of eradicating most of their superstitions through the application of scientific knowledge (technology) to a successful economic life. This is in addition to supporting such countries in improving their socio-cultural lives through the creation of sophisticated technology that have made their lives much more comfortable in recent years, implying national growth. To put it another way, science education has aided human understanding by allowing people to create and employ tools to tackle real-world problems. For Nigeria to exploit the blessings of science for its developmental agenda, the purveyors are trained human resources in scientific skills who can apply the „knowledge gained in solving practical problems. It is through the growth of such a large scientific and technological manpower base that the needed development of the country can be assured. This is because it is manpower that will ensure the efficient application of a country's enormous natural resources, hence stimulating national development. Herein lies the missing link in relation to Nigeria's development efforts, which are based on science. The reason for this is that science education in Nigerian

schools has deteriorated over time due to poor funding of the entire education sector, resulting in numerous deficiencies such as poorly equipped laboratories, ill-prepared teachers, and the lack of internet access, among others, despite the fact that the government has placed a strong emphasis on science education in the country's school system.

Role of Government in Implementing Science Education

For instance, in view of the positive role of science and its by-product technology in a country's national development effort, successive Nigerian governments have made remarkable efforts to inculcate in the citizenry the culture of science and technology, These efforts according to Ekpo (2007:39) are reflected in the following areas namely

- i. Establishment of Nigerian Colleges of Art and Science
- ii. Establishment of colleges of technology
- iii. Establishment of special science primary and secondary schools
- iv. Establishment of federal/ state technical colleges
- v. Payment of special allowance for science teachers in secondary schools
- vi. Establishment of technical colleges of education; and
- vii. Establishment of universities of science and technology.

While underlining the importance of science and technology for the country's development strategy, the National Policy on Education (FRN: 2004) specifies that "a greater amount of expenditure on... education shall be committed to science and technology." As a result, the National Policy on Education (FRN: 2004) stated that particular arrangements and incentives for science study should be provided at all levels of the national education system. The functions of all agencies concerned in his promotion of science research shall be appropriately funded by government for this objective, and that: Government shall popularize the study of the sciences and the production of adequate number of scientists to inspire and support national development.

To help the Nigerian government realize its goals, the National Policy on Education (FRN: 2004) states firmly that "not less than 60% of spaces shall be assigned to scientific and science-oriented courses in conventional institutions, and not less than 80% in universities of technology?" The purpose of this is to

usher Nigeria into the technological age in order to boost the country's development through the use of its natural resources using information gained from science education.

Challenges of Science Education in Nigeria

Physics, Chemistry, Biology, Agricultural Science, and Mathematics are included in the science component of the Senior Secondary School core topics, according to the National Policy on Education (ERN: 2004). These will allow a student to teach science courses at the university level. Most secondary schools in the country, particularly those in rural regions, do not effectively educate students for the level required of them in the Senior Secondary Certificate Examinations by either the West African Examinations Council (WAEC) or the National Examination Council (NECO) of Nigeria (SSCE). This is because most pupils do not see even the most basic science equipment (beaker), as these are typically borrowed from schools in urban areas solely for external examinations. As a result, most students from rural regions are frequently aided by their teachers in operating these equipments during tests in order to ensure that they pass the practical exam, which is a must for passing the science exams. The suggestion is that such students will only pass if they have a basic understanding of the subject.

Paulley (2009:236), Kpolovie and Obilor (2013:281) had submitted that the Nigerian government budgetary allocation to the education sector from independence in 1960 to time of writing that is 2014 revolves within the range of 0.88% to 17.59% as against the benchmark of 26% proposed by UNESCO to developing countries of the world of which Nigeria is one. It was 0.88% in 1973 being the lowest and 17.59% in 1997 as the highest so far at the national level. At the states level, the trend is similar, For instance, Kogi State which declared a state of emergency on education under the administration of Governor Yahaya Bello allocated only 9.23% of its annual budget to education. As if this was too much, only 3.5% was actually released to the sector that year (Kogi state of Nigeria strategic education sector plan: 2013-2022: November: (2013:37). This is, without a doubt, a significant underfunding situation. Even so, much of the money that came into the sector was spent on recurring expenses like salaries and overheads. The situation in Kogi State is representative of what occurs in practically all of the federation's states. The impact of the above

scenario on the development of science education in Nigerian schools is the lack of enablers such as science equipment, reagents, specimens, chemicals, and laboratories, among others, for effective science teaching and learning in schools, resulting in the production of good future scientists for the country's development.

This is because very few students do apply on their own to be science educators in the country's teacher preparation centres as they are poorly prepared in their primary and secondary schools. For instance in the Niger Delta University Wilberforce Island, Kogi State during the 2011/2012 academic year, none applied on their own to read either Biology, Physics or Chemistry Education. In fact the university had to conscript students, into these areas in view of their positive role in national development. The implications of the above scenario are grave. First of all, both the primary and secondary school system, the supposed beneficiaries of the products of the faculties of education in either the universities or colleges of education are themselves in crises and so are inefficient as they will not have the needed science teachers to implement the science education component of the school curriculum. By and large, the secondary science education component in Nigeria, being the gate way for scientific preparation for national development can be said to be producing a crop of scientifically illiterate citizens who can at best only read and memorize science to pass examination but cannot do science. This is inimical to national development, the reason being that students who have such brilliant certificates under such conditions cannot contribute meaningfully in the national development agenda of the Nigerian state.

The acting, not the reading and memorizing of sciences, is what the Nigerian society requires for its development agenda employing scientific knowledge. The implication of the preceding is that as these underprepared students flood universities for science and technology courses, the upshot is the generation of "scientific historians."

This is the position of Shymansky and Kyle, as reported by Koseman (2000:144), when they opined that the utility of knowledge obtained in school, particularly in the sciences, should be that of application to handle the difficulties facing society rather than that of expressing one's ignorance.

The true manifestation of successful schooling is not how well students perform in school assessments. How citizens think, what they value, how analytical and

critical they can be, how they question and reflect are among the true measures of successful schooling. The most valid measures of the effectiveness of today's school science experience might not be available for 20 or more years.

The Nigerian government in principle attaches so much importance to science and technology in the country's developmental agenda hence the much emphasis on policy statements in these areas. The challenge, however, is that of marching action with intention which is the missing link as shown in this paper. This being the case, what is the way forward?

The Way Forward

Science education is vital to every country's technological growth, including Nigeria's. This means that the quality of science-based education offered to the people will decide the country's level of growth to a considerable extent. We must buy into the vision of science education as a country. The only way out is to devote serious attention to crucial areas that determine the country's innate capability for science and technology-driven growth. This, in our opinion, entails prioritizing science-based education in the educational planning of the country and following through on such plans with meaningful commitments at the implementation level. This is the part followed by the industrialized countries of the world.

In addition to the above, for Nigeria to harness the blessings of science education for its national development as a country, the following are suggested as ways forward.

- i. Proper training of science teachers should be encouraged. This must go beyond the normal classroom teaching with much emphasis on the practicalization of the learnt scientific concepts. This is because it is at this point that the knowledge of science will have a surrender value on the country in its developmental match. What this means is that the government must have the strong political will to provide all that is needed to actualize this which implies adequate funding of the education sector as the engine room of development.
- ii. Such trained teachers should be adequately motivated by way improved conditions of service including payment of science allowances to make them feel committed to the job of service delivery.

- iii. The provision of teaching materials such as equipment, laboratories, textbooks, among other enablers of the effective teaching and learning of science education should be given top priority in the funding of education in the country since science education is the pivot⁴ on which the development of the country is hinged upon.
- iv. iv. Given the importance of science and technology in promoting a state's growth, attention should be made on their development as outlined in the National Policy on Education (2004), particularly with a focus on Vision 2022020. However, it is important to avoid making the mistake of stereotyping children into science or art categories solely on the basis of school authorities' decisions. Instead, learners should be streamed into science-oriented programs based on their natural endowments, as evidenced by accomplishment in open competitive examinations and other assessment systems. This way, the much wastage in the school system may be avoided due to conscription of candidates to the field that learners have little or no aptitude for. It is only by this means that the country can assess the blessings of science and technology for its development.
- v. Greater recognition should be given to the promotion of technical skills among those learning the sciences in the country's educational institutions.
In other words, our educational system must be equipped with the capability to produce personnel with skills for running a knowledge based economy. Such skills must include ICT, team building, communicative skills, that is, ability to transmit what is known to others among others.
- vi. Incentives such as payment of bursary and award of scholarship among others should be provided for people genuinely interested in studying sciences in both the secondary schools as the feeders of the tertiary institutions for the production of the manpower needed for the country's development.

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