"SCIENCE EDUCATION IN NIGERIA: THE EMERGENCE, CHALLENGES AND EXPECTATIONS"

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By

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Preamble / Introduction

The Vice-Chancellor,
The Deputy Vice-Chancellor (Academic),
The Deputy Vice-Chancellor (Administration),
The Deputy Vice-Chancellor (Research, Innovation and Development),
The Registrar,
The Bursar,
The Librarian,
The Provosts,
Deans of Faculties,
Directors of Programmes,
Heads of Departments / Units,
Professors and Other Members of the Senate,
Royal Fathers Present,
Distinguished Colleagues,
Staff and Great Ife Students,
Invited Guests,
Gentlemen of the Press,
Ladies and Gentlemen

It is with great pleasure and a heart full of gratitude to the Almighty God that I stand before you to give an account of my stewardship in the business of Science Education within the last two decades of my transactions. This is the 392nd Inaugural Lecture in the University. I feel honoured and humbled to present today the 17th Inaugural Lecture in the Faculty of Education and the fifth in the Institute of Education since its inception in 1967. The inaugural lectures and lecturers from the Institute of Education, Obafemi Awolowo University, are summarized in Table 1.

Table 1. Inaugural Lectures from the Institute of Education, Obafemi Awolowo University, Ile-Ife

S/N	NAME	TOPIC	YEAR
1	Professor F.O. Aladejana	Teaching and Learning Science: Imperatives of Specialised Pedagogy in a Changing World	April 14, 2015
2	Professor J.O. Adeyanju	From the Studio to Overcrowded Classroom: The Use of Media-Arts and Technology for Instructional Process Enhancement in Nigeria	March 3, 2020
3	Professor B.A. Adeyemi	That I May Learn a Multi-Disciplinary Approach Discipline – Social Studies: Jack of all Trade, Master of All	November 8, 2022
4	Professor T.O. Bello	Journey Through the World of Physics: The Content, The Curriculum and The Pedagogy	August 13, 2024

I started my academic career at Obafemi Awolowo University, Ile-Ife, as an Assistant Lecturer in the Institute of Education on August 1, 2006. To the glory of God, I became a Professor of Science Education on October 1, 2021. My choice of teaching as a career was a divine one, and also that of predestination; I found myself studying Education Chemistry, which was not my dream course; I had wanted to study Industrial Chemistry. An administrative staff, Mr. Afolabi Ajayi, Faculty of Education, Ogun State University, Ago-Iwoye (now Olabisi Onabanjo University), whom I met in 1990 at the Faculty of Education while seeking admission to the institution, looked at my O' Level results and chose Education Chemistry for me. I was unhappy with the course, but little did I know I was on the path to achieving destiny. Again, when seeking postgraduate admission into Obafemi Awolowo University, Ile-Ife, in 2000, I wanted to study Tests and Measurement but later changed it to Curriculum Studies. However, before submitting the postgraduate form, one of our family friends, Mrs. Olowokure,

accompanied me to the then Dean of the Faculty of Education, the late Professor J. O. Fawole, for advice, again, the Dean also chose Education Chemistry for me.

When I started my postgraduate programme, I came in contact with Professor O. J. Ehindero, who was then the Dean of the Faculty of Education after the expiration of the late Professor J. O. Fawole's tenure. When he saw my course form, he told me that the Institute of Education had a vacancy for a Chemistry graduate willing to take the Chemistry aspect of their Mathematics/Integrated Science programme. To the glory of God, I was appointed in 2006. It was after my appointment that I realized the actual plan of God for my life, and my professional journey into science education began.

In 2022, my late husband, Professor Femi Kayode Agboola, encouraged me to deliver my Inaugural Lecture immediately after my pronouncement as a Professor, which I was not keen on. Still, after much persuasion, we both worked on the title and barely some months later, he passed on. It was a very harrowing experience for me; his sudden departure was most devastating, but today, to the glory of God, his desire is being fulfilled. Thus, the title: **"Science Education in Nigeria: The Emergence, Challenges and Expectations"** is hereby presented.

This title is relevant today because the country is undergoing significant demographic changes, with a rapidly growing youth population that requires a robust educational framework to meet their needs. As Nigeria aims to diversify its economy and reduce dependency on oil, there is a heightened demand for a skilled workforce in science and technology. Nigeria is behind in Science and Technology education in the Committee of Nations. It is a known fact that Science and Technology have a symbiotic relationship. Science produces an abstract commodity of knowledge, which becomes the raw materials for technology. Thus, whatever bedevils science will bedevil technology, as one cannot be taken from the other. If the narrative will change, the solutions

for technological advancement reside primarily in science education. However, science education cannot be improved, nor can acquisition be enhanced without viewing it through historical lenses. It becomes imperative, therefore, to trace and examine the metamorphosis of science education not just globally but within the Nigeria context in particular; knowing how science education evolves in Nigeria becomes the first step in advancing appropriate intervention strategy, identifying the daunting challenges of science teaching goes beyond armchair pontification but rather a product of empirically verifiable findings. When and until this is achieved, we can then proffer solutions that will place Nigeria on the global map of technological breakthroughs. Society has expectations, and how these expectations will become realities has been the thrust of my research over the years.

According to the National Policy on Science and Technology Education (2018), the long-term objectives are to:

i. ensure that young people entering the Nigerian workforce of the 21st centuries have the knowledge and skills necessary to promote economic, scientific and technological development;
ii. give the 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;
iii. ensure that products of Nigerian Science & Technology Education programmes can compete favourably at the global level; and
iv. provide employers with the skills and competencies required for competitiveness and sustainable economic self-reliance.

The question is, "Can Science Education in Nigeria achieve these objectives today?" The answer is glaringly evident in the state of science education in Nigeria.

Mr. Vice Chancellor sir, a philosophical phrase that has motivated me for many decades states thus: "Humans are the sole drivers of change." This quotation reflects the roles of education in the lives of human beings. Nelson Mandela stated, "Education is the most powerful weapon to change the world." There might be many weapons to change the world, but education is at the forefront. Education is not preparation for life but life itself (John Dewey, 1916). A nation's development potential depends on educating its people and creating a skilled workforce (Agboola, 2011). Education brings about learning, and learning is a tool that brings about positive changes in people's lives and reflects the experiences we have had and will have in the future. This is because learning is seen as everything that man thinks and does anytime, every time and daily (Adeyanju, Ajayi and Agboola, 2009).

Science is derived from the Latin word "Scientia," which means what to know, what a fact, truth or specific is. Science is a body of knowledge and processes studied for the possibilities it offers for the development and advancement of Technology. It is the branch of knowledge empirically acquired through observation, experimentation, tests and logical analysis. "Science is the bedrock upon which any nation can be built." The building and development of a nation are based on science, and without science, no nation can advance (Onah, 2003). Although science is as old as man, records indicate where and how science started. History reveals that science has its roots in Mesopotamia and Ancient Egypt between 3000 to 1200 (B.C.). The Ancient Egyptians were known for creating scientific principles that birthed subjects such as Mathematics, Astronomy, Medicine, Mummification, Engineering, Architecture, Agriculture, and Fermentation. The Egyptians were committed to building pyramids, storing their food systematically, and using horses for chariots. These developments were based on innovations (Rochberg, 2018).

The second emergence of science started in the 16th Century and resulted from the Copernicus-Newton Revolution. This revolution

brought about a paradigm shift in how people think based on the heliocentric model. The works of Newton started to increase scholars' ability to understand how the world works and the principles it applies to future developments. Sir Isaac Newton, famous for the invention of calculus, the law of motion, and the universal law of gravitation, is one of the foremost scientists in the world. Newton asserted that applying science is crucial to promoting sustainable societal changes (Huff, 2016). The Industrial Revolution, 1760-1840, also contributed to the solidification of science. During this time, Great Britain enhanced the practicality of scientific methods and procedures. The industrial revolution is primarily linked to the growth of technology for industrial activities. One of the foremost contributors to the popularity and peculiarities of technology is Francis Bacon, a natural philosopher. He created three global technological innovations: gunpowder, the printing press, and the magnetic compass (Moran, 2010). These developments are celebrated today and have become better and more extensive. For instance, Thomas Edison invented the Light Bulb after trying it many times (Aamodt, 2010). Based on this successful intervention, there are gigantic developments in today's world in tandem with Edison's work. The likes of power generators, inverters, and cars are improved technological developments based on the tents of ancient technologists. Therefore, technology has begun to solve the human world's technical problems. In addition, technology started by creating food preparation mechanisms, hunting, and survival (Rochberg, 2014).

Science education is the process of helping students to develop a deeper understanding of the natural world and to acquire the skills and attitudes necessary to participate in scientific inquiry and to make informed decisions about scientific issues (Osborne and Dillon, 2008). Also, according to Harlen (2010), science education was defined as helping students develop their understanding of the natural world and acquire the skills and attitudes necessary to participate in scientific inquiry and make informed decisions about scientific issues. However, with a broader perspective, the National

Research Council (2012) defined science education as teaching and learning about the natural world, including the physical life, earth sciences, Engineering, Technology, and Mathematics. To achieve the all-round objectives of science education, UNESCO (2017) defined science education as acquiring knowledge, skills, and attitudes necessary to understand and address the complex scientific and technological challenges facing society. Science education or pedagogy of science involves the methods and strategies used to teach science effectively. It focuses on helping students develop a deep understanding of scientific concepts, critical thinking, problem-solving skills, and an appreciation for the role of science in everyday life. The goal is not just to transfer knowledge but to nurture a scientific mindset, enabling students to explore, question, and analyse the world around them. These definitions present science education as an instrument which develops students' understanding of the natural world, acquiring scientific literacy, and preparing them to participate in scientific inquiry and make informed decisions about scientific knowledge.

Key Features of Science Pedagogy

a. **Inquiry-Based Learning:** Inquiry-based learning places students at the centre of the learning process, encouraging them to ask questions, explore, and investigate. Agboola and Abe (2017) purposed to find out the effects of inquiry-based and field-trip instructional strategies on pupils' learning outcomes in Basic Science. The study found that inquiry and field-trip strategies improved pupils' attitudes towards Basic Science.
b. **Hands-On Experiments:** Practical activities and experiments are integral to science education. They allow students to directly engage with materials and observe outcomes, making abstract concepts more concrete. For example, conducting a chemical reaction in a laboratory reinforces theoretical knowledge and teaches scientific techniques and safety protocols.

c. **Interdisciplinary Approach:** Science often intersects with other disciplines, such as Mathematics, Technology, and Social Sciences. For example, studying climate change might involve understanding scientific data (science), calculating carbon emissions (Mathematics), and examining its impact on societies (Social Studies). This approach helps students see the interconnectedness of knowledge.
d. **Use of Technology:** Technology enhances science education by providing tools such as simulations, virtual laboratories, and multimedia resources. For example, a virtual dissection app can allow students to explore anatomy without needing physical specimens. These tools make learning more interactive, accessible, and engaging.
e. **Constructivist Approach:** A constructivist approach builds on what students already know. Teachers guide students to connect new information with existing knowledge, fostering more profound understanding. For instance, students learning about the water cycle might first discuss their rain, evaporation, or dew observations.
f. **Collaborative Learning:** Collaboration encourages students to work together to solve problems, share ideas, and conduct experiments. Group projects, such as designing a sustainable energy solution, foster teamwork, communication, and a sense of collective achievement.
g. **Real-World Context**: Science Education becomes more meaningful when linked to real-life applications. For instance, teaching about renewable energy sources can include discussions on current environmental challenges, encouraging students to think about solutions to global issues.
h. **Assessment for Learning:** Assessments in science education are not just about grading but are used to guide and enhance learning. Formative assessments,

such as quizzes, observations, and peer reviews, help teachers identify areas where students need additional support.

Goals of Science Pedagogy are to:

- **Develop Scientific Literacy:** Equip students with the ability to understand and evaluate scientific information, enabling them to make informed decisions in their personal and civic lives.
- **Foster Curiosity and Creativity:** Encourage students to ask questions, seek answers, and think creatively about solving problems.
- **Enhance Problem-Solving Skills:** Teach students to analyse situations, gather evidence, and develop logical solutions.
- **Prepare for Future Challenges:** Develop essential skills, such as critical thinking, adaptability, and collaboration, in a rapidly advancing technological world.

Emergence of Science Education in Nigeria

Science education in Nigeria has a rich historical background that reflects the country's broader educational and socio-political developments. The roots of science education can be traced back to the colonial era when British educational policies began to shape the Nigerian education system (Babajide, 2015). Initially, education in Nigeria focused primarily on religious instruction and basic literacy. Nigeria's journey to independence and beyond is a fascinating story. A brief overview of the pre- and post-independence historical background of science education in Nigeria is hereby presented.

Pre-independence Period

The Christian missionaries brought Western Education into the country around 1843. These missionaries established some schools, such as the Church Missionary Society (CMS) Grammar School in Lagos, the Roman Catholic Missionary School in Benin,

the Wesleyan Methodist School in Badagry and many others. Some rudiments of science education were introduced into the secondary school curriculum, such as General Science, Nature Study, Arithmetic, Algebra, Geometry and Physiology. In addition to these schools, some teacher training and pastoral, agricultural, and vocational institutes were founded. Examples were the Hope Waddle Institute in Calabar, founded in 1861 and St Andrew College Oyo, founded in 1899. All these institutions had science education in their curriculum. At the primary school level, the rudiment of science was taught as Nature Study, while it was taught as General Science at the secondary school level. The science students at the tertiary level then depended on the products from secondary schools. There was a wide gap between ordinary and advanced levels, which made few science students qualify for university admission, and only a few science graduates returned to classes to teach science. These inadequacies were observed by the Ashby report of 1959, which recommended an enriched curriculum to ensure the relevance of students to local workforce development.

The teaching of science gained better ground in 1920 due to the visit of the Phelps-strokes-funded education commission to Africa, which found that science education was deficient. They, therefore, recommended the inclusion of science subjects in the curriculum of all secondary schools in Nigeria. Even then, very few qualified science teachers were in schools, and the teaching methods were unsatisfactory. The contents of science were dictated by external examination boards (Cambridge and London) with little or no regard for the Nigerian environment. The education ordinances of 1960 brought slight improvement in the science education content in Nigeria. Different examination bodies were set up in 1952, with its headquarters in Accra, Ghana, following the Jeffrey report of 1950. The board later became the West Africa Examination Board (WAEC), which revised the curriculum of school subjects, including science, and had its first examination in 1955. Professional bodies such as the Science Teachers' Association of Nigeria (STAN) were also established on November 30, 1957. This

body reviewed the WAEC and Higher School Certificate (HSC) science curriculum 1958. The Federal Government of Nigeria established other Colleges; the Federal College of Arts, Science and Technology was established in Ibadan in 1950, Zaria in 1952, and Enugu in 1954. These colleges administered fairly comprehensive curricula in science education and science-related fields such as Architecture, Engineering and Pharmacy. The launch of the space satellite (Sputnik) by the Soviet Union in 1957 was a remarkable development of science in the world, and this resulted in the development of the science curriculum effort by the Western World. This innovation led to the awareness of re-examining the school science curriculum objectives, content and evaluation. In the early 60s in Nigeria, the science curriculum was geared towards fulfilling overseas examination requirements. A clear pattern for science project development at the Primary and Junior secondary levels has recently been integrated. Still, the emphasis has been on inquiry and problem-solving activities at the senior secondary schools.

Figure 1: The First Primary School in Nigeria (Saint Thomas Nursery/Primary School, Badagry)

Figure 2: The First Grammar School in Nigeria (Church Missionary Society (CMS) Grammar School)

Post-independence Period

After independence, there were several conferences to identify science education problems and deliberate on improving science teaching and learning. One of such conferences was the National Curriculum Conference of September 8-12, 1969, which gave birth to the science curriculum and other different types of curriculum reforms in education. It also brought about the new National Policy on Education in 1977, revised in 1981, 1998 and 2004. The innovations in the fourth edition were the introduction of information and technology education (ICT), the repositioning of science technology and vocational Education. The national policy ushered in the 6-3-3-4 System of Education and the Universal Primary Education. So many materials in science were produced for primary and secondary levels, such as the Nigeria Secondary School Science Project (NSSSP) was developed by the defunct Comparative Education Study and Adaptation Centre (CESAC), now merged into the Nigerian Educational Research and Development Centre (NERDC) and Science Teacher Association of Nigeria (STAN) for secondary schools.

The Nigerian Integrated Science Project (NISP) and the National Primary Science and Mathematics Project (NPSMP) for primary

school science were also produced. This curriculum was student activity-based. There were innovations in theory and practice in the student-activity-based curriculum. The training of science teachers during the long vacation holiday and the development of standard equipment as the minimum standard for science education in Nigeria are the two significant undertakings embarked upon by STAN and NERDC. The training of teachers was mainly on methodology and improvisation of instructional materials. Government policies aimed to encourage science education at all levels (Ivowi, 1990).

The Federal Government of Nigeria through the National Policy on Education (NPE) emphasized the importance of science and technology education at all levels; at the primary school level, science education aims to lay sound knowledge in scientific and reflective thinking (FRN 1989;8). There was inculcation of literacy and numeracy and the study of science and introductory technology. The government planned to provide materials and teachers for teaching science and technology. At the secondary school level, the aim is to prepare students for a useful life in society and higher Education. The science policy aims to equip students with adequate scientific knowledge to live effectively in modern science and technology. Integrated science is offered as a core subject at the Junior Secondary School (JSS), and science subjects such as physics, chemistry and biology are part of the core subjects at the senior secondary school (SSS) level.

The higher education level aims to develop a higher-level workforce for the nation. Government policy at this level is that the science course content is with a professional career and must reflect the national requirement through consultation among universities. A broad-based and strong scientific background is expected of a university system. Hence, a more significant portion of education expenditure is devoted to science, and university admission is fixed at 60:40 for science students to art students. The government has consistently given priority attention to science and technology. There is a lower basic science and technology

curriculum for primary 1-3, a middle basic science curriculum for primary 4-6, and an upper science basic curriculum for junior secondary school. At the senior secondary level, there is senior secondary school education (science /Mathematics curriculum and senior secondary school education (technology) curriculum. The new curriculum was pilot-tested in 2008-2011, and the lower, middle and upper science curriculum was found to be overloaded (Awofala & Shopekan, 2013). Hence, it was rectified, and a new curriculum was implemented in 2013.

In recent years, there has been a renewed focus on Science, Technology, Engineering, and Mathematics (STEM) education to better prepare students for the demands of the modern world. This shift promotes critical thinking, problem-solving skills, and innovation among Nigerian youth. Overall, the historical background of science education in Nigeria reflects a journey of evolution, adaptation, and ongoing challenges, reflecting the nation's goals of self-development and global competitiveness.

Current Status of Science Education in Nigeria

The status of science education in Nigeria varies significantly across the primary, secondary, and tertiary levels, reflecting broader educational challenges in the country. At the primary level, science education is often integrated into the general curriculum and taught as a discrete subject, but mainly by teachers who may not have a strong background in science, which can impact their ability to teach the subject effectively. Pupils' achievement, therefore, varies with teachers' mastery of the subject matter, which varies from teacher to teacher. There is a focus on basic scientific concepts, but limited resources, inadequate teacher training, and outdated learning materials hinder its teaching effectiveness (Adeyinka and Afolabi, 2015; Adeyemi and Agboola, 2017). The curriculum at this level is oblivious to the need for laboratories; thus, hands-on learning experiences are lacking. The situation is similar in junior secondary schools, where basic or integrated science is taught, and there are almost no laboratories. Thus, basic science is not sufficiently preparatory for exemplary performance

at the senior secondary level, where biology, chemistry, and physics are offered.

Urban schools often have better facilities and trained teachers than rural ones, focusing on rote learning over critical thinking and practical skills remains challenging, and many students struggle with standardized examinations due to insufficient preparation and resource disparities (World Bank, 2018).

Biology is an important subject in senior secondary school, especially considering its relevance in understanding life sciences, health, and environmental issues. However, it is no longer compulsory for non-science students in senior secondary schools. The situation is now different; the reason behind the curriculum review is that non-science students do not need scientific knowledge in their professional practice; this reason is not without flaw. Reintroducing biology into the curriculum for non-science students in Nigeria is important for several reasons. It enhances health literacy, critical thinking and scientific literacy, equipping students with the skills to analyse and interpret information. A foundational understanding of biology also promotes environmental responsibility and awareness of sustainability issues. It also emphasizes the interconnectedness of various disciplines. For example, many non-science disciplines, such as psychology and sociology, benefit from a foundational understanding of biology, showing how biological concepts can enrich these fields. Ultimately, incorporating biology into the curriculum equips non-science students with valuable skills and knowledge that contribute to a more informed and responsible society.

Approaches to science teaching in Nigeria appear disconnected from global best practices and contemporary trends. For example, trans-contextualization, an approach that extends science learning beyond the classroom to address real-world societal concerns and encourages students to develop action plans and engage in persuasive actions to promote positive change, appears alien to our

classrooms. Also, science teaching practices in our nation do not combine constructivist and humanist approaches to learning. This has been found beneficial in empowering students to take action on social and environmental issues while promoting self-actualization and self-efficacy.

The Federal Ministry of Education has promoted science education at the tertiary level through initiatives like the National Teacher Education Policy and the Needs Assessment of Nigerian Public Universities. However, challenges still exist, such as declining student enrolment in science courses, insufficient funding for research and development, sometimes outdated academic materials and inadequate laboratory equipment. Where they exist, they are often poorly maintained. In Obafemi Awolowo University, for example, an asthmatic might not find it convenient to pass by the Chemistry Department in those days due to the odours of the chemicals and reagents. However, today the Chemistry Department does not smell differently from the Faculty of Law.

Green chemistry is gaining popularity in Nigeria as awareness of environmental issues and sustainable practices increases. Many educational institutions and organizations are starting to incorporate green chemistry principles into their curricula and research. Additionally, there is a growing interest in developing eco-friendly technologies and processes in various industries, such as agriculture, pharmaceuticals, and manufacturing. However, challenges like inadequate funding, infrastructure, and policy support continue to affect the country's widespread adoption of green chemistry practices. While it is not yet mainstream, the movement toward green chemistry is steadily progressing in Nigeria. Global trends in science education are shifting towards more innovative, inclusive and technological-driven approaches.

The current status of science education in Nigeria reflects a mix of challenges and opportunities. While there have been positive developments in science education in Nigeria, significant issues still hinder the effective teaching and learning of science.

Addressing the existing challenges is crucial for enhancing the quality of education and preparing students for future scientific endeavours. Continued government, educator, and community efforts are essential to driving improvements in this sector.

Challenges Facing Science Education in Nigeria

Mr. Vice Chancellor sir, distinguished audience, science education in Nigeria faces numerous challenges despite its objectives. Some of these problems vary depending on the perspective the expert focuses his/her attention. Some of these problems include inappropriate teaching methods, students' poor attitudes towards science, brain drain and teacher migration, teachers' attitudes; politics of education, underfunding of education by the government; misalignment with industry needs, inadequate professional teachers, deplorable conditions of science learning infrastructures such as inadequate or lack of laboratories; science textbooks; libraries; internet facility; science equipment and reagents; teachers poor remuneration and poor leadership, among others. The challenges are diverse. Many of these challenges have overflowed by researchers, but some are still as important to be singled out for mentioning, and they are presented as follows:

1. **Politics of Education:** In Nigeria, politics has significantly influenced the education sector, often affecting policies, funding, and the overall quality of education. Political leaders sometimes use education to gain support, making promises during election campaigns to improve schools, provide free education, or increase funding. However, these promises are not always fulfilled once they are in power. Issues like budget allocations often become political battlegrounds. For example, funding for education can be diverted to other areas or insufficiently allocated, impacting infrastructure, teacher salaries, and learning resources in schools. While there have been efforts to reform and improve education in Nigeria, the interplay between politics and education continues to present challenges that must be addressed to achieve its educational goals.

2. **Insecurity:** Terrorism, banditry, and communal conflicts often lead to school closures. These interruptions can result in students missing critical lessons, particularly in subjects requiring continuity, like science. They also create fear and anxiety in both students and teachers. These challenges require improved security measures, community engagement, and investment in education resources to ensure that science education continues to thrive despite the prevailing insecurities.

Figure 3: Insecurity in Schools

3. **Corruption** significantly undermines science education in Nigeria, affecting various aspects of the system. Some of the areas include:
    i. **Misallocation of Funds:** Resources intended for the development of science education are often embezzled or mismanaged, leading to inadequate laboratory facilities, poor instructional materials, and insufficient funding for research.
    ii. **Poor Infrastructure:** Corruption results in substandard construction of educational facilities. Many schools lack essential resources, such as laboratories and equipment, hindering practical learning experiences vital for science students.

iii. **Quality of Instruction:** Bribery and favouritism can compromise the hiring and promotion of qualified teachers, impacting the quality of education. As a result, students may not receive the necessary guidance to excel in scientific fields.

iv. **Examination Malpractices:** Corruption in examination processes, including cheating and manipulation, devalues educational qualifications and undermines the integrity of assessments, further affecting students' understanding of scientific concepts.

v. **Limited Opportunity for Research:** Corruption restricts access to grants and funding for scientific research, limiting opportunities for innovation and advancement in various scientific fields. Corruption creates a cycle of inefficiency and decline in science education, ultimately hampering Nigeria's scientific and technological advancement progress. Addressing these issues requires systemic reforms and a commitment to transparency and accountability in the educational sector.

Figure 4: Form of Corruption

Figure 5: Form of Examination Malpractice

4. **Language of Instruction:** The country is home to a diverse range of ethnic groups and languages, which can create barriers in the learning process. Many students are taught in English, the official language, but this may not be their first language. As a result, students often struggle to comprehend complex scientific concepts and terminologies presented in English, leading to gaps in understanding and knowledge retention. Furthermore, lacking adequate support in students' native languages means they may not fully grasp the material. This issue is compounded by the varying educational backgrounds of teachers, some of whom may not have a firm grasp of scientific language or are more comfortable teaching in local dialects. The National Policy on Education in Nigeria supports a multilingual education system that respects and incorporates the country's rich linguistic heritage. According to Fafunwa (1975), the African child like any other child (in India, Germany, France and China) could be helped right from the start to develop some scientific skills and abilities in his/her own mother tongue.

5. **Home Factor:** Parents can pose several challenges to science education through various factors: These are: lack of understanding or appreciation for the significance of science subjects; some may prioritize traditional or vocational careers over scientific fields, and some parents' educational backgrounds may not equip them to support their children's science studies, resulting in insufficient guidance and encouragement. Cultural factors can also play a role, as some parents may uphold stereotypes about gender roles, discouraging girls from pursuing science, which limits diversity in scientific fields; the interplay of these factors can hinder the development and quality of science education in Nigeria, negatively impacting students' engagement and success in pursuing scientific careers.

   Learning could be encouraged if parents create time to engage their children in academic exercises at home (Agboola, 2025). Agboola and Afolabi (2020) found out that some guardians and parents do not have time for their children and wards when they get home, distracting their attention from compelling study and completion of their homework. Also, some parents habitually force their children to study science, making them miserable and frustrated when they do not make enough progress. Parents' involvement in education is widely believed to influence students' outcomes; children demonstrate various achievement-related outcomes when parents actively participate in their child's education. Research has shown that parents' involvement impacts children's social, emotional, and character development, increased attendance, reduced suspensions, reduced high school dropouts, attitude toward school, academic motivation, and better academic performance. Character development improves students' academic performance, engagement and skills (Omiyefa, 2016; 2021).

6. **Brain Drain:** Many qualified scientists and educators migrate to other countries for better opportunities, leading to a shortage of skilled professionals. The migration of skilled professionals hampers the nation's technological progress. Addressing the brain drain in Nigeria requires concerted efforts by the government to improve economic conditions, governance, infrastructure, and opportunities for professional development. The country can retain talented individuals and foster growth and development by creating a more conducive environment for work and living.

7. **Inappropriate Instructional Strategies:** Inappropriate instructional strategies can pose significant challenges to science education, ultimately affecting student learning outcomes. Some ways in which inappropriate instructional strategies can hinder science education are presented thus:

Ineffective Teaching Methods

a. **Lecture-dominated classes:** Overreliance on lectures can lead to passive learning, failing to engage students and promote critical thinking.
b. **Textbook-based instruction:** Relying solely on textbooks can result in outdated information, lack of hands-on experience, and failure to address real-world applications.
c. **Didactic teaching:** Focusing solely on transmitting knowledge without encouraging inquiry, exploration, or discussion can stifle students' natural curiosity and creativity.

Insufficient Practical Experience

a. **Limited laboratory activities:** Inadequate hands-on experiences in laboratories or fieldwork can hinder students' ability to apply theoretical concepts to real-world situations.

b. **Lack of experimentation:** Insufficient opportunities for

experimentation and investigation can prevent students from developing essential scientific skills, such as observation, measurement, and analysis.

Failure to Address Diverse Learning Needs

a. **Inadequate differentiation:** Failing to cater to diverse learning styles, abilities, and prior knowledge can result in some students being left behind or disengaged.
b. **Inaccessible resources:** Using instructional materials that are not accessible to students with disabilities can create barriers to learning.

Inadequate Assessment and Feedback

a. **Overemphasis on rote memorization:** Assessments that focus solely on memorization can neglect essential scientific skills, such as critical thinking, problem-solving, and communication.
b. **Lack of timely and constructive feedback:** Failing to provide regular, actionable feedback can hinder students' ability to adjust their learning strategies and improve their understanding.

Negative Impact on Student Motivation and Engagement

a. **Disengagement:** Inappropriate instructional strategies can lead to student disengagement, decreased motivation, and a lack of interest in science.
b. **Negative attitudes:** Poor instructional strategies can foster negative attitudes toward science, potentially discouraging students from pursuing science-related careers. For instance, a teacher who says, 'I know you will not know it 'for a girl and 'I know you can still try more next time' for a boy has communicated a message that can deter or discourage the girl-child from studying science (Bilesanmi-Awoderu, 2012). To overcome these challenges, educators can adopt more effective instructional strategies, such as:

1. **Inquiry-based learning:** Encouraging students to explore

scientific concepts through investigation and experimentation.

2. **Project-based learning:** Having students work on real-world projects that integrate scientific concepts and promote critical thinking.
3. **Technology-enhanced instruction:** Leveraging digital tools and resources to enhance teaching and learning.
4. **Differentiated instruction:** Catering to diverse learning needs through varied instructional strategies and assessments. Few of my studies have examined varied instructions in the learning and acquisition of scientific knowledge. For instance, Agboola and Ajayi (2011) in a study on comparative analysis of two methods of teaching environmental-related concepts in senior secondary school chemistry, found that the guided-discovery method significantly differentiates students' achievement in chemistry from those exposed to the socratic method. Also, a study by Agboola and Olajide (2011) on the investigation into students' common errors in Chemistry practical tests of the school certificate examination found that some common errors students make were wrong observations, wrong reagents, poor reading of the tables, incoherent inference, and student lack of understanding of the test questions. The results showed that some of these errors made by students resulted from insufficient practical skills and poor instruction. Furthermore, examining the effects of concept-mapping and peer-tutoring instructional strategies on students' learning outcomes in Chemistry (Agboola & Oloyede, 2013) found that concept-mapping and peer-tutoring instructional strategies significantly improved students' performance. Also, concept-mapping instructional strategies enhance students' acquisition, retention, and achievement in chemistry.

   However, Ogundipe and Agboola (2018), in a study on the relative effectiveness of inductive and interactive demonstration strategies in improving pupils' learning

outcomes in Basic Science, found that interactive demonstration strategy is more effective in developing cognitive skills than the inductive strategy, as pupils exposed to the interactive demonstration strategy have better academic performance and higher retention ability in Basic Science. Further research by Agboola (2018) on enhancing the comprehension of Basic Science through visual-analogy and teacher-expository instructional strategies on pupils' learning outcomes in Basic Science in Ondo State found that the visual-analogy instructional strategy improved pupils' attitudes toward Basic Science more than the teacher-expository instructional strategy.

Agboola and Adereti (2020) revealed no significant difference in student's attitudes toward the relative effectiveness of guided discovery and reciprocal peer-tutoring instructional strategies in improving secondary school students' learning outcomes in biology. However, retention ability significantly differed when students were exposed to guided discovery and reciprocal peer-tutoring instructional strategies. This indicated that both instructional strategies improved secondary school students' learning outcomes in Biology. In another study by Agboola and Haruna (2017) on the effects of physical and virtual laboratory experimentation on students' learning outcomes in Basic Science in Ife Central Local Government Area, Osun State. The findings revealed that a virtual laboratory is more effective than a physical laboratory in improving students' academic performance in basic science and technology and enhancing their retention ability.

Educators can create engaging, inclusive, and effective science learning environments that promote student motivation, understanding, and achievement by adopting more effective instructional strategies.

8. **Shortage of Qualified Teachers:** There is a need for more qualified science teachers in Nigeria. The so-called science

teachers in many schools are not professionally qualified; they may know science but lack methods (Kola, 2012). With fewer teachers available, classrooms often become overcrowded. This makes it challenging for educators to give individual attention to students, which can hinder their academic performance and personal development. Existing teachers often face increased workloads due to the shortage. This can lead to burnout, decreased morale, and reduced effectiveness in teaching, ultimately impacting students' learning experiences. An inadequate education system due to teacher shortages can have long-term implications for national development, as it affects the skills and knowledge base of the workforce, hampering economic growth and societal progress.

9. **Poor Remuneration of Teachers:** The poor remuneration of teachers in Nigeria is a challenge to science education in several ways:

i. **Low Morale and Motivation:** Inadequate salaries can lead to low morale among teachers. When educators feel undervalued and underpaid, their motivation to provide quality education diminishes, impacting the enthusiasm and energy they bring to their science classes.

ii. **Lack of Resources:** Poorly compensated teachers may struggle to invest in their professional development or purchase necessary teaching materials. This lack of resources can lead to a subpar educational experience for students, especially in science subjects that often require practical knowledge and hands-on learning.

iii. **Attrition of Qualified Teachers:** Many qualified and passionate teachers may leave the profession for better-paying opportunities. This high turnover rate can result in a shortage of experienced science teachers, adversely affecting the quality of education and student learning continuity.

iv. **Negative Impact on Student Engagement:** Teachers dissatisfied with their pay may not engage students effectively or inspire a love for science. This can lead to decreased interest and participation in science subjects, as students may not receive the encouragement and support, they need to succeed.

v. **Limited Curriculum Delivery:** With financial constraints, teachers might resort to 'teaching to the test' and focus on rote memorization rather than fostering critical thinking and problem-solving skills essential in science education. This limits students' understanding and application of scientific concepts.

The challenges posed by poor remuneration can have long-term consequences for the quality of science education in Nigeria, ultimately affecting the country's scientific progress and capacity for innovation.

10. **Lack of Technology-Based Teaching:** Without modern technology, students and teachers often struggle to access up-to-date scientific resources, databases, and research materials, hindering their ability to learn about current scientific developments and discoveries. Traditional teaching methods dominate in the absence of technology. This can lead to passive learning experiences, where students memorize information rather than interact with it. In a world where technology drives scientific advancement, students in Nigeria may find themselves unprepared for global challenges and opportunities. This can affect their employability and ability to contribute meaningfully to scientific fields: Teacher Training and Development. In today's job market, digital literacy is crucial. Without technology-based teaching, students may graduate without essential skills needed for the workforce, limiting their employability and adaptability. Embracing technology in education is essential for enhancing the learning experience and preparing students for future challenges in Nigeria.

11. **Outdated Curriculum:** The science education curriculum in Nigeria needs to be updated and aligned with the needs of the modern world. It is often outdated and does not reflect modern scientific discoveries and advancements.

12. **National Policy on Education:** Efforts have been made to develop and enhance science curricula, increase access to learning materials, and promote teacher training programmes. However, these initiatives often encounter obstacles that impede their full realization. Additionally, regional disparities in education quality can affect the uniform implementation of the policy across different states. While there have been strides towards implementing the National Policy on Science and Technology Education, a comprehensive and fully effective execution still requires ongoing commitment and resources from the government and stakeholders in the education sector. Olanipekun and Agboola (2023) conducted a study on government involvement in implementing the National Policy on Education on Basic Science and Technology in three states in southwestern Nigeria. The research findings showed that the National Policy on Education on Basic Science in the study area is partially implemented.

    The above-listed factors and many more are some of the factors militating against science education in Nigerian schools.

Expectations for Science Education in Nigeria

Mr. Vice-Chancellor sir, my distinguished audience, from what has been discussed so far, one would ask: Is there any hope for progress in science education in Nigeria? Yes, there is hope if only education, particularly science education, is considered an investment. Identifying and addressing the existing challenges is crucial while setting clear expectations for future developments. In the context of science education in Nigeria, the expectations aim at

addressing various aspects of the educational system. These include:

a. improved scientific literacy and critical thinking skills
b. increased participation of girls and women in science education
c. development of STEM skills and competencies
d. enhanced innovation and entrepreneurship in science and technology
e. better preparedness for the challenges of the 21st century, including
   climate change and sustainable development
f. Increased international collaboration and recognition in science education
g. funding
h. teachers' professional salary structure
i. qualified and competent teachers

Improved Scientific Literacy and Critical Thinking Skills:

Scientific literacy and critical thinking skills focus on equipping students with the ability to understand and apply scientific concepts and processes. This includes learning facts and developing skills to analyse information, evaluate evidence, and think critically about scientific claims and problems. Scientific literacy involves understanding the nature of science, engaging with scientific issues in everyday life, and making informed decisions based on scientific knowledge. This foundation allows students to navigate an increasingly complex world where science and technology play significant roles. Critical thinking skills are essential in science education as they empower students to assess the validity of sources, construct logical arguments, and approach problems methodically. These skills enable learners to question assumptions, identify biases, and draw reasoned conclusions based on empirical evidence. Ultimately, science education aims to foster a deeper understanding of scientific principles and create informed citizens who can contribute thoughtfully to discussions about science and its implications for society.

Increased Participation of Girls and Women in Science Education:

A study by Agboola (2021) on Women and STEM Education in Nigeria: Progress, Shortcomings, Challenges and the Way Forward revealed that there is still a wide variance in male and female enrolment in science, with male enrolment being significantly higher than that of female candidates, this gap can be closed by raising awareness that girls are as capable as boys when they are given educational opportunities and also promoting strong anti-discrimination and anti-gender policies against women. Supporting policies that promote gender equality in education and the workforce can help create a more inclusive environment for the girl child in science.

Development of STEM Skills and Competencies:

The expectation of science education, particularly in the context of STEM (Science, Technology, Engineering, and Mathematics) education, is to foster a range of skills and competencies essential for students to thrive in a rapidly evolving world. This development includes critical thinking, problem-solving, creativity, and collaboration, vital for tackling complex real-world challenges. Effective STEM education encourages hands-on learning and inquiry-based approaches, allowing students to engage with scientific concepts while developing technical skills relevant to modern industries. By integrating these elements, science education aims to enhance students' knowledge and prepare them for future careers and informed citizenship in a technology-driven society.

Enhanced Innovation and Entrepreneurship in Science and Technology:

Enhanced innovation and entrepreneurship in science and technology is an essential expectation of science education for several reasons:

a. **Skill Development:** Science education equips students with critical thinking, problem-solving, and analytical skills. These skills are fundamental for innovation,

allowing students to devise creative solutions to real-world problems.

b. **Hands-on Experience:** Practical laboratories and project-based learning encourage students to experiment and explore. This experiential learning fosters a mindset of exploration and resilience, which is crucial for entrepreneurship.
c. **Interdisciplinary Approaches:** Modern science education often includes an interdisciplinary approach, integrating elements of engineering, technology, and mathematics. This holistic view helps students understand how different fields can intersect to create new products or services.
d. **Exposure to Real-World Challenges:** By incorporating case studies and problem-based learning that address global challenges (like climate change or health crises), students can identify opportunities for innovation and entrepreneurship that respond to societal needs.
e. **Encouraging a Growth Mindset:** Science education encourages curiosity and continuous improvement. Students learn to view failures as a stepping-stone to success, fostering resilience that is critical for entrepreneurs.
f. **Collaboration and Networking:** Group projects and collaborative activities help students develop teamwork and communication skills, essential for successfully launching ventures and working within diverse teams.
g. **Resources and Support:** Many educational institutions now provide resources like incubators or access to mentors in science and technology fields, helping students transition from theoretical learning to launching their innovations into the marketplace.
h. **Emphasis on Ethics and Responsibility:** Science education also often includes discussions on the ethical implications of scientific advancements, guiding future entrepreneurs to create responsible and sustainable innovations. By embedding these aspects into the curriculum, science education can effectively prepare

students to innovate and become leaders in the entrepreneurial landscape of science and technology.

Better Preparedness for the Challenges of the 21st Century

Better preparedness for the challenges of the 21st century is a key expectation of science education in Nigeria, and it can be achieved through several strategic approaches:

- **Curriculum Reform:** There is a significant need for a curriculum relevant to the current scientific and technological advancements. The expectation is that the curriculum should not only meet local needs but also align with global standards to prepare students for the future workforce (Federal Ministry of Education, 2013). Updating the science curriculum to include contemporary issues such as climate change, public health, and technological advancements ensures that students have relevant knowledge. Integrating local and global challenges into the curriculum helps students understand their global context.
- **Resource Allocation:** Investing in laboratory facilities, technology, and teaching resources is critical. Enhanced infrastructure supports hands-on learning and experimentation, essential for understanding scientific concepts and their applications. Bamidele and Agboola (2011) researched on the availability of laboratory equipment and chemicals for chemistry teaching in senior secondary schools. The study was conducted among 20 teachers from 10 selected public schools in Osun State. The findings revealed that equipment and chemicals in the chemistry laboratory were inadequate. Also, Agboola (2022) conducted a study on the availability of basic science and technology laboratories in Osun -State. The study found no basic science laboratories in the state; the so-called basic science laboratories in schools are chemistry, physics and biology. Many schools struggle with a lack of proper teaching aids, textbooks, and technology. A study by Abe and Agboola (2021) on

textbook utilization and class participation as predictors of academic achievement in Basic Science and Technology in lower primary schools in southwestern Nigeria. More than 50% of the pupils did not have the needed textbooks for learning basic science and technology in the study area. The study found that textbook utilization and class participation could predict lower primary school pupils` academic achievement in Basic Science and Technology. Without these essential resources, the quality of education suffers, as teachers may find it challenging to deliver lessons effectively. The integration of Information and Communication Technology (ICT) in science education is expected to enhance students' learning experiences and engagement. Schools are anticipated to adopt more digital tools and resources to complement traditional teaching methods (Olatoye, 2019). Addressing these infrastructure deficiencies is crucial for improving the quality of education in Nigeria and ensuring that all students have the opportunity to succeed.

- **Teacher Training**: The quality of science education heavily depends on the educators themselves. An educated person is not necessarily an effective teacher if they are not trained in the arts and techniques of teaching. Continuous professional development for teachers in the latest scientific discoveries and pedagogical strategies is necessary. Well-trained educators are better positioned to inspire students and foster critical thinking and creativity.
- **Interdisciplinary Learning:** Encouraging collaboration between science and other subjects like mathematics, technology, and even arts can provide students with a more rounded education. This approach can help them develop innovative solutions to complex problems.
- **Entrepreneurship Education:** Embedding entrepreneurship within the science curriculum can empower students to apply scientific knowledge to real-world challenges. Programs focused on innovation,

startup creation, and business principles can help cultivate the next generation of entrepreneurs.

- **Partnerships with Industries:** Collaborating with local and international industries allows students to gain insights into real-world applications of science and technology. Internships and mentorship programs can further enhance learning and provide networking opportunities.
- **Promoting Research and Innovation:** Encouraging students to engage in research projects and innovative initiatives can stimulate their interest in science and technology. Competitions, grants, and scholarships for scientific research can motivate students to pursue their ideas.
- **Focus on Ethics and Sustainability:** Discussing the ethical implications of scientific advancements helps prepare students to consider the societal impacts of their work. This focus is essential for creating responsible future leaders who prioritize sustainable and equitable solutions.
- **Extracurricular Programmes:** Science clubs, competitions, and workshops can provide additional platforms for students to explore their interests, develop skills, and connect with peers who share similar passions. By adopting these strategies, science education in Nigeria can better prepare students to face the complexities and challenges of the 21st century, fostering a generation adept in innovation, critical thinking, and problem-solving.

Increased International Collaboration and Recognition in Science Education

Strong partnerships between educational institutions and industries/research organizations are expected. This collaboration can enhance practical training opportunities for students and align science education with industry needs (Adeleke & Kamrul, 2021). Strengthen partnerships between the government, education

stakeholders, and local communities to ensure sustained support and resources for science education. Experienced professionals in scientific fields can offer mentorship to students, providing guidance, support, and encouragement. This can inspire students to pursue careers in science and foster a love for the subject. Non-governmental organizations can collaborate with communities to implement science education initiatives, providing training and resources to both teachers and students.

Funding: funding is one of the most significant opportunities for improvement in the Nigerian education system. The government must fulfill its promise of allocating 26% of its annual budget to education and ensure that the funds are used effectively and efficiently. In 2023, UNICEF faulted the Nigerian budget for education and complained that it was too low (This Day Live, 2023). It has also been found that Nigeria's annual education budget is low compared to other African countries. The Federal Government in December, 2024 presented the 2025 budget proposal of ₦49.70trillion out of which ₦3.52trillion was allocated to education, just seven percent of the total budget, covering costs for Universal Basic Education and nine new higher institutions (Punch Newspaper, 2024). The allocation falls far below the 26% benchmark recommended by the United Nations Educational, Scientific and Cultural Organisation and Nigerian National Policy on Education.

Government policy must be consistent from one to another. This includes legislation, governance and implementation, financing of basic education, and budgeting. Government programmes must be a continuum, and amendments to meet today's international trending outlooks should be made where necessary, not minding the party at the centre. Furthermore, governments, corporate bodies, and philanthropies provide scholarships and grants for students pursuing science courses. This financial support can attract and retain talent.

Teachers' Professional Salary Structure: The expectations in science education regarding teachers' professional salary structure in Nigeria are multifaceted and deeply tied to the overall quality of education. Many stakeholders, including educators, policymakers, and parents, believe an equitable and competitive salary structure is essential for attracting and retaining qualified science teachers. Teachers, especially those in science fields, are expected to receive competitive salaries to align with other professions requiring similar education and expertise. This would reduce brain drain and ensure capable individuals consider teaching careers. The salary structure should be equitable across different regions and types of institutions, including public and private schools. This equity will help ensure that all students have access to quality science education, regardless of their geographic or socio-economic status. Ensuring that salaries are paid on time and that there are provisions for regular increases can help maintain morale and commitment among teachers. A thoughtful and well-structured salary system for science teachers in Nigeria is expected to improve the quality of science education significantly, ultimately benefiting students and the broader society.

Qualified and Competent Teachers: this centred around several key areas**:**

a. **Content Knowledge:** Teachers should strongly understand scientific concepts, theories, and methods. This includes staying current with developments in their field and understanding the curriculum changes.
b. **Pedagogical Skills:** Competent science teachers should employ effective teaching strategies that engage students and facilitate learning. This includes the ability to differentiate instruction to meet diverse learners' needs.
c. **Lab and Practical Skills:** Teachers are expected to guide students in hands-on experiments and practical applications of scientific concepts, ensuring safety and adherence to scientific methods.
d. **Assessment and Evaluation:** Qualified teachers should be skilled in assessing student understanding and using that

information to inform their teaching practices. This includes both formative and summative assessments. Agboola and Olajide purposed to find out the influence of feedback on the quality of science teaching in southwestern, Nigerian universities revealed that there was no significant difference between gender on perception of students' feedback on the quality of teachers.

e. **Promoting Inquiry and Critical Thinking:** Effective science education encourages students to ask questions, think critically, and develop problem-solving skills. Teachers should create an environment where inquiry is valued.
f. **Integration of Technology:** In today's educational landscape, teachers should be comfortable integrating technology to enhance learning and engagement.
g. Professional Development: Ongoing professional development is expected to keep teachers informed about the latest research in science education and ensure their continued growth as educators.
h. **Fostering a Positive Learning Environment:** Teachers should create inclusive, supportive classroom environments that encourage student collaboration and respect. Through these elements, qualified and competent science teachers are expected to inspire and equip students with the necessary skills and knowledge to succeed in science and related fields.

My Contributions to Research and Practice

Mr. Vice Chancellor sir, the usual misconception has always been that Professors of teacher education only research into pedagogical concepts; little do many know that understanding and researching into core concepts of the cognitive courses are key to effective pedagogical research. My research had navigated through various research inquiries in core chemistry, which is my teaching subject; for example, Ogunfowokan, Morakinyo, Agboola and Durosimi (2005) analysed 28 different brands of Nigerian sweets and biscuits wrappers respectively for their levels of lead and

cadmium. However, lead is found to be higher than cadmium; there are no guidelines for the level of lead and cadmium in food wrappers. However, the levels reported in the research are pretty high and may give cause for concern. In another study, Agboola (2008) determined cyanide content in some local fruits in Ile-Ife, Osun State. The study reported the presence of cyanide in local fruits consumed around us. According to the classification guide, some fruits are innocuous, while a few may be dangerous to health when eaten.

Agboola and Adejumo (2013) also worked on the nutritional composition of the fruit of the Nigerian wild date, called *'dabino'* by the Hausas. Wild date palm is sweet and locally consumed in Nigeria without cooking. The study looked at the nutritional importance of its consumption. It contained high amounts of carbohydrates, protein, fibre, and ash but with low-fat content. The mineral contents in the date sampled have potential to provide a good source of zinc, potassium, calcium and sodium in diet. In another effort, Agboola (2014) investigated the antioxidant potentials of local fruit and foreign wines sold in Ile-Ife for their phenol content and the antioxidant potential of the methanolic extracts. The study found that fruits are valuable sources of natural phenolic antioxidants known to have health-promoting properties. Okonji and Agboola (2014) in a comparative study of some enzymes in different varieties of fruits, found a widespread arginase, rhodanese, and thiaminase enzyme distribution in the fruit samples. The presence of these enzymes in the fruits, especially rhodanese and arginase, suggests these enzymes may be functional in many physiological activities. In another effort, Ayoade and Agboola (2016) investigated the proximate composition and mineral profile of yellow and brown mustard seeds from Nigeria. The study found that brown mustard seed is richer in protein, fat, ash, crude fibre and flavonoid than yellow mustard seeds. Also, Njoku and Agboola (2021) determined the concentrations of lead, arsenic, cadmium, zinc and copper in domestic water in four Local Government Areas of Osun State, Nigeria. The results showed high concentrations of heavy metals in

the domestic water, but the concentrations varied from one location to another due to anthropogenic and geological factors.

Also, one major thrust of my research was in environmental education. The causal factors of inadequate environmental ethics, ignorance or inadequate environmental awareness, knowledge and skills can only be removed through education. Agboola (2007) in a study on the need for environmental education (EE) in Nigeria's pre-service teachers' programme and concluded with a proposal recommending that EE be a core course in a few compulsory courses in the National Certificate of Education (NCE) and Bachelor of Education (B.E.d) pre-service teachers' programme. Also, Agboola., Okewole and Ayoola (2010) in a study on teaching environmental education through the mass media, found out that using newspapers as a medium for environmental education is a powerful way to inform, engage, and mobilize the public, ultimately fostering a more environmentally conscious society.

Further research by Agboola **(**2014) on Environmental Education and Public Awareness found that educating adults, community, and traditional leaders on the importance of environmental health and the natural environment is critical to sustainable development. In another study, Agboola and Emmanuel (2014) investigated climate change and sustainable development awareness levels among undergraduate students from two selected universities in Oyo-State, Nigeria. The findings revealed that most respondents know climate change and sustainable development but do not know how they could be minimized. This justifies the need for awareness and enlightenment on climate change and sustainable development due to the prevailing human activities and natural phenomena causing them and how they can be controlled. Enhancing environmental education among primary school teachers is vital for fostering a generation that values and protects their environment. Teachers play a crucial role in shaping students' understanding of environmental issues. Agboola (2023), in a study on an environmental education literacy campaign among Osun State

primary school teachers, revealed that the teachers' awareness of environmental education is high.

Besides my teaching, I have been privileged to mentor many young men and women through the supervision of their research projects. I have successfully supervised over 130 undergraduate projects, 32 Post Graduate Diploma in Education (P.G.D.E.), 31 Masters theses and projects, and three Doctoral theses (and three ongoing). In addition, Mr. Vice Chancellor sir, and my distinguished audience, I have assisted in assessing colleagues to Professorial cadre. I have served and am still an External Examiner to some institutions and a member of the Editorial Board for various local and national publications. I am a member of different national and international bodies, including the Science Teachers Association of Nigeria (STAN), Institute of Development and Administration of Nigeria (IDAN), Teachers Registration Council of Nigeria (TRCN), Early Childhood Education Association of Nigeria (ECAN), Ife Curriculum Development Improvement Group (ICDIG), Integrated Science Educators' Association of Nigeria, (ISEAN), Children - In-Science and Technology (CIST), and Organization for Women in Science from the Developing World (OWSD).

On the administrative front, I have served and am still serving in many departments, faculties, and the University at large. I am the initiator of the Ife Journal of Integrated Science (IJIS), whose first edition was published in 2024. I am also the initiator and National President of the Integrated Science Educators' Association of Nigeria (ISEAN). The inaugural conference was held at Obafemi Awolowo University in September 2024 at the Africa Centre of Excellence.

I have made humble efforts to expand the frontier of knowledge, with more than 50 articles published in many reputable national and international journals. I have also participated in and presented papers at local, national, and international conferences, workshops, training, and seminars. I have participated in various workshops in

the training of primary school teachers tagged 'Teacher Professional Development Workshop' under the Millennium Development Goals (MDGs) Projects that took place between 2006 and 2013. I was a resource person for Osun State Teachers' Professional Development Programme and Teachers' Capacity Building Programme for Integrated Science Teachers organised by Osun and Ekiti states SUBEB.

I was the Acting Director of the Institute of Education between 2021-2023, and I am grateful to God and all past Directors for the selfless services they rendered during their tenure. Despite the eight months of the Academic Staff Union of Universities (ASUU) strike during my tenure, to the glory of God, within 16 months, numerous accomplishments were made: The Language and Communication Arts Programme was approved for the Institute of Education by the Senate; Integrated Science postgraduate programmes were revised and approved by the Senate; Institute of Education's first Departmental Postgraduate handbook was produced; the Institute of Education annual conferences held in 2022 and 2023; two textbooks namely Introduction to Teaching Profession & Fundamental of Teaching Profession were revised, four editions of Institute Departmental journals were published (2020, 2021, 2022 & 2023) and two Institute of Education conference journals were also published (2022 and 2023). Also, two academic staff were appointed; one staff finished his Ph.D. programme and was confirmed and regraded. Seven academic staff were promoted; a staff was Prima Facie Qualified (P.F. Q) for the Readership cadre; all full-time and part-time results were processed to the Senate; our Part-time handbook was revised; Departmental Mathematics/Integrated Science association was launched; Institute of Education website was created, and 65 oral examinations were conducted (Qualifying/M.Ed/M.A.Ed/ M.Phil / Ph.D.). Under my leadership, the Institute procured an official vehicle.

Conclusion

In conclusion, distinguished audience, this lecture titled "**Science Education in Nigeria: The Emergence, Challenges and Expectations"** highlights the significant progress made in developing science education while shedding light on the challenges that impede its growth. These challenges include inadequate infrastructure, insufficient funding, and a lack of trained educators, which collectively hinder the effective delivery of science education. However, the expectations for the future are promising, as there is a growing recognition of the importance of scientific literacy for national development. By addressing these challenges and investing in innovative educational strategies, Nigeria can pave the way for a robust science education system that equips future generations with the skills and knowledge necessary to thrive in an increasingly complex world. The world is rapidly changing, and the skills needed today are far different from those needed just a few years ago. The challenge now is for us to "redefine" (classrooms, rigour, teachers, school, priority) what has been successful in the past and apply those concepts to the new demands and expectations (Agboola, 2019).

Recommendations

The recommendations for enhancing science education in Nigeria focus on addressing the key challenges identified in this lecture. The following are therefore recommended:

1. Policy reforms and initiatives to support science education
2. Investment in infrastructure, teacher training, and resources
3. Curriculum review and development to reflect modern scientific knowledge and skills
4. Promoting science education among girls and women
5. Encouraging public-private partnerships and international collaborations to support science education
6. Fostering a culture of innovation and entrepreneurship in science and technology
7. Funding and Resource Allocation
8. Monitoring and Evaluation

Mr. Vice-Chancellor sir, with all humility, I wish to also encourage all students who feel frustrated at their choice of study, especially in the Faculty of Education / Colleges of Education, to accept their fate and work harder. Their current course may be the study that can open the gates of the world for them, as it did for me.

Appreciation and Acknowledgements
First and foremost, I have to express my gratitude to God Almighty and my Lord and Saviour, Jesus Christ, who made it possible for me to weather through the storm of life, "Many are the afflictions of the righteous, but the Lord delivers him out of them all." To Him be the glory. Amen.

I want to thank Obafemi Awolowo University, Ile-Ife, for allowing me to train, develop, and grow to the peak of my career as a Professor of Science Education. I acknowledge my M.Sc. (Ed) and Ph.D. supervisor, the late Professor Ezekiel O. Oloyede, for his guidance, thorough supervision, and immense contribution. I shall forever be grateful for his invaluable assistance and support and his keen interest in me.

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I remember my late parents, Mr. John Ona-Olubode Sogbesan and Deaconess Beatrice Funmilola Sogbesan. I acknowledge the pastorate and members of Gospel Faith Mission International, both within and abroad, Jesus Centre Church (Ile-Ife), Christ Apostolic Church, Gbongan (solution centre), Christ the King Chapel, Osogbo, and The Living Gospel of Christ Church, Itire, Lagos, where I first knew the Lord Jesus.

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Mr. Vice Chancellor sir, distinguished audience, this lecture will be largely incomplete if I fail to acknowledge and appreciate my late husband, Professor Femi Kayode Agboola (my GCE and JAMB tutorial teacher). I appreciate all your sacrifices for our family and how you put our needs before yours. You were a caring partner, a loving father, and a true friend. Your ability to see the good in others and uplift those around you was a remarkable gift for which I am eternally thankful. Though you may no longer be by my side, your legacy lives on in the countless memories we created and the love you shared with everyone. I will forever cherish the lessons you taught me and the warmth of your spirit. Thank you for all that you were and all that you gave. You will always have a special place in my heart. May your gentle soul continue to rest in perfect peace.

Finally, my joy knows no bounds in appreciating my children. They are the reason for my stability in the storms of life: Barrister Ifeoluwa Agboola, Miss Oluwaseyi Agboola, and Mr. Oluwafemi Agboola. I love you all wholeheartedly, and I am very proud of you.

Finally, I return all the glory to God, the Almighty, who has given me life, opportunities, and great people who have helped me to succeed.

Mr. Vice-Chancellor sir, Distinguished Audience, may I crave your indulgence to end this lecture with a song which I request you to please join me in singing

My hope is Built on Nothing Less
(Edward Mote, 1834)
My hope is built on nothing less
Than Jesus' blood and righteousness
I dare not trust the sweetest frame
But wholly lean on Jesus' name
On Christ the solid rock I stand
All other ground is sinking sand
All other ground is sinking sand

Mr. Vice-Chancellor, the University Central Administration, Students, my Fathers and Mothers, Royal fathers, Gentlemen of the Press, Ladies and Gentlemen. This is my story, and that is my song.

Thank you most sincerely for your attention. God bless you all.

Figure 6: My Supervisor, Dr. R. L. Meyes and his wife at the University of Wyoming, Wyoming, United States of America

Figure 7: International Conference on National Capacity Building Strategy for Sustainable Development and Poverty Alleviation (NCBSSDPA), Dubai, The American University in the United Arab Emirates, UAE

Figure 8: Conference at Havard Medical School, Boston, United States of America

Figure 9: Adult Education Academy, University of Wurzburg, Germany

Figure 10: 23rd Annual Africa Conference, The University of Texas, Houston, United States of America

Figure 11: 23rd Annual Africa Conference, the University of Texas, Houston, United State

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