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Challenges Facing the Development of Science Education in Nigeria and the Way Forward: A Review

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Abstract

The fact that science education is the hallmark and an integral part of modern and progressive societies is not in doubt. However, the situation in many developing countries (Nigeria inclusive) is nothing to write home about. The challenges facing science education are quite enormous: corruption, inadequate services (electricity, water, gas etc.) lack of internet facilities, incompetent teachers, lack of basic teaching-learning resources and a host of others. The paper discusses some of these factors as they affect the development of science education in Nigeria. Possible solutions to the problems were preferred.

Keywords: Science, Education, Science Education, Development, Problems.

Introduction

We are living in a world where the impact of science education cannot be denied, and any country that neglects the contributions of science education, does so at its own peril, because science education is the bedrock upon which any nation can be built (Onah, 2003). This implies that no country can be recognized globally without talking about its scientific advancement. According to Pember and Humbe, (2009) science is a process of teaching or training especially in school to improve one's knowledge about the environment and to develop

one's skill of systematic inquiry as well as natural attitudinal characteristics. Science education involves the study of science in depth and in addition educational knowledge and concepts are learned and verified. It also equips teachers, learners and the society with knowledge, skills, equipment and freedom to perform noble task useful for improving socio-economic standard. In addition science education courses are designed to produce capable scientists who contribute meaningfully to academic excellence of the society to raise the economic level of nations (Obianuju Angela and Francis 2013).

Science education has brought about improvements in many aspects of human endeavor such as improved health conditions, increased capacity to produce food in order to feed the increasing population, living in comfortable conditions, improved means of communication and transportation as a result of the advent of information communication technology (ICT). In fact the benefits are too numerous to list all in this short presentation. However, despite the numerous importance of science education, it has not been able to move the country to the required level of industrialization and upliftment above poverty level (Obianuju, Angela and Francis, 2013). In realization of the fact that science education is the foundation of technological development the Federal Government recommended that 60% of students going into tertiary institutions be in science and science related disciplines (FRN, 2004).

Concept of Science Education

Science education have been viewed and defined differently by science education authors. According to Ekanem and Obodom (2014) it is the study of the inter-relationship between science as a discipline and the application of educational principles to its understanding, teaching and learning. It has been described as the mother of all sciences. It deals with showing of science content and process with individuals who are not considered traditionally to be members of the scientific community-students, farmers, market women or a whole community (Aina 2013; Njoku & Edori 2022). While Makwerere, (2022) viewed science education as the teaching and learning of science to school children, college students or adults within the general public. The field of science education includes work in science content, science process and some pedogody/methods. Science education include many topics such as learning and education policy, organization and leadership. According to

Omosewo (2009) science education is very important to the development of any nation. Indeed, science education contributes to the growth of national economy by improving the knowledge skills and productive capacity of its citizens. This can be seen from standard of living of people in the industrialized countries of the world. In a nutshell, science education can be seen as the integration of educational principles and practices to the teaching and learning of science, which impacts on a nations education and economic systems.

Impact of Science Education in Nigeria

The impact of science education permeates every aspect of human endeavor. This is evident from the materials we use in daily life. Some of the areas where science education has impacted our existence are discussed below;

1. Agricultural sector

The application of the knowledge of science education has led to the production of fertilizers, herbicides, fungicides, fumigants, rodenticides to control parasites, fungus bacteria insects mites virus, rodents, birds, rabbits and weeds that destroy farm crops thereby reducing crop yield considerably. The use of these products has greatly improved the quality, lifespan and yield of farm products. There has also been the development of drought resistant crops and biologically modified crops and hybrid animals too. The combine effect of these development has resulted to increased food production and consequently assisted in the fight against food insecurity, hunger and poverty.

2. Medicine and Health

Knowledge of science education has played a major role in the production of drugs, vaccines and other medical devices which have greatly improved the quality of life. Indeed science education have been used in the production of many kinds of medical devices and equipment such as catheter, hospital bedding, blood and intravenous bags and tubings, syringes, surgical instruments and many more. Science has formalized the consumption of various nutrients such as proteins, carbohydrates, vitamins, fats, mineral in required amounts for a person to remain healthy. Science has also developed preventive measures to combat diseases such as malaria, tuberculosis and hepatitis B. Various diagnostic techniques have been developed e.g MRI, ECG, X-rays, sonlography etc. Use of antibiotics has freed man from several diseases such as

syphilis tuberculosis leprosy, white cancer and tumour are now treated using drugs and radiotherapy.

3. Education and Industry

Graduates of science courses work in diverse areas such as industry (as Research and Development Scientists), technologists, teachers (Primary, Secondary and Tertiary institutions). Scientists work in laboratories, regional councils and private research organizations. Increasing number of scientists are also employed in advisory roles, marketing sales, management or in government departments in key decision-making positions. Furthermore areas of study such as ICT, engineering, medicine, pharmacy, agriculture architecture, astronomy and so on will not be possible without the work of science teachers to teach students the care science subjects (physics, chemistry, biology) needed for these courses.

4. Creation of Employment Opportunities

Many graduates of science nowadays are self employed where they offer job opportunities to job seekers. For instance;

i). A graduate of physics education that have some knowledge of electronics, with little training as apprentice can stand alone as electronic technician.

ii). Many graduates of biology education are self employed and employers of labour. Some own private schools where they employ others as teachers, while others earn their living by establishing fish businesses.

iii). Chemistry graduates are taught how to make pomade, detergents, soap, liquid soap, liquid fertilizers etc. These graduates can establish their own small scale industries where they can become employers of labour.

5. Building and construction Industry

Knowledge of science education particularly chemical knowledge has led to the production of high tensile strength and corrosion resistant metals (steal) that extensively used in the building and construction industries. Also, advanced fast setting cements have been developed. Use of plastic building and construction materials; high-performance building insulation sealants and wraps are now used for saving energy in homes, offices and factories which lowers green house gases that cause of global warming.

6. Renewable Energy

Due to global warming and related changes in weather patterns as a result of burning of fossil fuels, science has sought and developed clean energy sources in order to

address the effects of burning fossil fuels. Some of these devices include wind power, solar power (man-made photovoltaic cells), geothermal energy, hydroelectric power, fuel cell, biomass and so on. It envisaged that in few decades coming, these new energy technologies will replace fossil fuel based automobiles.

7. Information and Communication Technology (ICT)

Development of computers and internet facilities has greatly help humankind in numerous ways: Personal communication technology today is becoming far advanced than in the 90's where smart devices provide immediate internet access, photo and video editing, live streaming television, music, books and fitness trackers among several other benefits. In the education sector, access to academic and research information have been made easy through the development of diverse search engines and other internet facilities such as e-books, e-library etc. In the business and banking sector, e-commerce and digital banking are now the order of the day. Artificial intelligence is currently employed in many manufacturing industries (robots), hotel business and the military (drones, laser beams). The use of artificial intelligence has found application in the agricultural sector too where automation is used in poultry, fish farming etc. Furthermore, drones are being used to apply fertilizers and spray farm crops.

8. Transportation Sector

The invention of the automobile industry and airplanes (fast plane and supersonic jets) have drastically reduced travel time around the globe. Outer space is now being explored like never before as a result of the development of space crafts and space shuttles. The use of unmanned satellite technology has greatly increased the understanding, prediction and accurate forecast of weather patterns and related environmental issues such as rainfall, draught, landslides, floods etc.

Indeed, areas where science has impacted human civilization are too numerous to be exhausted. Science is the basis of many devices that impact human life such as food, clothing and shelter, in short, it has gone deep in the veins of modern society. All our daily routine is controlled by science and its products. In food production, insecticides, pesticides, preservation industry and ingredients of balanced diet are influenced by scientific knowledge. Science education has also been used as an instrument of societal change, economic prosperity, reducing illiteracy, dispelling superstition and misconceptions. Through the application of science people have been able to develop knowledge and skills needed to participate effectively in community life as workers,

teachers, citizens, parents, leaders and role models, where they provide solutions to societal problems.

Challenges Facing the Development of Science Education in Nigeria

- Paucity of learning resources and poor funding: With the exception of few breakable equipment/apparatus that are fabricated in Nigeria, almost all science equipment, apparatus and reagents are imported from other countries of the world. However, science equipment are generally expensive, which calls for massive injection of money into the sector. Due to mono-economic nature of Nigeria's economy (dependence on oil), coupled with high exchange rate, there has been continuous insufficiency of science equipment and apparatus in our schools. This has greatly affected the development of science education and science generally in the country. Science equipment are not being supplied due to the dire economic situation of the country. As a result of corruption and incessant oil theft, bunkering and smuggling of petroleum products, the country is unable to provide the necessary materials for effective sciencing.

  For the country to make meaningful advancement in science, education and Technology, proper funding is necessary. Nwangu (2014) asserts that workshops, laboratories, and libraries are ill-equipped. In the same vein Danjuma and Ikpe (2019) and Obianuju, Angela and Framers(2013) concluded that lack of funding by the government makes the provision of necessary facilities/infrastructure, as a result of which the teaching and learning environment become unfriendly to both teachers and students, which translates directly to Nigeria's low standard of science and technological output. Despite the fact that government have been earmarking huge budgetary allocation at all levels, financial allocations in real terms have been grossly inadequate. In fact, Nigeria governments over the years have not been able to meet the UNESCO recommendation of allocating 26% of annual budget or 5% of the gross domestic product (GDP) to the education sector. This has had huge negative implications on effective management of education as a whole and science education in the country (Aja-Okorie, 2015). The fact that the education sector in Nigeria has not been properly funded in line with international standards culminating into problems such as shortage of qualified

teachers, dearth of infrastructures, inadequate laboratory for teaching and research and poor teaching methodology.

- Insecurity: The issue of insecurity in Nigeria is not a new phenomenon, where it has taken a great toll on the education, economic, social, psychological life and development of the country. Banditry kidnapping and armed robbery has turned Nigeria into a mere shadow of its past. Of recent there has been attack on some university in the northern part of the country, where staff (academic and non-academic) and students were gruesomely murdered in cold blood including a professor of chemistry and also the kidnapping of hundreds of female students from state and federal government schools in the north. This has negatively affected science education and education in general. Parents and guidance no longer consider the school environment safe for their children and wards. As a result there will be a drastic drop in the number of students enrolment into institutions of learning. One sad effect of insecurity is the fact that science infrastructure/facilities built with huge amounts of money for schools had been destroyed, while gas installations vandalized, the consequential effects of all these is on education (Aina, 2009).
- Lack of Qualified and Competent Science Teachers.

  The quality of education in general and science education in particular in any nation largely depends on the quality of her teachers. However, qualified and competent science teachers are grossly inadequate in Nigeria. When they are available, they are not enough especially in rural areas where the teacher-student ratio is 1:150 Thus making it impossible to properly teach science subjects particularly practicals. Due to the shortage of science teachers, some teachers that are not qualified to teach science do teach the subject. There are two categories of science teachers: Those who have the competence but lack the methodology and those who have both the content and methodology. It is the later that are limited in number (Babajide, 2015; Ekanem & Obodom, 2014). Another problem is those that are qualified, lack the ability to upgrade their certificates and attend in-service training, workshops, conferences and seminars, where their intellect would be broaden.
- Poor Laboratories and Insufficient Exposure of Students to Laboratory Activities

The laboratory is where the students learn science under the guidance of the teacher or laboratory technician. The emphasis is on students learning by doing which will create the required intellectual development, manipulation of tools/apparatus and acquisition of practical skills. However according to Babajide (2015), the teaching of science require adequate laboratory equipment for practical activities and demonstrations, but unfortunately the laboratories are not adequately available. Generally students exposed to laboratory work show more favourable disposition towards the study of science. On the other hand unavailable or poor laboratory is a strong militating factor against the meaningful teaching and learning of science.

Having a functional laboratory is desirable but exposing students to laboratory activities is another. According to Babajide (2015), science students have not been successfully exposed to laboratory activities probably because of lack of adequate laboratory equipment or due to other factors. It is therefore essential that students are adequately exposed to laboratory activities in order to provide the learners with opportunities to use scientific equipment so as to develop basic manipulative skills and practices of inquiry activities which in turn help develop problem solving skills/attitudes needed for future work in science.

- Corruption

  According to Hornby (2010) corruption is dishonest or illegal behavior especially of people in authority. The fact that corruption has eaten deep into the nation's system is not in doubt and is manifest in every sector of the society including education (Aina 2009). Corrupt practices is now very rampant, for instance recruitment of teachers, admission, purchase of science equipment and re-training and teacher training are no longer done on merit, but depends on connections/favourism or how much one can afford to pay. The same applies to issue of scholarship and bursary award for students are not judiciously and duly disbursed to deserving students due to ethnicity and unnecessary bureaucratic bottle necks.

- Student's Psychological Disposition and Lack of Interest

  Most students in the lower levels of education in Nigeria (particularly secondary schools) do not display positive disposition towards the pure sciences as a result of misconceptions about the nature of science and the perception that science subjects are abstract and difficult, hence they prefer to

study art and social science subjects(Ekanem & Obodom 2014). This lack of interest is crucial to the study of science because success in science depends on how mentally prepared the mind is particularly at the point of students choice of career path. It is therefore pertinent for science teachers to present scientific facts and concepts to students in a friendly manner with some degree of humour rather than a rigid dogmatic discourse.

- Poor Administrative Policies

  What successive governments in Nigeria have been doing to the education sector since independence can at best be described ass mockery. This has resulted in the stunted growth of the country both scientifically and technologically in comparison to our counterparts such as Malaysia, Idonesia, Brazil, just to mention but a few. The problem can be attributed to lack of stable political system and non-continuation of policies and programmes of past administrations. According to Aina (2013) the few years of civilian rule has been years of lack of focus; government education programme change according to the taste of the political party in power. Many science equipment and infractures are lying in waste in our schools as a result of instability in the political system.

The Way Forward

In view of the importance of science education and the numerous factors militating against its development in Nigeria, the following are suggested as a way forward for science education:

1. Infrastructural facilities such as laboratories, workshops, water supply, electricity and internet services should be provided education.
2. There should be consistency and continuity of government policies with respect to science and technology.
3. Teaching of science should be activity based where students can explore the teaching-learning materials in order to develop problem solving and critical thinking skills. This will raise students' interest in learning science.
4. Government can make remarkable improvement towards the development of science education through:
   - Enactment of sound and enduring science education policies.

- Provision of qualified and competent science teachers (in content and method)
- Establishment and empowering inspectorate units in both local, state and federal levels of education to ensure proper implementation of education policies

5. The school authority being an important organ of education, should be concern with issues such as:
   - Provision of conducive learning environment.
   - Prudent use of funds meant for laboratories and library.
   - Encourage professional growth of teachers by sponsoring them to seminar workshops and conferences in order to become conversant with innovations in science and also sponsorship for postgraduate studies.
6. Government can boost the morale of teachers in order to achieve effective sciencing by provision of incentives in form of prompt:
   - Promotions, payment of salaries, provision and improvement of basic science allowance and in-service training and re-training.
7. Non-Governmental Organizations (NGOs), alumni associations and other critical stakeholders should also be involved in the development of science education through the establishment of outfits such as education trust fund, endowment foundations, giving of study grants, bursaries and scholarships to science students.

Conclusion

Science education literacy is very critical to the development of any nation particularly developing countries where technological advancements are built on. However, several factors are militating against the development of science education in Nigeria. Some of these factors include insecurity and corruption, unstable policies, poor funding, dearth of infrastructure, teachers factor (attitude, content and method). It is suggestive that most of these problems can be surmounted through concerted fight against corruption, stable governmental policies/programs, diversification of the economy to the agricultural sector, provision of conducive learning environment and enhancement of the welfare of science teachers.

References

Aina, J.K. (2013). Importance of science Education to National Development and Problems Militating Against its Development American *Journal of Educational Research* 1 (7) 225.229

Aina, J.K. (2009). Challenges and Prospects of Science Education in Nigeria. Continental Journal of education, 5(2), 32-37

Aja-Okorie, U. (2015). Under-Funding Education in Nigeria: Implications for Effective Management of Tertiary Institutions for Manpower Development and social transformation, *Journal of Teacher perspectives*, 9(2) 267-276.

Babajide, V. F. T. (2015). Science Education in Nigeria: The Journey so far, *International Journal of Innovative Research in Education, Technology and Social Strategies* 1(1), 50-69.

Danjuma, S.G. and Ikpe, A. (2019). Science Education and Sustainable Development in Nigeria: An Analytic Approach. JOSR. *Journal of Humanities and Social Science*, 24(6), 29-34.

Ekanem, N.U. and Obodom, M. I. (2014). Education for All: Problems and Prospects of Science Education in Nigerian School, *Journal of Resourcefulness and Distinction*, 8(1), 1-4.

Federal Republic of Nigeria (2004). National policy of Education 4th Edition, Lagos: NERDC Press.

Hornby, A.S. (2010). Oxford Advanced Learner's Dictionary of current English, Eight Edition, Oxford University Press.

Makwerere, D. (2023). A short Note on Science Education and its Importance. Research and Reviews: *Journal of Social Sciences*, 9(3): 1-3.

Njoku, M.I.A and Edori, J. U. (2022). Science and Technology Education in Primary and Secondary Schools: Problems and Prospects. *Journal of Mathematics and Science Education*, 3(3), 19-25.

Nwangu. R. (2014). Teachers for Technology: Basic Principles of School Technology Report. PATT 3 Conference, 2, 487-493.

Obianuju, O.S. Angela, O.N. and Francis E.A. (2013). Science Education for Sustainable Development in Nigeria: Challenges and Prospects, Academic Journal of Interdisciplinary Studies, 2(6), 159-169.

Onah, A. O. (2013). Science Education and Poverty Eradication in Nigeria, Eha-AMUFU School of Education Journal, 3(1).

Omosewo, E.O. (2009). Views of Physics Teachers on the need to Train and Retrain Physic Teachers in Nigeria, African Research Review, 3(1), 314-325.

Pember, S.T. and Humbe, T. T. (2009). Science Education and National Development. Paper presented at the ASSUTIBS Maiden National Conference at C.O.E Katsina-Ala, 6th , 9th October.