

**SCIENTIFIC AND TECHNOLOGICAL LITERACY FOR SUSTAINABLE
DEVELOPMENT IN NIGERIA**

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Abstract

This paper examines scientific and technological literacy for sustainable development in Nigeria. The paper discussed what scientific and technological literacy for sustainable development is all about considering the view of science and technology educators. The paper discussed campaign for sustainable development. The paper also discussed scientific and technological literacy as an indispensable platform for life long education for sustainable development and Re-engineering science and technological education for quality service delivery in Nigeria is been discussed and appropriate suggestions are being advanced to ease the way to scientific and technological literacy for sustainable development in Nigeria.

Keywords: *scientific, technological literacy, sustainable development and Nigeria*

Introduction

Scientific and technological development and self-reliant of Nigeria or any nation develop or under-developed largely depends on the scientific and technological literacy of the people of that Nation. Scientific and technological literacy has been the main cause of development of developed countries and some developing countries in the recent times.

Nigeria is in danger if a considerable percentage of her citizens are not scientifically and technologically literates who are unable to understand or make informed decision about the evolving high scientific and technological culture. It is worthy to note that, in the advent of any disease outbreak like the Corona Virus (COVID 19) that is currently spreading, killing people, threatening Nations Economies and disrupting every activities around the entire globe or continents, it is highly skilled trained and qualified scientists and technologist from developed and underdeveloped countries that are researching in medical field who are fervently struggling to produce drugs, vaccines and medical equipment such as ventilators among others to stamped out COVID 19 pandemic. Nigeria can now respond by exigency funding scientific and technological research. It is very interesting to observe that, all of us in the technological sector should see the need to respond to issues hampering scientific and technological literacy for sustainable national development.

It is important to make changes in the decade ahead in science and technology educational sub-sectors. The science and technology need re-engineering or re-direction or retraining for the teacher's yearly re-evaluation of courses, areas of study and alertness in all directions. Ogunlade (1992) stated that, the history of the development of science and technology over the ages has been very closely related to the development of man himself. There is therefore, a mutual relationship between man science and technology one cannot live without the other. Stashak (2001) was of the view that, by being scientifically and technologically literate students will be able to contribute to the advancement of science and technology, be better able to assess current and future science and technology be better able to control science and technology and be better able to adapt to their changing world. All of this adds up to the intelligent use of science and technology for all humans now and in the future in developed and developing countries.

Scientific and technological literacy would go a long way in ensuring that, curricula and learning programmes developed in science and technology are more practical than theoretical and are directly related as much as possible to labour needs. Science and technology teachers/educators must be encouraged to see the need for the industrial attachment and to take interest in professional activities. Ozoro (1985). Very succinctly put it that, the most outstanding factor working against science and technology is the prospects which literary education offered to those who acquired it from the earliest times of its introduction to the country.

According to Snyder and Hales (2001) scientific and technology literacy is considered as the knowledge and study of human endeavours in creating and using tools, techniques resources and systems to manage the man-made and natural environment for the purpose of extending human potential and the relationship of those individuals, society and the civilization process. Similarly, Keller (2010) defined scientific and technological literacy as the ability to read international and write however, these days it's been extended to mean knowledge or competence in a particular area. Also the International Technology Education Association (ITEA) (2000) define scientific and technological literacy as the study which provides an opportunity for to learn about the processes and knowledge related to science and technology that are needed to solve problems and extend human potential and the ability to use, manage, accesses and understand science and technology. Furthermore, Kurt (2001) said scientific and technological literacy connects academic learning with real-life experience which can help students gain a deep understanding of course content. Science and technology content are vehicles for addressing social concerned, students to beyond just studying about scientific and technological processes and gain a deeper understanding of science and technology as it related to everyday life.

According to Onyeaghalaji (2009) science is a body of knowledge, method or process of acquiring knowledge. Science is both a process and a product of empirical investigation and research. Scientific knowledge allows for the development of new technologies. Technology on the other hand is aims at translating ideas, theories and plans into concrete products and processes and the production of things, devices and materials and technology is characterized by innovative spirit. Onyeaghalaji maintained further that, in spite of the seeming differences between science and technology, they are inter-linked. None will progress much without the other. They go hand in hand. Scientific product is inter-twined with its applications. For instance, while scientific investigation leads to invention of new and improved technologies new technological advances may motivate scientific investigations and lead to new scientific discoveries.

Science could also be define as a process or way of collecting information, investigation and researching on the knowledge gathered about the entire earth and changing such information or knowledge into laws and theories when effectively tested. Technology on the other hand, deals with manufacturing of devices, sophisticated or improve machines, hand tools, and equipment to be diligently and effectively used by human beings on the earth surface.

Sustainable Scientific and technological literacy through enlightenment and awareness campaign for national development

Scientific and technological literacy enlightenment campaign would emphasize the significance of science and technology in Nigeria. This would also improve the amount of resources that would be allocated to science and technology educational sub-sector. Government policy makers and implementers would be aware of the benefit of science and technology. There is comparatively small amount of resources going into science and technology, the impression given is that, it is commonly regarded as of only incidental importance for economic and social development.

How far scientific and technological literacy have helped in the economic, political and social development of countries can be illustrated by United States of America (USA), Germany, Brazil, Britain, Italy, France, Russia, China, India and many others where science and technology has made a very large impact on these countries as a whole. It is worthy to note that, the above mentioned countries might have faced a lot of scientific and technological literacy problems comparable to those existing in Nigeria today. This could be confirmed by Achebe (1998) when he stated that;

Scientific and technological literacy and civilization does not fall down from the sky it has always been the result of people's toil and sweat, the fruit of their long search for order and justice under brave and enlightened leaders. Nigeria is not absolutely beyond redemption. Critical, yes, but not entirely hopeless. But every single day of continued neglect brings her ever closer to the brink of the abyss.

Scientific and technological literacy enlightenment campaign would bring about strong national awakening and a transition from absolute dependence to an independence strong and reliable economy that would be able to compete with the developed countries. These would also bring about great changes in vocational and technical education agricultural and other sectors of the economy and a beginning of industrial revolution in Nigeria. Scientific and technological literacy would play an important role in speeding up these development and helped to integrate the new developments with the existing cultural pattern, thereby smoothing the transition to the new modern society that all of us look forward for.

It is very interesting to observe that, scientific and technological literacy campaign would contribute to sustainable national development of Nigeria by making most Nigerians familiar with the history of science and technology and tradition of the nation and create an awareness of the developments taking place and the problems confronting Nigeria as a developing country scientifically and technologically. Scientific and technological literacy has a kind of multiplier effect because students communicate their ideas to other people who in turn communicate with others again, so that, the total effect is that, knowledge would be widely diffused not only over space but over time.

Becka (1985) observed that,

It is implicitly clear that, more scientific and technological manpower is needed to educate Nigerians to develop scientific and technological appreciation. By scientific and technological appreciation means knowledge of how common products work, how they are produced and how best to maintain them.

It should be pointed out that, scientific and technological literacy campaign could only be achieved through radio jingles and announcements, television coverage, public demonstrations, restructuring science and technology syllabus that would include scientific and technological literacy awareness at all the educational levels in institutions of learning in Nigeria. Science and technology education policies should recognize the needs of the country not only in terms of the national requirement for manpower development or need but also in terms of the achievement of the five objectives stated by National policy on education (NPE 2004) which states that:

1. A united, strong and self-reliant nation
2. A great and dynamic economy
3. A just and egalitarian society
4. A land of bright and full opportunities for all citizens and
5. A free and democratic society

Science and technology teachers should be better equipped to impart rudimentary scientific and technological skills, knowledge and techniques to their students. At the primary and secondary school levels, students should be exposed to service learning. Service learning is a pedagogical method of learning that combines community service with academic learning activity. Nigerian students should also be exposed to simple machines mechanisms and taught how they can be constructed using simple or cheap available materials which can stimulate and enhance scientific and technological skills, techniques and knowledge for sustainable national development. This is essential to the achievement of a highly scientific and technological literacy for sustainable national development.

In support to this axiom, King (2006) stated that:

Going to seminars, workshops, exhibitions will help science and technology teachers come in contact with the newest equipment that are used in industry and it also sharpens students/teachers occupational skills, watch your students at work and teach in industry. This is a good way to find out what skills they expect their employees to have, spend at least an hour a day reading professional journals, join professional associations, take advantage of their conventions, seminars, workshops and meetings and get to know other members.

Science and technology teachers/lecturers need to update their knowledge in their various specialties by going on sabbatical leaves. The one year sabbatical leave correctly carried out by senior lecturers, Associate Professors and Professors sabbatical leaves period should be extended to two years this would help science and technology lecturers/teachers to impart more knowledge skills and techniques and carry out good research for science and technological development of Nigeria. It is unfortunate that, most universities, polytechnics and colleges of education in Nigeria do not establish science and technology courses. Even when some established science and technology courses few students are enrolled for science and technology requires constant attention to change in science and technology in their applications and their usefulness in the world of work place.

Industries, companies, factories, non-governmental organizations and government establishment should donate machines, equipment and hand tools to various universities, polytechnics, colleges of education and other institutions of learning for students to learn on how to use them so that, they would be able to work diligently and effectively in the world of work after graduation as they would meet these or same current or sophisticated equipment, machines and hand tools in the labour market.

Scientific and technological literacy as an indispensable plat-form for lifelong education for Nigeria sustainable development

Nigeria as a developing country with lack of scientific and technological literacy is poor in manpower development in science and technology educational subsector. How can we achieve sustainable development goals when we are not scientifically and technologically literate? Scientific and technological literacy are therefore needed to give the Nigerian talented citizens a sense of belonging and as a prevention against juvenile and adult delinquency and crime. The unemployment market keeps on growing every year in Nigeria. Graduates of our institutions of learning find it extremely difficult to secure jobs because most of them do not have scientific and technological skills or vocational and technical education skills, knowledge and techniques needed by employers in the global world of work today.

Scientific and technological literacy would make the entire educational system more reliable efficient. Nigeria urgently need scientist and technologist. It does even in greater number than envisaged in the new policy on education. In present circumstance of Nigeria, the attainment of sustainable development goals would be difficult, or impossible without scientific and technological literacy and complete re-engineering and transformation of our scientific and technological policy framework. It is unfortunate and worrisome to note that, People drive sophisticated and highly computerized vehicles, cars and trucks today in Nigeria but, they did not have the idea on how the vehicles or cars they drive or use works or how the air conditioner in a vehicle, car, offices and homes work before the cooled refined air gets to them.

Nweke (1985) stated that;

Lack of scientific and technological literacy for national development is as a result of wrong approach to and unplanned policy on education that has rendered scientific and technological literacy in effective. It will be right, therefore, to say that, our educational policies fail before even they start. It is lack of concrete planning that brings uneasy ending of the policies.

Conscious efforts should be made to promote scientific and technological literacy for sustainable development. Nigeria had stuck to the colonial educational system inherited from Britain, a system not patterned for our use but designed to serve British interest. Instead of serving societal needs on the contrary lack of scientific and technological literacy has created more problems for us. It is worthy of note that, scientific and technological literacy would provide a better solution to the economic development of Nigeria. Scientific and technological literacy of Nigerian citizens would definitely help in pushing the country into rapid development in all sectors

of our economy because both science and technology are geared towards acquisition of skills, knowledge and techniques which is good for Nigeria as a developing country to be self-reliant and independent.

Similarly, Dike (2010) was of the view that,

The neglect of scientific and technological literacy is socially and economically injurious because it is robbing the nation the contributions the graduates would make on national development. For that, Nigeria is today wearing the toga of a poor state. Because of the sorry state of the nation's tertiary institutions many of the graduates lack "employability" skills, which would easily be acquired from institutions of learning.

As part of government efforts to achieve the transformation agenda in Nigeria, through scientific and technological literacy as an indispensable platforms for life long education, government have to embarked on a science and technology training programme to meet the dearth of science and technology teachers in its institutions of learning in Nigeria. There is urgent need to use mass literacy campaign for acquisition of scientific and technological rudiments for achieving the transformation agenda in Nigeria. For the transformation agenda of government to be able to achieved, the country's educational programme should properly reflect its need for scientific and technological developments. There is urgent need to tailor the nation's educational policies to suits its developmental needs in line with global standard. Insufficient science and technology teachers has immensely affected scientific and technological literacy. The 60:40 ratio of science to liberal arts students as stated in the NPE 2004 revised has to be reviewed upward in accordance with the man power needs of Nigeria but it has not been reviewed. This could be confirmed by Nevkar and Ukuma (2012) when they stated that, it would be very difficult for Nigeria to achieve vision 20:2020 for national development because, the government did not redirect her policy and implement section 69 sub-section 1 and 2 of the national policy in education NPE (2004). Revised which states that, a greater proportion of expenditure on university education shall be devoted to science and technology. Not less than 60% places shall be allocated to science and science-oriented courses in the conventional universities and not less than 80% in the University of Technology. The above has not been implemented. Most of the Universities, polytechnics and colleges of education in Nigeria today have not established science and technology courses.

In contributing to the re-engineering science and technology education, Gap and Porozny (2008) stated that:

Science and technology students entering the world of work must be better prepared in the future than he/she was in the past. Science and technology students must be flexible, aware of the need for continuing education and progress and have skills, knowledge and work habits that are up to date as possible.

Re-engineering science and technology education would ensure science and technology curricular and learning programmes to be more practical than theoretical and should be directly related as much as possible to the world of work or labour market. Science and technology teachers must be

encouraged to see the need for them to have regular contact with the industries, register with the relevant professional bodies such as Council for Regulation of Engineers in Nigeria (COREN), Nigerian Association of Engineering Craftsmen (NAEC) among others and deeply involve themselves in professional activities.

Similarly, Beeka (1981) was of the view that:

Our entire future depends to a great extent on scientific and technological literacy and thoughts which we permit to harbour in our minds. We know very well that to think clearly is to become aware and that awareness the more we find we want to know – the instinct to ask questions is awakened and that is the beginning of imagination and the creation of ideas.

Scientific and technological literacy through sensitization awareness campaign would help Nigerians stand the chance of been able to learn, select and determine latest, useful and current scientific and technological innovation from developed nations. This would help Nigeria to be self-reliant instead of allowing the proliferation of highly sophisticated technologies in to the Nigerian market that is difficult to maintain and does not suit and meet the basic needs of the Nigerian citizens.

Scientific and technological literacy through sensitization awareness campaign would also enhance the development and application of appropriate technology that would promote easy, not capital intensive and suitable for common people who resides in the rural areas. It would also enhance the upgrading of indigenous technology producing or manufacturing new equipment, machines and tools in line with global standard for national development. Science and technology teachers/lecturers must have contact with the industries and be current in their various areas of specialization and they must relate or intimate the new information's to their students so that after graduation, students would be able to work effectively in their world of work place.

It is disheartening to note that, there is a wide gap between urban and rural institutions of learning in Nigeria. This has negatively affected the learning of science and technology students who are in the rural areas. This is because most of the institutions in the rural areas do not have workshops, equipment, tools, electricity and qualified science and technology teachers which is unhealthy and if not urgently addressed can adversely affect national development and other developmental programmes in Nigeria.

Conclusion

The use of mother-tongues as a medium of teaching, learning and enlightenment of Nigerians on scientific and technological literacy wherever possible and adequate arrangement be made for the full participation of men and women in scientific and technological literacy and community development programmes. Also, federal, states and local governments should adequately give recognition, support and incentives in form of finance, equipment and training in order to enhance the effectiveness of scientific and technological literacy for national transformation or development.

Finally, government should fund Research and Development (R and D) in science and technology educational sub-sector so as to discover new ideas and keep abreast of recent scientific and technological change. This would help revamp our industries, companies and factories so as to boost productivity to compete with developed and developing countries and be able to export our products to other developed and developing countries and improve our economy which is the greatest challenges facing Nigeria and other developing countries today.

Suggestions/Recommendations

Significant suggestions and recommendations on how to further improve scientific and technological literacy for Nigeria's sustainable development:

- Government should draw up an authentic time table for eradication of scientific and technological literacy. Strictly followed to the later science and technology education should be placed on the national priority list and the need for all higher institutions of learning to establish correspondence courses for the benefit of science and technology students in the vicinity.
- The Federal, states and local governments in Nigeria should allocate and make available adequate funds to institutions that offer science and technology courses for the purpose of research, workshops, seminars, conferences and other professional activities that would help in updating scientific and technological knowledge, skills and techniques of science and technology lecturers/teachers for the attainment of scientific and technological literacy for Nigeria Sustainable development.
- Universities, polytechnics and colleges of educations in Nigeria should have coordinators appointed or desk officers in all the institutions of learning. Those desk officers would be charged with the responsibility of coordinating the laudable activities of science and technology and disseminating relevant information about scientific and technological innovations to science and technology teachers, science and technology association of members, students, parents, and the entire Nigerians citizens for sustainable transformation of the Nigeria for sustainable development.

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