Ensuring Quality Science Education for Sustainable National Development

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ABSTRACT: *This paper provides an insight into some of the challenges faced by science teachers in Nigeria in ensuring quality science education for sustainable national development. The paper also suggests ways on how to confronting the identified challenges. Also, the concept of Science Education, quality education, and quality science education were examined. It was concluded that if science education was given adequate attention by the government, the national economic growth would be achieved. Recommendations were made among others that: academically and professionally qualified teachers should be recruited to teach science subjects in schools. Also, quality assurance should be put in place at all levels of education. Provision of adequate science laboratories and provision of found to finance science education etc. must be ensured.*

Key Words: *science education, sustainable development, laboratories, laboratory equipments.*

Introduction

Science education is an important key to achieving sustainable national development for a nation to grow and survive. Aina (2013) opines that science education deals with sharing of science content and process with individuals who are not considered traditionally to be member of scientific community; the individuals could be students, farmers, market women or a whole community. Science education in Nigeria concentrates on the teaching of science concepts, method of teaching and addressing misconceptions held by learners regarding science concepts (Aina, 2013). Quality science education is essential for a nation to develop socially and economically. Education is the greatest and most important investment. Science education is an aspect of education that deals with scientific knowledge and ways of solving scientific problems.

Quality Education

Adegbesan (2010) views quality as the process, product or service or its performance in customers or client perception of that performance. This include reduction of wasted and improvement of productivity and efficiency in the meeting of its goals. Similarly, Ajayi & Adegbesan (2007) opines that quality education is related to accountability which is concerned with maximizing the effectiveness and efficiency of educational system and services in relation to their contexts, missions and stated objectives.

The concept of quality education has been linked to three major measures which are the acquisition of measurable knowledge, skills and attitudes among learners. Yang (2017) opines that the major functions of quality education is to stimulate people's inner potentials, give full play to students' initiative spirits and develop students' personalities.

Quality is that thing that distinguishes something from others; it is also the degree of goodness of a thing. Ahmed (2011) defines quality as the freedom from deficiencies, freedom from errors that requires doing work over again. Similarly, Akinbobola (2014) opines that the concept of quality in academic is the quality of educational input and output in its entirety. Quality is considered as base line standard in education which can be measured on a scale of preference, standard, accepted principles, rules, guidelines or levels established by group of people, organizations or society. quality is defined as the degree of good or value of characteristics of how good or bad things are.

According to Ibukun (2004) the quality of human resources informs of teachers often dictates the extent of the effectiveness of educational programmes.

No society can develop beyond its educational system. It is the product of education that transforms the society. The quality of education will therefore determine the quality of manpower and the products. Some of the indices of quality education include adequate and proper equipment and staffing, sufficient staff quarters and classroom in schools, conducive and appropriate teaching and learning environment, effective quality control, proper funding, good quality and well-motivated staff that are truly committed. Ensuring

quality education will lead to achieving sustainable national development. Quality education will give room for result research that can propel technological innovation. Quality education produces learners who are healthy and well-nourished and ready to participate and contribute meaningfully to the economic growth of nations (UNICEF, 2000).

In Nigeria, it is observed that the quality of education has been dwindling especially in the last decade for example most of the graduates that are turned out in our various institutions of learning do not have in-depth and practical knowledge of their courses of study. The quality of science education in Nigeria can be enhanced by making education curriculum more dynamic to equip graduates with skills required in science. The concept of quality education as a whole is multifaceted with different connotations and contradictory positions (UNESCO, 2007). Tilky & Barret (2007) and Tilky (2010) believed that the multifaceted nature of quality education to being grounded in the content and culture of particular setting, factors which also contribute to the specialty of the education system of a country.

UNESCO (2005) described the concept of quality education in terms of his ability to deliver satisfactory human fulfillment and to prepare learners to master their educational challenges and contribute to social progress and social change, Mosha (2000) regards quality education as a degree of goodness or excellence while Lomas (2002) regards it as a degree of fitness to what the educational beneficiary desires.

Quality education is one that provides all learners with capabilities they require to become economically productive, develop sustainable livelihoods, contribute to peaceful and democratic societies and enhance individual well-being.

In the 21st century, Quality education is measured in terms of effective teaching which is universally and broadly understood as teaching that is focused on students and their learning. Thus, excellent and competent teachers are often perceived as those who know how to motivate their students, how to convey concepts and how to help students overcome difficulties in their learning (Ojokheta, 2019).

The importance of quality education in nation building cannot be overemphasized, quality education is the bedrock for every society, for quality education to be achieved in educational institutions in Nigeria, the principal actors of learning who are the teachers must be adequate in quality and quantity, the students must be well trained and facilities must be provided as well, however quality education is the right of every citizen.

Yoloye (2005) is of the view that quality must characterize education at every stage therefore quality assurance in our education system in Nigeria must be seen as an important aspect that will help to:

- Generate formative data that can be used to improve the quality of the management and delivery of courses.
- Provide information to the public and other interested partners about quality and standards.
- Ensures that quality and standards are maintained in the schools and the college in general.
- Monitoring teaching etc.

Quality Science Education

Science is an organized body of knowledge, a way of investigating national phenomena and a way of thinking in an attempt to understand nature.

According to Ezekiel (2018), the objectives of science education for secondary school are to enable students:

i. Acquire scientific and thinking skills
ii. Understand the development in the field of science and technology.
iii. Acquire knowledge in science and technology in the content of natural phenomenon and everyday life experience.
iv. Apply knowledge and skills in a creative and critical manner of problem solving and decision making.
v. Evaluate science and technology related information wisely and effectively
vi. Face challenges in the scientific and technological world and be willing to contribute towards the development of science and technology.
vii. Appreciate the contributions of science and technology toward national development and the well-being of mankind.
viii. Practice and internalize scientific attitudes and good moral values
ix. Realize the importance of inter-independence among living things and the management of nature for survival of mankind.
x. Create awareness of the need to love and care for the environment and play in active role in its preservation and conservation.

Science education is the field concerned with sharing scientific content and process with individual not traditionally considered part of the scientific community while the learners may be children, college students or adults within general public (Omole & Ozoji) while it can also deals with sharing scientific knowledge and methods of solving scientific problems. The scope of science education includes work in science content, science process, some social sciences and some teaching instruction.

The principle guiding the development of National science education as stated in Junald & Alanamu (2019) are:

- **Science Education is for all**: All students regardless of age, sex, cultural or ethnic group, disabilities, interest and motivation in science should have equal right to attain high level of scientific literacy.
- **Learning science is an active process**: teaching of science must involve students inquiry oriented investigations in which they interact with the teachers and peers students establish connections between the current knowledge of science and the scientific knowledge found in many sources
- **School science reflects the intellectual and cultural traditions that characterize the practice of contemporary science**: To develop a rich knowledge of science, students must become familiar with methods of scientific inquiry, rules of evidence ways of formulating questions and ways of proposing explanation.
- **Improving science education is part of systemic education reform**: The National Science Education standards provides the unity of purpose and vision required to focus all those components effectively on the importance of improving science education for all students, supplying all what is needed for a long term changes required.

The importance of science education has become very vital in determining a country's scientific status and its socio economic power in todays open economies. Quality, relevant and sustainable science education must be ensured that is provided for every student not on targeted scientific communities but also to non scientific communities (Kola 2013)

Bull, Gilbert, Barwick, Hipkins and Baker (2010) and Tyller (2007) in Ajao (2019) states that The changing conditions and emphases in science education require some changes which include:

i. The shifting from viewing science as an individually controlled pursuit to viewing as commercial and multi-disciplinary.
ii. The changing practice on the way the public engages with and responds to science and its product
iii. The increasing attacks on science as a body of knowledge
iv. The changing nature of learning science that is from teacher-centredness to student centredness.
v. The changing audience of science education by making it compulsory for learners up to secondary school level.

Challenges of Science Education in Nigeria

Many factors have been responsible for the challenges faced in science education which has resulted to low standard of science education in Nigeria. The standard of science education in Nigeria in our various schools has been very low, factors responsible for this low standard include:

(i). Inadequate Teaching-Learning Resources

This has been a major problem in most of our schools in Nigeria. Most of our schools lack resources, and where there are resources, they are inadequate. Science teaching is not interesting when learning resources is not available, this view is supported by Ekanem and Obodom (2014) poor laboratory facilities and inadequate classrooms are major constraints to science education in Nigeria. Therefore, students could not really be trained on how to discover and solve scientific problems, they only read and cram to pass examinations rather than reading and understanding the theories and practical behind the topic taught. Poor laboratory facilities and inadequate classrooms are also major constraint to education in Nigeria (Ugadu 2017) while Agommudu(2013) and Ematarom (2012) stated that unavailability of essential resources for imparting knowledge to students has made learning not interesting and boring.

(ii). Shortage of science teachers

This is another challenge faced in science education. Teacher's quality is a function of academic qualifications, knowledge of subject matter, competence skills as well as commitment, these are factors that plays vital role in teaching learning process (Omorogbe & Ewansiha, 2013). When good and qualified teachers are available, there will be successful academic environment. Teachers are the passage to improvement and success when it comes to education policy (Wasagu, 2006). Maiwada (2003) lamented about competency of graduate employers especially in situations demanding practical work, teachers are the main determinant of quality teaching in education. If they are apathetic, uncommitted, uninspired, lazy, unmotivated, the whole sector will be affected. At the same time if they are disciplined, dedicated,

committed and inspiring to their students, there will be a good outcome in terms of quality and performance (Babatunde & Olarewaju, 2019).

(iii). Poor funding

The quality of environment where teaching and learning take place in Nigeria are very shameful and worrisome. Many of our schools lack infrastructure, no equipped laboratories, furniture, libraries, halls etc. Teachers welfare are not giving priority. Ajegena (2010) observed that finance is crucial to the survival and success of every human organization.

Ajao (2019) states that poor remuneration affects the morale of teachers, distracts and impedes their commitments, efficiency and effectiveness. If a teacher gets a suitable salary that covers basic household expenses, he would be able to live comfortably and be more effective in imparting knowledge to learners. Victor (2002) argued that under funding of education is connected to factors such as mismanagement of funds and lack of focus. The government is not spending adequately on the education sector of the country as this can be seen in the number of classrooms that are dilapidated, laboratories are not well equipped, the computers are not available, some not enough and non functioning in some cases.

(iv). Academic qualification and quality of teaching

Poor quality of teachers owing to inadequate knowledge base and weak pedagogic skill is also identified as a limitation to students performance. Teacher quality is a function of academic qualifications knowledge of subject matter, competency, skills as well as commitment. Quality of teaching can only be achieved when the teacher is capable of transforming written knowledge into forms that would be easily understood by students, considering their abilities and backgrounds. Inappropriate and ineffective teaching methodology is a factor hindering students understanding and achievement in teaching (Enyi, 2011).

Teacher's qualification is one of the determining factors of his ability. Academically qualified teacher has deep knowledge of subject matter than the academically less qualified ones, inadequate knowledge of subject matter is very prevalent in our school system nowadays Ajao (2019) while Molnar (2002) posited that a poorly trained teacher will likely produce a poor doctor, engineer, fellow teacher and the like. Some of the science teachers are not professionally trained, as engineers are recruited to teach Mathematics, Chemistry, Physics instead of specially trained Mathematics and Science Educationist (Omayuli & Omayuli, 2009). Competencies increase in the art of teaching. Most of the secondary schools especially in rural areas do not have enough science teachers to handle the subjects properly. Some of them lobbying for urban schools thereby adversely affected science education (Ekanem & Obodon, 2014).

(v). Lack of motivation for teachers

Teachers are poorly remunerated and it affecting the morale of teachers. This also distracts and impedes their commitment efficiency and effectiveness. If teachers are given good salary that covers all their needs, then teachers will be comfortable and effective imparting knowledge to learners.

(vi). Proper Monitoring

Most of our schools lack monitoring, monitoring of teachers is not well done and hence most of the schools are not maintaining standard. Quality addresses the issue of accountability in educational practice in terms of the use of human and non-human resource. Akinbobola (2014) stated that, quality assurance entails the quality of teaching personnel, quality of Available instructional materials, equipment and facilities, school environment and students and quality of the academic programmes and infrastructural facilities which allow an objective review of the quality of the programme and instructional delivery. Inspection monitoring & control in our school system are done once a while instead of been done regularly.

In order for sustainable National development to be realistic, quality education is highly vital to all spheres of development of a nation – social development economic development, political development and technological development.

Osam (2016) highlighted the objectives and goals of science and technological education in promoting sustainable national development to include the following

- Enhance the country's image
- Expand Nigeria technological framework
- Reduce poverty among the people
- Create wealth and employment opportunities
- Generate appreciate income and
- Enhance local production of goods and services.

Way Forward

In other to effectively accomplish sustainable National development, appropriate solution to the problems/challenges should be provided as follows

i. There should be proper monitoring and supervision and must be done regularly.
ii. Science teaching resources is very important and therefore should be made available to teachers to engage their students in practical and activity work.
iii. There should be training and retraining of teachers so that they can be more competent, effective and efficient.
iv. Odia & Omofonwman (2007) said government at all levels must ensure that right caliber of teachers are recruited and teaching as a profession should not be seen as a dumping ground for those who cannot secure employment in other areas and that admission standards are not compromised.
v. More funds should be allocated to education, so that things like the school facilities and all other things can be provided for our various schools.

Conclusion

The true picture and problems that actually exist presently in our various schools and tertiary institutions shows that quality improvement is very important for confronting fundamental challenges and growth in Nigeria schools. Quality science education should start with the science teachers by encouraging the students to develop interest in science, there should be use of strategies and good techniques for the teaching of science. Sustainable national development can be achieved through functional science and technology programmes and adequate attention should also be given to science education by the government.

Recommendations

In order to achieve sustainable National development through quality science education the following recommendations are made.

i. There should be setting of quality assurance units in all our institutions to ensure quality education.
ii. Regular inspection must be done in terms of maintenance of equipment and other educational programmes for flaws or breakdown.
iii. Innovative teaching method can be adopted in additions to the conventional method
iv. Laboratory facilities should be well equipped to encourage practical work.
v. Government should release fund for the training and retraining of teachers.
vi. Government should give good salaries to teachers – this will serve as encouragement to them.
vii. Academically and professionally qualified teachers should be recruited for the teaching of science subjects
viii. Science education curriculum should be reviewed in such a way to collaborate with entrepreneurship

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