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RESTRUCTURING SCIENCE AND TECHNOLOGY EDUCATION TOWARDS ACHIEVING 2030 EDUCATION AGENDA FOR INDUSTRIALIZATION AND SUSTAINABLE DEVELOPMENT IN NIGERIA

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Abstract

It has been observed that science and technology (S&T) policies have not been a critical determinant of national development performance in Nigeria. Also, that Nigeria has not fully realized its national objectives of S&T-driven rapid industrialization and development. It is in recognition of this fact that this paper is intended to stimulate discussion and recommendations related to why have science and technology education failed in its industrialization cum economic development objectives? Through extensive review of literatures, the paper recognizes that all is not well within science and technology education and that there are concerns related to its vision, its philosophy, its research, its approach, its teaching methodology and most definitely its way of meeting needs. It therefore recognizes that science and technology education must do more than simply pay 'lip service' to industrialization for sustainable development and must focus learning on issues of relevance facing society. In order to reduce poverty and to achieve equitable and sustainable development, we have to develop industries that provide increased employment opportunities for all citizens. Therefore, the development of labor- intensive industries ought to be a central theme of development economics and a central focus of development policies. As a result of this, the paper identified some strategies for restructuring science and technology education in achieving 2030 education agenda for industrialization and sustainable development.

Keywords: 2030 education agenda, restructuring, science and technology education, industrialization and sustainable development.

Introduction

Education is the greatest force that can be used to bring about change. It is also the greatest investment that a nation can make for the quick development of its economic, political, sociological and human resources. It was in this regard that a National Policy on Education was formulated for the country. The policy seeks the inculcation of national consciousness and national unity; the inculcation of the right

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type of values and attitudes for the survival of the individual and the Nigerian society; the training of the mind in understanding of the world around; and the acquisition of appropriate skills, abilities and competence both mental and physical as equipment for the individual to live in and contribute to the development of his society (FRN, 2004).

As a part of educational curriculum, Science and technology is an all-embracing concept that is applied to boost sustainable development and create wealth through industrialization for everyone especially as globalization has brought about a more competitive environment. Innocent, (2016) is of the view that training in science and technology has been used by countries (e.g., Japan, France, Germany, Norway, China, Finland, UK, USA.) to set up unique educational oriented outfit programs, inculcating discovery and innovating spirit, deliberately targeted at youths. Because science and technology played these critical roles in the success of today's advanced and emerging economies, developing countries are also encouraged to find ways of building their capacity in science and technology education. There has been a widespread belief among educational economists that educational development would lead to accelerated economic growth, more wealth and income distribution, greater equality of opportunity, availability of skilled human power, a decline in population growth, long life, better health outcomes, low crime rates, national unity and political stability (Peter, 2009). Therefore, developing countries could consider making capacity-building in science and technology education a priority for national socio-economic development, as part of a wider framework of the enabling environment.

The evidence to above assertion is clearly seen in the adoption of the 2030 education agenda for sustainable development which articulates a much broader vision of the role of education in societal development. While reaffirming the right to basic education and focus areas articulated within Education for All (EFA), the 2030 Agenda also introduces new features that reflect an ambitious and holistic approach to education and learning in the twenty-first century. Among these, is a renewed focus on the learning of youth and adults in a lifelong perspective essential for the realization of most sustainable development goals for 2030.

However, according to Bello, (2015), educational growth and social development in developing countries are hindered by a number of factors ranging from inadequate teaching and learning facilities to inefficient delivery of quality sustainable education particularly science and technology. Some of these factors he continued could be as a result of certain challenges that curriculum issues faced in schools. The curriculum issues have suffered so much neglect at the same time inextricably linked to matters on educational concerns and reforms around the world. In a sense, experiences of educational reform strategies almost all over the world have shown that curriculum is at the same time a policy and a technical issue, a process and a product, involving a wide range of institutions and actors.

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Whereas the 2030 Agenda accepts industrialization as being associated with economic growth and potential for reduced poverty, science and technology education is still no doubt a road map to achieve reliable industrialization for sustainable development. Industrialization, infrastructure and innovation are driving forces behind social and economic development, and are critical to ensuring low-carbon development and environmental sustainability. Increased productivity through environmentally sustainable industrialization can support job creation, access to decent work, income generation and the promotion of micro, small and medium-sized enterprises (United Nations, 2016). Knowledge and skills development are therefore essential to enable Nigeria develop her capacity in formulating and implementing dependable policies and plans to enhance industrialization with a skilled workforce, and to achieve sustainable development. Quality infrastructure is essential for sustainable development, and includes supporting access to clean and affordable energy, basic sanitation facilities, drinking water, telecommunications, health, education and financial services.

Nigeria must therefore redefine its economy whereby import substitution industries will turn out goods with local raw materials for the local market while export substitution industries will replace traditional exports particularly crude oil, solid minerals and agricultural resources; a situation where dependency on importation of foreign goods and services will be remarkably reduced (Damian, 2016). Thus, effectiveness in science and technology education will meet these industrial and infrastructure requirements for sustainable and inclusive economic growth, influencing capacity for innovation, and laying a foundation for economic diversification and uptake and dissemination of technology.

The 2030 Agenda for Sustainable Development has become a globally-shared ambition and a truly collective endeavour. It is an inter-governmental commitment comprised of seventeen aspirational goals that address shared challenges at the global and local levels (Heribert et al., 2016). It was on First January 2016, that the world officially began implementation of the 2030 Agenda for Sustainable Development, a transformative plan of action based on its Sustainable Development Goals (SDGs). This body was put in place to address urgent global challenges over the next 15 years (Ban, 2016) cited in (Emmanuel, *et al*, 2017). This agenda is a road map for people and the planet that will build on the success of Millennium Development Goal (MDGs) and ensure sustainable social and economic progress world-wide. The (SDGs) according to Beisheim (2015) are:

1. *End poverty in all its forms everywhere.*
2. *End hunger, achieve food security and improve nutrition and promote sustainable agriculture.*
3. *Ensure inclusive and equitable quality education and promote lifelong learning opportunity for all.*
4. *Ensure healthy lives and promote well-being for all ages.*
5. *Achieve gender equality and empower all women and girls.*

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6. *Ensure availability and sustainable management of water sanitation for all.*
7. *Ensure access to of affordable, reliable, sustainable and modern energy for all*
8. *Promote sustainable inclusive and sustainable economic growth, full and productive employment and decent work for all.*
9. *Build resilient infrastructure, promote inclusive and sustainable industrialization foster innovation.*
10. *Reduces inequality within and among countries.*
11. *Make cities and human settlements inclusive, safe resilient and sustainable.*
12. *Ensure sustainable consumption and production patterns.*
13. *Take urgent action to combat change and its impact.*
14. *Conserved and sustainably use the oceans, seas and marine resources for sustainable development.*
15. *Protect, restore and promote sustainable use of tangential ecosystems, manage forests, combat desertification, and halt and reserve land degradation and halt biodiversity lose.*
16. *Promote peaceful and inclusive societies for sustainable development provide access to justice for all and build effective, accountable and inclusive institutions at all levels and*
17. *Strengthen the means of implementation and revitalized the global partnerships for sustainable development.*

As a means of implementing the agenda, the body during declaration stated "we recognize that these will include the mobilization of financial resources as well as capacity building and the transfer of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed. Public finance, both domestic and international, will play a vital role in providing essential services and public goods and in catalyzing other sources of finance. We acknowledge the role of the diverse private sector, ranging from micro enterprises to cooperatives to multinationals, and that of civil society organizations and philanthropic organizations in the implementation of the new" (United Nations, 2016).

This paper, therefore seeks to identify strategies for restructuring science and technology education as the pivot between improved industrialization and other sectors in order to achieve economic diversification and sustainable growth and development in Nigeria.

Science and Technology Education: What is it and why is it needed?

Education has been defined as a process by which individuals are assisted formally through proper direction and guidance to develop their capacities for their own benefit and that of the society (Okeke, 2003 cited in Orikpe, 2013). Mbajiorgu (2003) cited in Okoli et al; (2013) viewed science as an act of doing and is more concerned with various investigative processes and activities with regards to developing, acquiring and controlling knowledge, skills, capacity and attitude about the natural factors of the environment. Technology is also seen as the application of scientific knowledge and research to solve problems of life in the society, thereby making life more comfortable

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for human beings (Bello, 2015). Hence, through the enquiry process, students will develop scientific knowledge and skills to help them evaluate the impacts of scientific and technological development.

Science and Technology education as defined in the National Policy on Education (Federal Republic of Nigeria - FRN, 2004) is an aspect of the educational process involving, in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economy and social life. Science and technology are related in the sense that science is the input while technology is the output (Kennedy, 2011 cited in Bello, 2015). Science and technology education is therefore a kind of education that aims at producing scientifically literate citizens and potentially scientific and technology manpower while technology education leads to the acquisition of practical, applied skills, as well as the basic scientific knowledge (Okonkwo, 1996 cited in Ige, 2013). Without a proper foundation in the basic scientific knowledge, it is very difficult if not impossible to achieve a sustainable scientific development (Linda, 2000).

The scientific enterprise is one that is challenging and innovative. It blends with technology which focuses on inventions and problem solving. Consequently, the harmonious interplay of science, technology and society is the springboard for sustainable development. It equally facilitates and enhances industrial and technological progress among the people and within a nation. This consciousness according to Linda, (2000), stems into global agitations for literacy in science and technology to: ensure that young people entering the Nigerian workforce have the knowledge and skills necessary to promote economic, scientific and technological development; and also give the future citizens of Nigeria an understanding of scientific and technological approaches and evidence, so that they will be able to make informed decisions on scientific and technological issues. Clearly, these two purposes are linked together and indicate the importance of ensuring that all young people have a good education so that as citizens and members of the workforce they can engage critically and creatively with opportunities and issues relating to science, technology and engineering for industrialization and sustainable development. This is very essential because industrialization drives economic growth and job creation, thereby reducing income inequality, innovation as fundamental for human development because it expands the technological capabilities of industrial sectors and leads to the development of new skills (Ajiboye, 2011) cited in Emmanuel *et al*., (2017).

Science and Technology Education, Industrialization and Sustainable Development: Conceptual Clarification and Relationship

Anyanwu *et al*., (1997) cited in Mandara *et al*., (2018), describes industrialization as the process of building up a nation's capacity to convert raw materials and other inputs to finished goods and to manufacture goods for other production or for final

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consumption. Industrialization enhances the utilization of productive inputs (labour, capital and raw materials), given the country's technology, to produce non-durable and durable consumer goods, intermediate goods and capital goods for domestic consumption, export or further production. Industrialization is said to be the process of building up a nation's capacity to convert raw materials and other inputs to finished goods for other production or for final consumption (Anyanwu, et al., 1997). It brings about an increased volume and varieties of manufactured goods resulting in increased employment and improved standard of living of the citizens. Industrialization is also regarded as a veritable channel of attaining the lofty and desirable national goals and quality of life for the citizenry (Adeoye 2005) cited in Mandara et al., (2018). It forms the central object of economic policy in most developing economies and is seen as a crucial and powerful integral part of overall development and structural process of an economy (Uniamikogpo 1996) cited in Mandara *et al*., (2018). In defining the industrial sector, it is seen to be a section of the economy which consists of the manufacturing that provides goods and services and the structure of any economy should be one which has industry playing a dominant role in its composition. Attaining and sustaining full industrialization is therefore the goal and aspiration of every sovereign nation like Nigeria.

Development, *per se*, is the process of enhancing the economic, socio-cultural, political legal and technological living standards of a people through the exploitation of natural resources (Meier, 1986). It becomes sustainable when it meets the needs of the people not only now but also for the future generations (Damian, 2016). Development is sustainable when a country is committed to a national policy on environment that ensures proper management of natural resources in a manner which meets the needs of the present and future generations (Emaviwe, 2016). Therefore, the term sustainable development means the development that can be sustained over a period of time. The Report of the World Commission on Environment and Development (1987) sheds more lights on this. It describes it as the development that meets the needs of present generation without compromising the ability of the future generations to meet their own needs. Taking into cognizance these definitions, sustainable development can also be described as the development that builds on the present and provides enabling environment for future generations to develop and meet their needs.

Since science and technology are part of the national strategy for development, its literacy is elemental in Nigerian economic sector. Part of what is needed to enhance that process is public pressure to encourage more Nigerians to study science and technology. Hence, there is no doubt that these are vital tools for national development of any country including Nigeria. Due to its utilitarian value to national development, every effort should, therefore, be made to promote its development by any state that wants development. Nigeria as a state yearning for development can, therefore, not shy away from it in its developmental agenda (Igbaji, 2017).

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The relationship between science and technology and industrialization is such that the dividing line between them is very thin. While industrial development of any nation depends very highly on the level of advanced science and technology that the nation had achieved, it is worthwhile to note that science and technology are prime instruments in the exploitation of resources for human use. The present stage of technology advancement in Nigeria has been possible through science and technology education. Water resources, for example, has been utilized and transformed into hydro-electric power on River Niger at Kainji Dam. Specialized human resources, sophisticated equipment and geological surveys are essential tools for locating and exploiting minerals. Some technicalities like prospecting (geological survey of potential mineral locations), drilling, refining and transportation are required in exploitation and development of natural resources. Many natural resources that have been exploited and developed for technological progress and economic development such as petroleum, forest (for fuel, pulp and paper, timber and ply-wood at Sapele), iron ore (for production of steel at Aladja and Ajaokuta) and limestone (for production of cement at Sokoto, Abeokuta and Nkalagu) are attained through advances in science and technology. These are modern industries employing higher level of science and technology than traditional industries yet using mainly local agricultural raw materials for processing activities. However, more is needed for an improved developing economy like Nigeria. Therefore, there is a need to educate citizens who are aware of the problems in the world and could make critical decisions for the environment and society (Choi et al., 2011 cited in Güliz, et al., 2016). Whereas technological development propels industrialization and promotes the development of the capacity to manufacture goods, particularly capital goods, industrial development in turn provides the impetus for technological development and innovation (Gapanski, 1996). A major prerequisite for this transformation is the acquisition of technological capacity – that is, the ability to select, diffuse, develop or adapt technology and build on imported technology. The point here is that technological progress is a vital requirement for industrialization and sustainable development.

At the same time, as Carter (2008) stated, the purpose of science and technology in the 21st century has been set as to help students make critical judgments about science and increase their engagement to work for a more socially just, equitable and sustainable world. Therefore, we could interpret that the content and the purpose of science and technology in the 2030 agenda coincide with those of Education for Sustainable Development (ESD). ESD has gained importance in science and technology together with UNESCO (2005)'s declaration that is related to reorienting education to promote public understanding, critical analysis and support for sustainable development. This declaration was supported all around the world and it is concluded that ESD is important and essential to succeed sustainable development (UNESCO, 2006). Further, UNESCO (2009) described a rich and holistic perception of ESD that is related to principles for supporting sustainable living, democracy, protection of

environment and human well-being, sustainable use of natural resources, emphasizing on sustainable production and consumption and maintaining peace in the societies.

Presently , it is suggested that in the 2030 education agenda, Science Education should hold a wider perspective to prepare citizens who could explore components of sustainability (social, environmental and economic) and who could make social, political, environmental decisions for themselves and for the community (Choi et al., 2011; Feldman & Nation, 2015) cited in Güliz et al., 2016). Therefore, we are in a position to appreciate the relationship between SE, industrialization and sustainable development and we agree that ESD shall be integrated into SE program so that the cooperation between SE and ESD supports and encourages young people to be globally responsive and environmentally sustainable future citizens (Güliz *et al*., 2016).

National Policies on Science and Technology Education and Industrialization

According to Igbaji et al., (2017), Nigerian government like all other governments in the world realizes the role of science and its bye product-technology in issues of national development. In Section 39 of National Policy on Education (2004), the National Policies on Science and Technology Education stated that science education shall encompass the teaching and learning of science process and principles which will lead to fundamental and applied research in sciences at all levels of education in Nigeria. Its goals shall be to:

- *Cultivate inquiry, 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 world, the forms and the conduct of life.*

As also indicated in Section 40, technical and vocational education shall:

- *Provide trained manpower in the applied sciences, technology and business particularly in craft, advanced craft and technical levels;*
- *Provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development; and*
- *Give training and impact the necessary skills to individual who shall be self-reliant economically.*

In other to make the goals of science and technology education a realistic, special provisions and incentives shall be made for the study of sciences at each level of the national education system and for this purpose, the functions of all agencies involved in the promotion of the study of sciences shall be adequately supported by government while government shall popularize the study of sciences and production of adequate number of scientists to inspire and support national development.

Earlier before the National Policy on Education (2004), the national Science and Technology (S&T) policy was formulated and launched in 1986 with its objectives as

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captured in the fourth development plan include among others, the achievement of self-reliance through:

- ✓ acquiring enough technical know-how, skills and materials to defend the integrity and security of the nation;
- ✓ being technically self-reliant in the production of capital and consumer goods and raw materials, and
- ✓ maintaining a flourishing national export capability of goods and services.

The S&T policy marked the beginning of the recognition of S&T efforts as a vehicle for successful industrial development in Nigeria. To facilitate the achievement of the 'self-reliance' aspiration of the S&T policy, the Raw Materials Research and Development Council (RMRDC), was established by Decree No. 39 in 1987. The Standards Organization of Nigeria (SON) was also established for the purpose of ensuring standardization and adequate quality control in industrial production. The S&T policy emphasized the transfer of foreign technology to local firms, via the licensing and registration of patents, trademarks, technical assistance arrangements, research and development, training, and operations. Among such other industrialization policies include the export promotion industrialization strategy embedded in the structural adjustment programme of 1986, which emphasized domestic production of manufactured goods for export in order to generate more foreign exchange particularly from non-oil sources to meet the country's rising import bills, mounting external debt obligations, rising fiscal responsibilities of the government, and to attend to socio economic responsibilities (Obioma and Ozughalu, 2005 cited in Jonathan *et al*., 2018); the foreign private investment led industrialization strategy adopted since 1999 after years of military dictatorship and targeted at restoring investor's confidence in the Nigerian economy in order to attract massive inflow of foreign capital in the industrial sector; the small and medium enterprises development agency of Nigeria established in order to cater for the development of SMEs in Nigeria; and the national economic empowerment and development strategy, which in the main was aimed at growing the private sector as the engine of growth for wealth creation, employment generation and poverty reduction (Okereka, 2015; Ekpo, 2014; Nyor and Chinge, 2014 cited in Jonathan *et al*., 2018).

Why Does Science and Technology Education Fail in its Industrialization Cum Economic Development Objectives?

However, despite the implementation of above industrialization policies, there is little or no evidence that the S&T policy was successful because in view of Nyor and Chinge, 2014) cited in Jonathan et al., 2018), Nigeria is still far from being industrialized. In fact, it seems as if the more Nigeria stresses on its Science and technology education and industrialization policies, the more the country moves away from being industrialized. These facts according to Jonathan et al., (2018) indicate that the country has faced several challenges in its journey to industrialization. As a result of this,

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extensive review of literatures was made to ascertain the factors militating against Nigeria's industrial development.

1. **Poor Policy Conceptualization and Implementation:** Beautiful policies are put forward on paper but they fail at the level of implementation (Abraham, 2004 cited in Innocent, 2016). Successive governments in Nigeria most of the time are insensitive to the plight of the people even when there are means for improvement and development. Bad policy or poor policy implementation has adverse effect on national development.
2. **Inadequate Information and Communication Technology (ICT) Technologies:** Despite that the world is now said to be a global village due to the discovery of computer and ICT and other related technologies, many Nigerian science students in both secondary and tertiary institutions are faced with various problems in their attempts to computerize science and technology activities.
3. **Lack of Technological Capability:** Lack of adequate **technological capability** to boost new ICT technologies and limited resources in developing nations, has been identified as problems militating against schools to fully participate in international activities arising from ICT induced globalization.
4. **Insufficient Funding for the S&T Sector:** Lack of finance for research and development in Science and Technology for industrial development activities is a menace to science and technology education to realize its industrialization cum economic development objectives.
5. **Concentration on Light Consumer Goods instead of Capital Goods which Sustain industrialization;** This is as a result of weak raw material base since more attention is being channeled into mining following the discovery of oil.
6. **Inadequate infrastructure:** Infrastructure like transportation system, water supply, electricity supply and telecommunications, which are crucial enablers of industrialization are not sufficient to encourage foreign investors in Nigeria. Provision of solar energy to schools and other institutions of technology should be encouraged instead of relying on public power.
7. **Poorly Developed Human Capital:** Such as lack of entrepreneurship skills.

Restructuring Science and Technology Education in Achieving 2030 Education Agenda for Industrialization and Sustainable Development: Strategies

It has been observed that science and technology (S&T) has not been a critical determinant of national development performance in Nigeria as expected. Also, that the country has not fully realized its national objectives of S&T-driven rapid industrialization and development. It is in recognition of these observations that it becomes imperative to suggest the following strategies for improving quality of science and technology education towards achieving 2030 education agenda for industrialization and sustainable development.

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1. **Effective Implementation and Application of Information and Communication Technology (ICT):** According to Ogunsola, (2008), the real tasks facing the institutions, among others include repositioning the policy initiatives and priorities of key players to map out a practical and achievable developmental agenda for the implementation and application of ICT in these institutions. Inadequate external and internal training programs, absence of systematized plans for integrating technology into teaching and learning, inadequate human resources base for implementation or technical projects especially in the rapid and progressing technology field.
2. **Consistent and Regular Review of Science and Technology Curriculum: T**here is urgent need to re-examine the curriculum content and delivery methods in Nigerian schools, shifting the emphasis from textbook-oriented learning to competence-related learning that can guarantee relevance, practicality and values for sustaining the future of our children. Such an orientation is imperative given the demands of 2030 education agenda for industrialization and sustainable development. This orientation according to Akinjide *et al*., (2018) involves a conscious acceptance that education is a preparation for life, hence educating people to question, criticize, and analyze issues bordering on the environment, and society and economy is a desirable exercise to do.
3. **Improving Teaching Methodology of Science and Technology**: Science and technology teaching methods should be modernized to bring life back into it. To do this, a policy on standards of professional development of teachers should be implemented, requiring teachers to maintain a reasonable level of pedagogical content knowledge and skills.

   Under goal 8 towards realizing Curriculum Framework for Enabling the Sustainable Development Goals, Amina et al., (2017), further explains that education content should be adapted to life and job market requirements in terms of skills and focusing on easing the school-to-work transition and preventing labour market mismatches. However, for restructuring to be effective, creativity and innovation are highly required in science and technology education.
4. **Adequate Funding:** For effective implementation of science and & technology programmes, there should be improved funding of education to meet the 26% of GDP standard already set by UNESCO (Ige, 2013). Both private sector and non-governmental organization (NGO) should assist government in the funding of science education, particularly through the provision of facilities, libraries, laboratories, and workshop for science and technology education.
5. **Recruitment and Training of Science and Technology Teachers:** In view of the role of teacher in science and technology education provision and the shortage that characterized this in schools, experts in the areas of science and technology should be recruited for courses; science and technology teachers should be committed to the job and be motivated through improved conditions of service.
6. **Motivation of Science and Technology Teachers and Other Staff:** Government as well as parents through the Parent Teacher Association (PTA) should encourage teachers in

the area of science and technology particularly from the basic levels to be able to perform expectedly.

7. **Admission of Science and Technology Students by Merit**: In view of the negative effect of the implementation of this policy, particularly on the quality of graduates, tertiary institutions backed by governments should make it a standing policy that only qualified students should be admitted to tertiary institutions.
8. **Equipping and Maintaining of Science and Technology Laboratory and Workshop in Schools and Other Related Institutions of Learning**: The elemental contribution of laboratory equipment and materials to effective teaching and learning of Science and Technology cannot be overemphasized. In view of this, government should equip the laboratories and provide or employ laboratory assistants who would have the knowledge of laboratory work.
9. **Improved Commitment of Science and Technology Teachers:** It has been established in various literatures that education is the central theme in our lives which prepares the young generation for life that lies ahead, and it informs adults of the world about them. A transformation in what we teach, how we teach it and the manner in which it is assessed is crucial to the major knowledge and attitude changes which are essential if sustainable development is to be a focus, especially in science and technology curricula. Hence, the commitment of Science and Technology Teachers are sine quan non to improvement of Science and Technology education.
10. **Recruitment of Guidance-Counselors:** Government should recruit and post Guidance-Counselors who are expert in Science and Technology education, particularly to those schools that are urgently in need of them. The guidance-counselors in schools should however be alive to their responsibilities and ensure effective guidance of students in the choice of career.
11. **Adequate Training of Pupils from Basic Schools to Imbibe Science and Technology Culture:** There is no doubt that the background of a child plays influential role in the academic performance at other levels of the educational system. Thus, it is imperative for parents and teachers to adequately inform their children of the benefits of science and technology education to the development of nation as well as themselves. Basic education focuses on helping pupils gain knowledge, skills, values and perspectives that encourage sustainable livelihoods and on supporting citizens to live sustainable lives.
12. **Removing Gender Disparity in Science and Technology Education**: Gender equality should be put into consideration when planning and implementing educational curricula. Increasing investment in tertiary science education and adopting concrete measures to increase the enrolment of girls and women is one of the best strategies to stimulate girls who want to enter S&T programmes.

Conclusion

From the critically reviewed literature, it has been established that science and technology education is a central component of any nation's developmental process and

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for it to facilitate this function the process should be: clearly defined, legislatively protected from any political dictates, owned by relevant stakeholders, adequately financed and constantly subjected to periodic technical consultations and reviews to ensure that it is in harmony with both local and global needs.

It was also ascertained that a nation that has science and technology deficiency will find it difficult to industrialize and grow economically. Subsequently science and technology education is the answer to national dreams and thereby need to be properly guided, managed and funded for effective implementation for economic growth in Nigeria.

Recommendations

Science and technology education have suffered enormous setback in Nigeria due to the low status accorded to it in general. Some of the problems emanate from the various interpretations of science and technology education by policy makers as well as by the implementers of policies on science and technology education. New policies are needed to clarify the importance, the role of science and technology education, and to address the requirements in various sectors of society. In view of these, the following recommendations are made:

(1) Creation of More Favorable and Conducive Environment for Science and Technology Education. Public discourse in science and popular science activities will provide an active science-learning environment for students and thus, in the end, promote public understanding of science.

(2) Real Application of Information and Communication Technology (ICT). These include cyberspace, computer-aided education and distant education to reach more pupils at the grassroots.

(3) Fully Exploitation of the Potential of Mass Media, Particularly Films, Video, Radio and Television.

(4) Improving Access and Retention in Quality Basic Science Education. Enrolling and retaining both boys and girls in quality basic education is important to their well-being throughout their lives and to the society in which they live.

(5) Reorienting Existing Educational Programmes to Address Sustainability: Reorienting education requires revising education from early childhood care and up through higher education. It requires rethinking what is taught, how it is taught, and what is assessed, with sustainability as the central theme.

(6) Increasing Public Understanding and Awareness of Sustainability: There should be awareness for better understanding that will transform individuals and Nigeria as an entity from the world of yesterday to present world characterized by increasing discoveries, inventions and innovations. Public debate on scientific issues, lectures by eminent scientists and science exhibitions will encourage students to continue learning in science.

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