

# SCIENCE EDUCATION IN NIGERIA: CHALLENGES AND THE WAY FORWARD

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## **Abstract**

*Scientific literacy is of utmost importance for the development and growth of any nation since the level of scientific literacy directly affects her technological development and self reliance. It is practically impossible for a nation to develop technologically if Science Education is not given the right attention. The products of science have greatly influenced the lives of people and we enjoy them in our homes, hospital, in communication, in transportation to mention but a few. The objectives of Science Education in Nigeria have not been reasonably achieved due to some constraints. These constraints among others include inadequate funding, lack of equipped laboratory; lack of motivation for science teachers among others. This paper therefore discusses measures for achieving effective science teaching. The researcher recommended among others that science teachers should be giving financial support to enable them improve and acquire higher knowledge in science, also government should provide well equipped science teaching and research infrastructures.*

**Keywords:** Science Education; Scientific Literacy, Technological Development.

The impact of science on the overall development of any nation is generally acknowledged. The level of scientific literacy of the populace of any nation directly effects her technological development and self reliance. It is practically impossible for a nation to develop technologically if Science Education is not given the right

attention. The implication according to Iwuzor (2000) is that the technological progress of any country is predicted on a sound Science Education. To this extent, a country's development, be it economic, social or political can be taken as a function of the advances she is able to record in science and technology. A Nation with a scientifically uneducated citizenry cannot be expected to make reasonable socio-economic and political decisions. A solid background in science is very critical if Nigeria should attain require technological height.

According to National Policy on Education (2014:22), the goals of Science Education should be to:

*Cultivate inquiring, knowing and rational mind for the conduct of a good life and democracy, produce scientists for national development, service studies in technology and the cause of technological development and, provide knowledge and understanding of the complexity of the physical words, the forms and the conduct of life.*

Thus any country that overlooks science does so at its peril as current development in science and technology have so greatly affected the lives of every human being such that to be ignorant of the basic knowledge of these developments is to live an empty, meaningless and probably unrealistic life. Science was first introduced in Nigerian schools in 1859 and from that time to the present time, emphasis has shifted from science as a mere subject in the school curriculum to its use as the vehicle towards national economic development, (Akpan, 2012). It is to this effect that we need to educate all young people to be scientifically literate citizens.

Eze and Oluba (2010) postulated five main objectives of teaching science to the youths which include training the youths;

*To be able to observe, measure, record, collect, analyze data, hypothesize and predict data and events in an accurate and honest manner, these are the scientific skills necessary for further work in science later in life, to acquire the ethics of science which include honesty, skepticism, perseverance, objectivity, rationality etc, to give the youths sufficient doses of scientific literacy capable of preparing them for some worthwhile vocations in the fields of science and technology, to groom a preponderant number of youths for future adult roles by equipping them with skills and competence to identify societal issues and problems and possible resolutions of such socio-scientific and technological*

*problem, to produce a scientifically literate populace, some of whom will be professional scientists and technologists while others will be well informed, attentive citizens whose daily activities are guided by the products, ethics and processes they have acquired.*

### **Importance of Science to Development of Nigeria**

Before the coming of science, answers to problems were done through guess work. Many events were explained only by guess work in terms of superstitions and magic. Science has challenged this kind of thinking. With science these beliefs can be investigated, proved and disproved and hence conclusions are based on observed facts.

According to Ugwu and Eze (2005), science plays profound roles in the life of the society. It has helped and is still helping in a number of ways which include:

1. **Agriculture:**

Scientific effort has resulted to increased food production, mechanization of operations from land clearing to planting, weeding and harvesting. Science has brought about the discovery of manures and fertilizers for the enrichment of the soil for continuous cropping in areas of scarce Agricultural land. It has led to invention of chemicals and drugs used in the prevention and control of diseases and pests affecting crops and livestock.

2. **Health and Medicine**

Man's scientific know how has brought great improvement in medicine, nutrition and overall health care. Diseases and ailments such as malaria, diarrhea, dysentery, poliomyelitis, whooping cough, leprosy, venereal diseases etc can now be prevented and controlled through the use of new and effective drugs. Thus, it is now possible for people to enjoy longer and healthier lives.

3. **Transportation:**

Through the knowledge of science and technology, man has been able to make improvements in the area of transportations. He has been able to evolve modern land, rails, sea and air transportation systems and these have helped him immensely to interact with various international communities and his immediate environment.

4. **Communication:**

In the olden days and primitive societies, man communicate by means of town criers, smoke signal, messengers, wooden gongs, drums, sign etc. Today means of communication are made through the use of waves, electricity and mechanized

equipment. Means of modern communication include internet, radio, television, telephone, newspapers etc and these make communication easier, faster and more efficient.

5. **Comfort**

The diligent application in science has enabled man to overcome certain climatic problems. For example, in the tropics, air conditioners are installed in homes, offices and hospitals to cool the air and thus provide comfort to man. In cold regions of the world, homes, offices etc are provided with heaters to regulate environmental temperature.

6. **Entertainment and Welfare:**

In times of past, man went to cinema houses when he wants to relax and watch films of various kinds. These films are product of science. With the aid of televisions we are able to watch football matches and others sports taking place in faraway lands. With recent invention of the digital satellite dish, one can sit comfortably in his palour and watch life relay of events in different parts of the world and home videos.

7. **Homes:** Scientific products are extensively used in our homes. Varieties of zinc and brick materials are now used in building houses, electricity, clean water, textile materials and shoes, electric gas, electric appliances etc are all innovation as a result of knowledge of application of science.

**Challenges Facing Science Education in Nigeria**

The objectives of science education in Nigeria have not been reasonably achieved due to some constraints. These constraints according to Sjoberg (2001) include:

1. **Inadequate Funding:**

Funding science programmes and science related research has been a major problem facing technological growth and self reliance in Nigeria. Government do not adequately fund science and science related programmes and research. In addition to this, the little fund provided relapse and are embezzled by top officials incharge of its implementation.

2. **Interference of Imported Technology:**

Although majority of Nigerians are enjoying the products of scientific technology such as cars, aeroplanes, computer, television etc, almost all of them are imported from developed countries. There is yet functional indigenou technology, those that manage to spring up are seriously lacking local materials and thus cannot function under this condition.

**3. Lack of Laboratory Facilities:**

Majority of Nigerian schools lack laboratory spaces, those who have spaces lack equipments and necessary infrastructure for proper teaching and learning of science. Science therefore is not miracle where something happen out of nothing.

**4. Women Underrepresentation in Science Education:**

The issue of low representation of women and girls in science has been of great concern for more than two decades. Okeke (2000) stressed that mere observation of number is enough to show that in Nigeria, women are grossly underrepresented in scientific and technological fields. The National Policy on Education has its philosophy based on three issues, one of which is the provision of equal access to educational opportunities for all citizens of the country (NPE, 2014). This means all Nigerian citizens are to be exposed to Education irrespective of gender. Some of the factors militating against female participation in science and technology education in Nigeria include:

- Socialization process by which young people learn to adopt the socially approved norms, values, attitudes in the society through adults. In Nigeria culture, female children are reared differently from males. While girls are protected and discouraged from explorative and risky activities, boys are encouraged to be assertive and challenge their mental powers. This socialization leads to certain personality characteristics regarded as masculine or feminine. These personality characteristics affect the attitude of girls towards science and technology Education as they believe they are inferior to boys physically and mentally.

- Teacher Behaviour/Attitude: Attitude and teaching approach of some teachers negatively influence the attitude of female students towards science Education. Njoku and Okeke (2003), in their study of the view of teachers about the importance of science to boys and girls, found that teachers expressed the opinion that Science Education was of greater importance to boys and girls, some teachers openly discourage female from offering science subjects like physics, chemistry etc in schools, convincing them that the subjects are difficult and unnecessary for them. Such negative attitude militates against girls' entry into Science Education.

- Inappropriate Guidance and Counselling Services: Guidance counselors have the civic responsibility of directing students to choose subjects or careers in areas in which they are naturally talented. This enormous responsibility, has been discovered to be carried out with gender bias. School counsellors overtly or covertly scare girls from science by regarding them as masculine, convincing them that those subjects are difficult for girls and meant for boys (Okeke, 2000). Such misinformation seriously militates against female participation in science and technology education.

- Sex Roles Expectations: The sex of a child to a large extent determines the choice of career in many cultures, especially in Nigeria. Before the advent of western education in Nigeria, traditional education existed where the boys received training

from their father in farming, blacksmithing and other masculine activities, while girls stayed at home to prepare food, washed utensils and took care of the little children. Similarly, today in schools boys are encouraged to do the brain storming mathematics, physics and chemistry, which could lead them to be great scientists doctors, engineer etc. While girls are encourage to offer Biology and Home Economics that could enable them become successful house wives. In order words girls are being prepared for marriage, childbearing and caring which supports the saying that “women education ends in the kitchen.”

5. **Science: Difficult and “untrendy”?**

Science knowledge is by nature abstract and theoretical. It is often developed through controlled experiments in artificial and “unnatural” and idealized laboratory settings. Learning science often requires hardwork and intellectual efforts. Concentration and hard work is not part of present youth culture. In a world where so many “channels” compete about the attention of young people, such subject become untrendy.

6. **Outdated Curriculum:**

Many studies show that students perceive school science as lacking relevance. It is often described as dull, authoritarian, abstract and theoretical. The curriculum is often overcrowded with unfamiliar concepts and law. The curriculum is intensive with insufficient time allocation for Science Education. It leaves little room for enjoyment, curiosity and searching for meaning. It often lacks a cultural, social and historical dimension and it seldom treats the contemporary issues.

7. **Lack of Qualified Teachers:**

There is inadequate teacher compensation and professional development to attract, prepare and retain high quality and qualified teachers.

8. Insufficient number of science and technology teachers taking active role in the preparation of the programmes.

9. Insufficient inservice training of the science teachers in the transition state of a new programme.

10. **Poor Teaching Methods:** Science is taught with lecture method of teaching. The teacher is the main repository of knowledge and does most of the talking. The students remain as recipients, listening and taking down notes. Students do not participate in the development of the lesson. Consequently, the desired learning outcomes may not be accomplished.

**11. Lack of Motivation for Science Teachers:**

Teachers are the pivot on which educational process hang. They can influence the teaching/learning outcomes either positively or negatively because they determine the quality of instructional delivery and also influence the quality of Education when it comes to implementation of the curriculum and educational policies. Teachers are to be considered when addressing issues such as quality assurance, qualitative delivery (teaching), quality context and quality learning outcomes (Onucha, 2002). Study carried out by Ezechi (2016) showed that science teachers in Nigeria are not motivated. Science teachers are faced with poor condition of service, their salaries are not paid regularly, they are not given opportunities for developmental programmes and were not granted funds for creativity. All these have affected teachers performance in contributing towards learning.

**How to Revitalize Science Education in Nigeria (The Way Forward)**

The future development of a country are functions of its science and technological knowledge. Scientific and technological development presents tremendous opportunities for economic growth, poverty reduction and human development. The realization of the above development and growth depend on the quality and quantity of science and technology and education received by youths who are the future leaders of the nation. It became imperative to revitalize Science Education in Nigeria. Certain measures should be adopted which include:

**(1) Motivation of science teachers**

Teachers have important role to play to adequately prepare the young for their roles in the society in order to achieve the national objectives. Teachers influence is felt in every aspect of the society. All other professionals and workers within the society have at one time or the other passed through the tutelage of a teacher and thus whatever they now become is a direct outcome of what teachers have passed onto them. The saying that no nation ever rises above the quality of its teacher illustrates the pivotal position which teachers occupy in the society. Without teachers in the school system, there will definitely be no learning. This is why they should be motivated properly for effectiveness and efficiency in the educational system. If teachers are to perform at their optimal, they must be adequately motivated to boost their moral. To Ihebereme (2006), high moral among teachers correlates with high productivity and high achievement. Strategies that will enhance science teachers' motivation according to Fredrikson include staff development and training, participatory decision making, good working conditions, remuneration and salaries, promotion as at when due, recognition of teachers profession (professionalism), conducive working environment, provision of adequate teaching aids, financial rewards, teachers scholarship, sponsorship of both local and international seminars, conferences and workshops.

(2) **Improvisation**

Since the state of national economy has made it almost impossible for the provision of the real science equipment and other structural facilities necessary for effective science teaching, massive improvisation of science equipment should be embarked upon making use of local and cheaper materials. This should involve the science teachers and their students as well as the government. In this way, many of the basic and necessary science equipment that will make science teaching lively, interesting and meaningful can be improvised. Examples of such items are: imported reagent bottles could be substituted with clear or non coloured bottles like those of soft drinks with names of the reagents written and labeled on such bottles, the usual gas fittings and supply could be replaced with ordinary kerosene stove, retort stands could be made from pieces of iron and rods locally, the expensive glass funnels can be replaced with locally made plastic funnels etc.

(3) **Making science teaching cost effective:**

With the little resources available, certain science lesson could be used to generate more funds for the school. For instance, soap production during a practical chemistry class could eventually lead to soap production in the school on commercial quantities. This would be sold to the public thereby generating more funds for the school. Fund so generated could be re-ploughed into the system to enhance better science teaching by using the money to buy science equipments, reagents etc lacking in the school that will enhance better science teaching.

(4) **Foreign assistance**

Governments and schools should seek assistance through appropriate international bodies such as United Nations International Children's Emergency Fund (UNICEF) and United Nations Education Scientific and Cultural Organization (UNESCO). The assistance could come in form of science equipments, money, science textbooks etc, all of which will contribute towards achieving effective science teaching in the face of recessed economy.

(5) Effective teaching and learning of science requires adequate resources such as classrooms, laboratories, textbooks, charts models and consumables like chemicals and reagents for the teachers to engage students in practical and activity work, the stakeholders in Science Education should provide enough fund to build more classrooms, laboratories and provide equipments and resources for the teaching and learning of science. Libraries should be provided with modern quality science textbooks for teachers and students.



**(6) The need to encourage participation of women in science and technology Education in Nigeria**

Recently, Nations the world over recognized that no meaningful development would take place without the utilization of the potentials of the women folk. Science teachers should re-examine their teaching approaches. The guided enquiry method of teaching which requires students' active involvement should be employed. This will not only help to bring abstract concepts in science to observational level of students, but disprove the belief by females that science is very difficult and meant for boys. Teachers should avoid criticisms which could effect girls self-image or perceptions of their capabilities to learn science. Women Associations like Nigeria Association of Women Scientists (NANS), Nigeria Association of Women in Science, Technology and Mathematics (NAW STEM) etc can promote female access to Science and Technology Education through organizing conferences and seminars about gender issues in the practice of science and technology Education, organizing career talks to feature different women in science and technology Education. Government should also assist in formulating policies that will increase females' enrolment in science, give scholarships to women and girls who demonstrate capability in science and technology Education etc.

**(7) Co-curricular programmes**

Learning experiences for science students need not necessary end in the classroom or laboratory. Such opportunities need to be supplemented by learning opportunities and experiences outside the classroom such as field trip. Formation of well organized and properly co-ordinated science clubs should also be encouraged in schools. On the platform of such clubs, the students could be taken to science-based establishments or higher institutions of learning that are better equipped than their present school, where they can acquire practical experiences that are not available in their school. Resource persons could also be invited from outside the school to come and broaden their knowledge and also motivate them in science.

**Conclusion**

Every nation strives to acquire scientific and technological skills for her citizens so as to develop faster on the technological super highway. Development in science and technology begins with Education of the people in Science Education. The dwindling national economy has affected the education system adversely especially in the area of science teaching. The required facilities are either completely not available or grossly inadequate in schools. However, due to the importance of Science Education in the upliftment of the national Economy, adequate measures should be taken to enhance effective science teaching in Nigerian schools. Some of these have been highlighted in this paper and it is hoped that if they are

implemented, the acquisition of the desired scientific knowledge, ideas, skills etc by the populace would be enhanced.

### **Recommendations**

The following recommendations were made:

1. Government should encourage the Science Teachers Association of Nigeria (STAN) in organizing seminars, workshops and conferences for serving science teachers. This can be done by providing subventions to STAN enabling the association enrich its seminars and workshops.
2. There is need to provide more and well equipped science teaching and research infrastructures like computers, office space, classroom space and laboratories. Stakeholders in Education should join force with government to equip science laboratories in the nation to international standard.
3. Science teachers should be given financial support to enable them improve and acquire higher knowledge in science by sponsoring them to further studies.
4. Science teachers should be paid enhanced salary to take care of their socio economic needs. The salary should be regular. They should also be paid approved science allowance
5. Science clubs and societies should be on ground to ensure scientific literacy and the actual transfer of such knowledge to real life situations.
6. Government should give scholarship to women and girls who demonstrate capability in Science and Technology Education and also recognize and publish the contribution of women scientists and technologists.

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