

# IMPLEMENTING SUSTAINABLE HIGHER SCIENCE EDUCATION IN AFRICA TO COUNTER GLOBAL CHALLENGES

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## **Abstract**

*Global challenges and implementation of sustainable higher science education in Africa can be achieved through recognising science education as a pre-requisite in technological development. No country can be globally recognized without considering its scientific advancement. Therefore, implementation of sustainable quality science education in Africa will help to produce capable scientists who can contribute meaningfully to the academic excellence and raise the economic level of African nations. This paper examined how proper implementation of sustainable science education in Nigeria, can help in countering global challenges to obtained sustainable development in science. A descriptive survey was used to investigate science education students' performance from Affiliated Ahmadu Bello University, Zaria in Niger State College of Education, Minna Nigeria. The students' results were collected and used; questionnaires were administered to the students to collect information about the implementation challenges. The findings revealed that there are several contextual challenges rooted in the processes of planning, implementing and sustaining higher science education practices in our schools. Respondents identified these challenges as limiting the efforts to provide quality and sustainable higher science education. It is therefore recommended that employing comprehensive and multiple frame works to address the issue of sustaining higher science education will help in making school science education relevant, context responsive and functional as possible.*

**Key:** Challenges, Implementation, Global, Sustainable, Science Education, Development

Higher education can be considered as an asset if properly used will contribute to economic growth and the development of youths in an increasingly competitive global society. According to Materu (2007), higher education plays a critical role in promoting scientific advancement and improving a country's ability to capitalize economically. Asiyai (2013) sees higher education as a post secondary education in colleges of education and mono technics. She further explained that higher education has been recognized as a fundamental instrument for the construction of knowledge, economy and the development of human capital all over the world. Also, Peretomode (2007) stated that higher education is the facilitator, the bedrock, the power house and driving force for strong socio-economic, political, cultural, healthier and industrial development of a nation as higher education institutions are key mechanism increasingly recognized as wealth and human capital producing industries. From global perspective, higher science education training has been recognized as a primary tool for national development. High level of educational provision enables citizens to acquire skills and technique which are ploughed into human productivity, creativity, competence, initiative, innovation and inventiveness. Progress in higher science education will increase work efficiency and social opportunities for students.

Science education involves the in depth study of science and educational knowledge and concepts are learnt and verified. No country can be globally recognized without talking about its scientific advancement. In addition Jiya (2013) opined that science education courses are designed to produce capable scientist who should contribute meaningfully to academic excellence and to raise the economic level of African nations.

Science education in Nigeria has not produced skilled human resources needed for transformation into national prosperity. This implies that most of Nigeria higher science education development has been haphazard leading to acquisition of obsolete technology.

Education is the fundamental cultural process that prepares an individual to live, work, function and survive in a given society. Anya (2008) further pointed out that education is an instrument for inducing social change. Enamiroro (2007), sees education as all positive efforts, whether conscious and direct or incidental and indirect, made by a given society to accomplish certain objectives that are considered desirable in terms of the individual's need as well as the need of the society where the programme is based. Therefore education as a powerful instrument for development of man and society needs to be sustained. Sustainable education is the education that produces a complete person. Complete in the sense that the person is intellectually, morally, physically, emotionally and socially developed.

According to Nzekwe and Okeke (2014), sustainable development movement is a path of human progress which meets the needs and aspiration of the present generation, without compromising the ability of future generations to meet their needs. While many nations around the world have embraced higher science education to achieve sustainability, a lack of vision and awareness has impeded progress in Nigeria. This can be partially attributed to lack of planning, proper supervision and implementation of well-designed policies. By addressing these critical issues, the Nigerian governments can prevent or reduce delays or derailment of sustainable higher science education development and ultimately attain sustainability. To achieve this in Nigeria the relevant focal points for sustainable science education development must be identified and addressed.

Oyebode, Oladipo and Adetome (2008) opined that everyone has a role to play in ensuring good implementation of science education and its sustainability. One of the key building blocks of quality science education is the development of standards as in qualification of teachers, the quality of teaching in institutions, expected educational achievement of students and development of a more rigorous management process for education so that the entire sector develop stronger operating policies, procedures which are well documented and adhered to with time. This will develop into a total management system for higher science education in line with what is practiced internationally.

### **Challenges of Science Education in Higher Institutions**

Nigeria has many higher educational institutions, which are facing challenges that require the intervention of various stakeholders: national governments and development partners in order for the students to contribute effectively to the work force. Several factors pose as challenges to higher science education implementation. The factors include:

#### **1. Inadequate Funding**

This is the most critical challenge that has threatened the attainment of good quality science education in higher institutions in Nigeria. The success of any science education in Nigeria according to Asiyai, (2013) will depend largely on funding. This is because inadequate funding militate the provision of good implementation and sustainability of higher science education. Many institutions of higher learning in Nigeria are not able to build adequate lecture halls, students' hostels, equip laboratories and workshops, pay staff salaries, fund researches, pay allowances and medical bills.

#### **2. Inadequate Teaching Staff**

According to Chinyere (2015) one of the major challenges to the implementation of higher science education in Nigeria is the problem of inadequate academic staff.

Teachers determine the implementation and sustainability of higher science education because they transmit educational policies into practice and action. Without adequate number of inspiring and well informed teachers who are fully prepared to meet their responsibilities in our schools, we cannot have good implementation of higher science education and without good higher science education; we cannot competitive with other nations.

### **3. Frequent Labour Disputes and Closures of Universities**

A big challenge to the implementation of science education in Nigeria higher institutions of learning is the incessant disputes between government and staff unions which many times lead to closure of academic institutions. This usually affects staff productivity and the realization of educational aim and objectives for sustainability. The disruption of academic programme of institutions of higher learning affects students learning outcomes; science lecturers among other lecturers find it difficult to complete the course work. The frequent disputes and strike galore by university staff leaves students with little time to complete both theoretical and practical work. In most cases a semester's course work is sandwiched to few weeks during which lecturers are rushed to accommodate the time lost strike. This type of academic rush is a big threat to sustainability of higher science education implementation in Nigeria institutions. Therefore, the higher level of crisis, disruptions and hostility, lower the level of productivity.

### **4. Class size**

For quality teaching of science education in higher institutions of learning, Jepsen, (2015) opined that the class size must be small for effective students/teacher interaction, not over crowded with majority of the students standing at the corridors during lecture, In some institutions, science laboratories are empty they lack equipments needed for effective teaching of science education courses. It is not uncommon to see a student graduating from chemistry without handling volumetric analysis apparatus, doing quality research among others. The desirable conditions of institutions of learning in Nigeria have been worrisome to many science education scholars.

### **5. Lack of or Inadequate Library Facilities**

Library as an important department of any institution helps to promote the growth of knowledge and learning. It helps to promote professional development. (Ozigi, 2007) further maintained that, the library is an integral part of the school which compensates for inherent textbooks and other valuable teaching materials. For proper implementation and sustainability of science education in higher institutions in Nigeria, there should be a standard library stocked with latest textbooks and other relevant learning materials.

#### **6. Lack of Resources**

Jiya, (2013) reported that lack of ideal resources for science education in Nigerian higher institutions has been a major problem that affects students' performance in science. It is well known that the quality of education a student receives largely depends on the quality of teaching resources available. Classrooms, laboratories and general learning environment must be improved upon if good implementation and sustainability of science education is to be achieved in higher institutions in Nigeria.

#### **7. Quality of Teaching**

Quality science education teaching lies at the teacher's capacity to transform written knowledge into forms that are pedagogically powerful and yet adaptive to the students' abilities and backgrounds. Ayodele, (2006) identified the use of inappropriate and non effective teaching methodology as a major factor hindering students understanding and performance in science education. Onose, (2009) posited that many inexperienced teachers teach science in abstraction, thereby making science lessons boring and the students finding it difficult to grasp scientific concepts, skills and principles. Ogbeba, (2010) observed that most teachers emphasize theory rather than practical aspects of science subjects and most of them lack adequate knowledge of subject matter and the competence to deliver. In addition, they stress that the teaching of science education has been reduced to a descriptive exercises through the use of lecture method and very little inquiry.

#### **8. Inadequate Use of Research and Review**

The presence of vibrant research machinery is essential for the success of science education implementation and its sustainability in higher institutions in Nigeria. Although, some higher institutions of learning in Africa are making attempts to perform these functions, more is still expected of science education in higher institutions in Nigeria. The Nigerian government is not adequately utilizing the findings and suggestions from the available researches for review of situations in the science education implementation and sustainability in the education sector. Application of research findings can contribute greatly to the development of Nigeria.

#### **Objective of the study**

The study has the following objectives to:

1. find out the challenges that hinders sustainable implementation of higher science education.
2. find out possible solutions to help improve higher science education implementation

#### **Research Question**

1. What are the challenges that hinder sustainable implementation of science education in Nigeria higher institutions?

2. What solutions could be implemented to improve science education in Nigeria higher institutions?

### **Methodology**

The study investigates global challenges and implementation for sustainable higher science education. A descriptive survey was used. Population of the study comprised all the BSc. (Ed) undergraduate students of Niger State College of Education, Minna affiliated to Ahmadu Bello University, Zaria in Nigeria. A total of 252 students comprising of 136 males and 116 females made up the population of the study. Intact classes students' results were used to find out students that were able to graduate with first class, second class upper, second class lower and those with pass degrees. Also, structured questionnaire made up of 1- 15 questions with four items options was used to collect data, Likert four (4) point type of rating scale that ranged from agree, strongly agree, disagree, strongly disagree, and questions were validated by an expert in science education from ABU Zaria. 50 students were randomly selected and were used as respondents. 50 questionnaires were distributed and collected. The research instruments were subjected to scrutiny by research experts in order to establish the validity of the research. The instrument has reliability coefficient of 0.68 were given to science education undergraduate students to collect information on possible challenges and implementation issues.

### **Results and Discussion**

1. What are the challenges that hinder sustainable implementation of higher science education of afflitted Ahmadu Bello University students in college of education Minna?

**Table 1: Results of Final Year Degree Students for 2014/2015 Academic Session**

<b>CLASS OF DEGREE</b>	<b>NUMBER OF STUDENTS</b>	<b>PERCENTAGE</b>
First Class	0	0
Second Class Upper	5	5.21
Second Class Lower	16	16.67
Third Class	15	15.63
Pass Degree	0	0.00
Others	60	62.50
<b>Total</b>	<b>96</b>	<b>100</b>

**Source:** Examination Office Directorate of University Affiliated Programme (DUAP) ABU Zaria Programme, College of Education, Minna

**Table 2: Results of Final Year Degree Students for 2015/2016 Academic Session**

<b>CLASS OF DEGREE</b>	<b>NUMBER OF STUDENTS</b>	<b>PERCENTAGE</b>
First Class	0	0
Second Class Upper	4	5.88
Second Class Lower	19	27.94
Third Class	11	16.18
Pass Degree	0	0.00
Others	34	50.00
<b>Total</b>	<b>68</b>	<b>100</b>

**Source:** Examination Office – DUAP ABU Zaria Programme, College of Education, Minna

**Table 3: Results of Final Year Degree Students for 2016/2017 Academic Session**

<b>CLASS OF DEGREE</b>	<b>NUMBER OF STUDENTS</b>	<b>PERCENTAGE</b>
First Class	0	0
Second Class Upper	15	17.05
Second Class Lower	25	28.41
Third Class	10	11.36
Pass Degree	1	1.14
Others	37	42.05
<b>Total</b>	<b>88</b>	<b>100</b>

**Source:** Examination Office – DUAP ABU Zaria Programme, College of Education, Minna

**Table 4: Degree Students' Performance Progression between 2014 – 2017 Academic Sessions**

<b>CLASS OF DEGREE</b>	<b>2014/2015</b>	<b>2015/2016</b>	<b>2016/2017</b>	<b>TOTAL</b>	<b>PERCENTAGE</b>
First Class	0	0	0	0	0.00
Second Class Upper	5	4	15	24	9.52
Second Class Lower	16	19	25	60	23.81
Third Class	15	11	10	36	14.29
Pass Degree	0	0	1	1	0.40
Others	60	34	37	131	51.98

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Total	96	68	88	252	100
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**Source:** Examination Office – DUAP ABU Zaria Programme, College of Education, Minna

The findings of the study as shown in the tables above indicate that there is low performance in science education at higher institutions of learning in Nigeria. There is decline in science education students' performance from the year 2014 to 2017 as seen in the tables above. Within these years there is no student that graduated with first class grade, few had second class upper and lower degrees, fewer students graduated with third class grade degree while those who either dropped out or still having courses to pass constitute 51.98% of the total students' population. Within these three years, only 48.02% of the students graduated. This finding further reveals the need to look into challenges and implementation of science education at our higher institutions.

Items in the questionnaire administered from which respondents are expected to tick strongly agreed (S. A), agree (A), strongly disagree (S. D) or disagree (D) as presented below:

**Table 5: Responses on Factors affecting Science Students Performance**

S/No.	ITEM	S. A	A	S. D	D
1.	Well-equipped science laboratories.	1	2	30	5
2.	Suitable ICT resources for teachers use.	1	1	32	4
3.	Insufficient qualified teachers.	15	20	2	1
4.	Insufficient instructional materials.	1	1	35	1
5.	Insufficient library facilities.	20	10	3	5
6.	Students' attitude towards learning.	25	10	1	2
7.	Lack of use of innovative teaching strategies.	20	15	2	1
8.	Mark student's work and give back quickly.	5	25	5	3
9.	Little opportunity for outside school experience.	30	7	0	1
10.	Curriculum relates to scientific content to students'	1	2	30	5
11.	everyday life.	3	5	15	15
12.	There are reliable internet connections for research.	1	1	25	11
13.	Lack of adequate inspection and supervision.	5	8	15	10
14.	Students are allowed to conduct their own investigations.	10	15	7	6
15.	Lack of parental guide.	4	4	25	5
	Gender equality.				

**Source:** Field Survey, 2018

Fifty (50) questionnaires were distributed to the respondents, but only 38 questionnaires were returned. From the responses, most of the students disagree with well – equipped science laboratories, suitable ICT resources, sufficient instructional materials, curriculum related to scientific content to students' everyday life, students allowed to conduct their own investigations and gender equality. Some students strongly agreed with the following items; insufficient qualified teachers, insufficient



library facilities, students' attitude towards learning, lack the use of innovative teaching strategies, little opportunity for outside school experience and lack of parental guide, teachers not able to mark students' work and return it to them on time.

From the findings of this study, most of the information collected shows that the mentioned items are very important for effective implementation of higher science education for national development in Africa.

The findings of the study reveal that there is decline in students' performance in science courses in higher institutions of learning; this is attributed to certain challenges or problems. Most science education courses are made to be seemed abstract, difficult, boring and counter intuitive ideas that generate unscientific preconception in students thereby resulting into poor academic performance.

Result of this study are in line with the findings of Jiya (2013), Olurokooba, Lawal and Lapkin(2017) who observed that students perform better when taught where new innovative strategies are used. Ngoboka (2002) states that student academic performance is higher in the normal class size, controlling for the other predictions of students learning. Yelkpieri, Namale, Kweku, Eri(2012) gathered views from lecturers to assess the extent to which large class size affects the performance and quality of teaching of students, the weaker students are not attended to. Students may find it difficult to understand the lesson, to organize quizzes and class tests regularly become difficult. To ensure effective teaching, lecturers must necessarily assess students and involved even the weak ones. Kaptan (2012) opined that some of the problems to be overcome for a sustainable and proper science education are; inadequate teacher compensation and professional development to attract prepare and retain high quality teachers, the huge number of students in the class, insufficient physical conditions of school, intensive curriculum among other challenges. High level training is the facilitator, the power house, the bedrock and driving force to social economic development of any nation.

### **Conclusion**

From the findings of this study, it can be concluded that government wakes up to its responsibility of provision of basic science resources that will lead to effective science content delivery, performance of science education will not improve. Implementation of sustainable higher science education in Africa is the only panacea that will help meeting up with today's challenges.

### **Recommendations**

1. Reform in existing science education in Nigeria higher institutions can be promoted through deliberate collaborative efforts between government, civil society, business sectors and the academia. So as to help reinvent Nigerian science education for better quality delivery in research, teaching and community services.

2. Higher education institutions should be revised to ensure that more emphasis is on teaching effectiveness of lecturers for better quality science education.
3. Ways of generating money to fund all aspects of science disciplines should be evolved and utilized by the government.
4. Classrooms interactions which will enable both males and females achieve in science disciplines should be adopted for sustainable science education.
5. Adequate training and retraining is very necessary for effectiveness.

### **References**

- Anya, A. (2008): "Education, Scholarship and the wealth and Health of the Nation: The Search for the Dialectics of Sustainable Development". A Valedictory Lecture; University of Nigeria, Nsukka
- Asiyai, R (2013). Assessing School Facilities in Public Secondary Schools in Delta State, Nigeria. *African Research review International Multidisciplinary Journal*, 6(2), 192 – 205.
- Ayodele, O. O (2006). Building a Sustainable Science Curriculum in Nigeria: Accommodating Local Adaptation, Leveraging Technology and Enhancing Areas of Improvement for Quality Assurance. *Journal of Science Teachers Association of Nigeria*. 1(7).
- Enamiroro, P. O (2007). Family History: A Tool for Adequate Management of Pupils and Students in Schools. Doi:10.1080/09718923.2007.11978366.
- Jiya, A, Olurokooba, S. B, Lawal F. K and Lakpini, M. A (2012). Impacts of Collateral Teaching Strategy on Unscientific Preconception and Performance in Evolution Concepts among NCE Biology Students. *Journal of Education Research*, 1(1).
- Jiya, A (2013). A Survey of Relationship between Teachers Qualification and Students Academic Performance in Biology in Selected Senior Secondary Schools in Minna Town. A Seminar Paper Presented in Science Education Department, Ahamdu Bello University (ABU), Zaria.
- Kaptan, K (2012). Challenges for Science Education. <https://doi.org/10.1016/J.sbspro.2012.08237>

- Materu, P. N. (2007). *Higher Education Quality Assurance in Sub-Saharan Africa: Status, Challenges, Opportunities and Promising Practices*: World Bank Publications.
- Ngoboka, P (2002). The Effects of Class Size on Students' Academic Performance in a Principle of Microeconomics Course. Proceedings of the Midwest Business Economics Association. Retrieved from <https://www.usi.edu/media/3655163/Effects-of-Class-Size.pdf>
- Nzekwe, F. and Okeke, R. (2014): "Energy Security and Sustainable Development in Nigeria: Prospects and Challenges" Forthcoming
- Ogbeba, J (2010). Teachers Awareness and Utilization of Innovative Teaching Strategies in Secondary Schools Science in Benue State. *Journal of Educational Research*, 5(8), 839 – 842.
- Onose, G.M. Okogun. E. A & Richard, J. (2009). Reforms and Innovation in Training and Retraining of Science and Mathematics Teachers to Meet with the Challenges of Global Development. *Journal of Teacher Perspective*. 3 (2).
- Oriose, G. M, Okogun, E. A and Richard, J (2009). Reforms and Innovation in Training and Retraining of Science and Mathematics Teachers to Meet with the Challenges of Global Developing. *Journal of Teacher Perspective*, 3(2).
- Oyebade, S.A, Oladipo, S.A. and Adetoro J.A (2007) Determinants and Strategies for Quality Assurance in Nigerian University Education System. *East African Journal of Educational Research and Policy* 2, 63-81.
- Ozigi, G (2007). Computer Literacy and Teacher Job Effectiveness in Kwara State Secondary Schools.
- Peretomode, V. F (2007). Manpower Development and Lecturers' Productivity in Tertiary Institutions in Nigeria. Retrieved from <https://www.researchgate.net/publication279>
- Yelkpiri, D, Namale, M, Kweku, E and Eri, O. D (2012). Effects of Large Class Size on Effective Teaching and Learning at university of Winneba, Ghana. *Higher Education Research*, 3, 319 – 332.