REVAMPING SCIENCE EDUCATION: A PATHWAY TO SKILL ACQUISITION AND SUSTAINABLE DEVELOPMENT

OLUMIDE Olubukola Joyce Ph.D[1], IRINOYE James Ph.D[2]
[1&2]Department of Curriculum and Instruction, Adeyemi Federal University of Education, Ondo
bukolaolumide@gmail.com

Abstract
A society must embrace scientific awareness to achieve sustainable development. This entails being innovative, capable of protecting the environment, and promoting economic growth. These objectives can be realized through effective science education, which provides individuals with the knowledge, skills, and attitudes essential for addressing complex challenges. However, the field of science education faces numerous challenges that impede its full potential, highlighting the necessity for reform. This study explores how revitalizing science education can facilitate skills acquisition and contribute to sustainable development in alignment with 21st-century goals. It also examines the current obstacles confronting science education and identifies the essential skills necessary for fostering development. A descriptive survey methodology was employed, with questionnaires distributed to ten public secondary schools in Ondo. The collected data were analyzed using mean scores. Based on the findings, it is recommended that the government allocate sufficient funding to science education at all levels of the educational system.

Keywords: science education, skills acquisition, sustainable development

Introduction

Education plays a crucial role in the development of the mind, as it imparts knowledge, skills, and character traits to individuals under the guidance of trained professionals. It is also vital for the survival of the human race, as it preserves intellectual and cultural traditions. Furthermore, education drives economic development and fosters civilization for the well-being of humanity. According to Erinosho (2009), science is defined as an organized body of knowledge about the world, encompassing a set of logical and empirical methods for investigating and understanding natural phenomena, as well as an enterprise for applying scientific knowledge. The establishment of the Science Teachers Association on November 30, 1957, allowed for consistent reviews of the science curriculum nationwide, making it more activity-based for students. Science is introduced to all children at the primary level through basic science, while subjects like Biology, Chemistry, and Physics are taught in secondary schools, addressing the cognitive, psychomotor, and affective domains (Omole et al., 2014).

Science education, which refers to the teaching of science to students in the general public, encompasses work in science content, processes, and teaching methodologies. The importance of science education cannot be overstated, as it serves as the foundation for numerous science-related careers, such as engineering, medicine, architecture, and science technology. It also aims to nurture inquisitive, knowledgeable, and rational minds that contribute to a good life and democracy, develop scientists for national progress, support studies in technological advancement, and provide a deeper understanding of the complexity of the physical world and the various forms and conduct

of life (FRN 2004). Science education plays a crucial role in establishing a strong foundation of scientific knowledge and reflective thinking, equipping students with the necessary skills to navigate a world influenced by science and technology. It raises societal awareness about the significance of science and its applications in addressing everyday challenges. This form of education encompasses an understanding of scientific concepts and processes that aid in personal decision-making, civic engagement, cultural participation, and economic productivity. It serves as a platform for tackling societal issues, ultimately contributing to a higher quality of life.

However, despite these noble objectives, the effectiveness of science education is often undermined by various challenges. These include mismanagement of government funds, a shortage of qualified educators, negative student attitudes toward the subject, ineffective instructional methods, inadequate laboratory resources, and limited student exposure to hands-on laboratory activities. Additionally, poor incentives and remuneration for teachers, substandard working conditions, and unsatisfactory learning environments can lead to diminished teacher engagement. Furthermore, the socio-economic backgrounds of students often hinder their access to essential learning resources, resulting in lower achievement levels in science. Such obstacles impede the goal of imparting essential skills that can foster success and sustainable development within society, making the revitalization of science education imperative.

Skills acquisition encompasses a blend of movement mechanisms, physical literacy, biomechanics, athletic development, psychology, and coaching practices. In the context of the 21st century, it refers to a broad range of knowledge and traits deemed vital by stakeholders for achieving success in today's world, allowing individuals to function effectively in professional settings, engage in civic life, and enjoy leisure activities (Ananiadou & Clark, 2009). Different individuals hold various opinions regarding essential skills, but there are some widely accepted ones, including problem-solving, analytical thinking, reasoning, creativity, artistry, curiosity, imagination, innovation, self-discipline, adaptability, initiative, communication, collaboration, critical thinking, and technological proficiency (Adolphus, 2020). The acquisition of 21st-century skills through teaching and learning has emerged as one of the most significant challenges confronting education delivery in recent times.

Sustainable development represents an approach to growth and human development that seeks to satisfy the needs of the present without compromising the ability of future generations to meet their own needs. The goal is to establish a society where living conditions and resources adequately address human requirements without jeopardizing the integrity of the planet. This approach also aims to reconcile the needs of the economy, environment, and social well-being, and is often synonymous with sustainability. While sustainability is considered a long-term objective, sustainable development encompasses the processes and pathways required to achieve it (Mckeown, 2002). In Nigeria, progress towards sustainability is impeded by a lack of vision, planning, effective supervision, and proper implementation of well-designed plans. To foster awareness, these concepts should be integrated into education at all levels (Hamich & Wydler, 2014).

Revamping refers to the process of enhancing the form, structure, or appearance of something. Some practical strategies for revitalizing science education to better align with the objectives of skills acquisition and sustainable development are:

1. Fostering Partnerships: Establish collaborations between higher education institutions, organizations, and communities to provide students with real-life learning experiences.
2. Enhancing Learning Environments: Create improved learning spaces that facilitate experimentation, teamwork, collaboration, and exposure to technology and scientific equipment.
3. Funding On-the-Job Training: Invest in professional development for teachers to master their subjects, improve teaching methods, and integrate sustainable development into the curriculum.
4. Employing Active Learning Methods: Implement active learning strategies in teaching and learning activities to engage students more effectively.
5. Redesigning the Curriculum: Revise the curriculum to emphasize real-world applications, interconnections between subjects, and problem-solving activities.

Statement of the problem

Nations worldwide have embraced education as a key driver for achieving sustainability, and various commendable educational policies and programs have been developed over the years to foster skill acquisition and support development in Nigeria. However, these efforts have yielded limited results, potentially due to inadequate planning, oversight, and execution of the policies, as suggested by several researchers. Science education plays a crucial role in equipping individuals with the skills, knowledge, and attitudes necessary for sustainability. Nevertheless, the field faces numerous challenges, highlighting the need for reform. This study focuses on exploring strategies to enhance science education in alignment with 21st-century skills and sustainable development goals.

Research questions

1. What are the expected skills in science education that can aid sustainability?
2. How can science education be revamped to aid skills acquisition and sustainable development?
3. What are the current challenges facing science education?

Methodology

This study adopted a descriptive survey design to collect data from selected science teachers in public secondary schools across Ondo State. The target population comprised all science teachers employed in these institutions. Utilizing a simple random sampling technique, 100 teachers were randomly selected from 10 public secondary schools in Ondo State. Data collection was carried out using a self-structured questionnaire titled "Science Education: A Pathway to Skill Acquisition and Sustainable Development." The instrument was validated by experts, and its reliability was

determined using the test-retest reliability coefficient, which yielded a coefficient of 0.86, indicating that the instrument is reliable. The data collected was analyzed using the mean.

Results

Research Question 1: What are the current challenges in science education?

Table 1: *Challenges in science education*

Item	SA	A	D	SD	*Σfx*	x̄	Decision
One major challenge is the poor funding of science education in Nigeria	176 (44)	114 (38)	16 (8)	10 (1)	316 (100)	3.16	Agree
Shortage of trained teachers	128 (32)	108 (36)	20 (10)	22 (22)	278 (100)	2.78	Agree
Students' lack of interest in science subjects	144 (36)	126 (42)	20 (10)	12 (12)	302 (100)	3.02	Agree
Lack of sufficient exposure to laboratory activities	120 (30)	120 (40)	36 (18)	12 (12)	288 (100)	2.88	Agree
Poor environment for the teachers	144 (36)	102 (34)	40 (20)	10 (10)	296 (100)	2.96	Agree
Poor working conditions for the teachers	152 (38)	111 (37)	34 (17)	8 (8)	305 (100)	3.05	Agree
Lack of good learning facilities and equipment	168 (42)	132 (44)	20 (10)	4 (4)	324 (100)	3.24	Agree
Cluster Mean						3.01	Agree

Table 1 depicts the significant challenges identified, with a cluster mean of x̄ = 3.01, surpassing the benchmark for agreement set at x̄ = 2.50. This suggests that these challenges are prevalent in secondary schools in Nigeria, posing obstacles to the enhancement of science education for skill acquisition and sustainable development. The results further indicate that the most pressing challenge is the lack of adequate learning facilities and equipment, which has a mean of x̄ = 3.24, while the least pressing issue is the shortage of trained teachers, reflected by a mean of x̄ = 2.78.

Research Question 2: What are the expected skills in science education that students are supposed to learn?

Table 2: *Expected skills in science education*

Item	SA	A	D	SD	*Σfx*	x̄	Decision
Specific job skills	160 (40)	108 (36)	32 (16)	8 (8)	308 (100)	3.08	Agree
Collaborative skills	128 (32)	108 (36)	20 (10)	22 (22)	278 (100)	2.78	Agree
Communication skills	120 (30)	90 (30)	36 (18)	22 (22)	268 (100)	2.68	Agree
Practical skills and their applications	172 (43)	132 (44)	10 (5)	8 (8)	322 (100)	3.22	Agree
Technical skills	120 (30)	90 (30)	44 (22)	18 (18)	272 (100)	2.72	Agree

Scientific skills	164 (41)	120 (40)	20 (10)	9 (9)	313 (100)	3.13	Agree
Problem-solving skills	176 (44)	114 (38)	16 (8)	10 (10)	316 (100)	3.16	Agree
Cluster Mean						2.97	Agree

Table 2 indicates that respondents acknowledged the effectiveness of all skills outlined in the questionnaire, agreeing that each has the potential to enhance science education for skills acquisition and sustainable development. The cluster mean ($\bar{x}$ = 2.97) surpasses the benchmark mean ($\bar{x}$ = 2.50). Furthermore, the findings reveal that practical skills and their applications—which can significantly improve skills acquisition—received the highest mean value ($\bar{x}$ = 3.22). In contrast, communicative skills, while still important for skill acquisition and sustainable development, held the lowest mean value ($\bar{x}$ = 2.68).

Research Question 3: How can science education be revamped to ensure sustainable development?

Table 3: *Science education for sustainable development*

Item	SA	A	D	SD	Σfx	$\bar{x}$	Decision
Aid students to pursue STEM careers	128 (32)	108 (36)	20 (10)	22 (22)	278 (100)	2.78	Agree
Introduce the use of cutting-edge techniques	132 (33)	108 (36)	24 (12)	19 (19)	283 (100)	2.83	Agree
Encourage students to cultivate the habit of continual learning	144 (36)	102 (34)	40 (20)	10 (10)	296 (100)	2.96	Agree
Stimulate in the students the ability to proffer solutions to global challenges like environmental degradation, climate change and economic recession.	164 (41)	120 (40)	20 (10)	9 (9)	313 (100)	3.13	Agree
Encourage students to develop the right scientific skills and their applications	168 (42)	132 (44)	20 (10)	4 (4)	324 (100)	3.24	Agree
Promote inquiry-based learning	120 (30)	90 (30)	36 (18)	22 (22)	268 (100)	2.68	Agree
Support inclusion and a diverse scientific community.	112 (28)	84 (28)	40 (20)	24 (24)	260 (100)	2.60	Agree
Provide students with real real-world learning experience	160 (40)	144 (48)	8 (4)	8 (8)	320 (100)	3.20	Agree
Engage partners and stakeholders in science education programmes	120 (30)	120 (40)	36 (18)	12 (12)	288 (100)	2.88	Agree
Cluster Mean						2.92	Agree

Table 3 indicates that all the listed items represent various approaches to revitalizing science education in order to promote skill acquisition and sustainable development. Notably, item 19, which emphasizes the importance of encouraging students to develop the necessary scientific skills and their applications, recorded the highest mean value ($\bar{x}$ = 3.24). Furthermore, the responses from participants overwhelmingly confirmed that all the specified items, with a cluster mean ($\bar{x}$ =

2.87 > $\bar{x}$ = 2.50), could significantly enhance skill acquisition in science education and contribute to the realization of sustainable development.

Discussion of Findings

In discussing the findings of this study, the researcher followed a methodical approach to data analysis, utilizing relevant literature to support the conclusions. The first research question revealed that science teachers face a variety of challenges, including inadequate funding for science education in Nigeria, a shortage of qualified teachers, students' lack of interest in science subjects, unfavourable teaching environments, poor working conditions, and insufficient learning facilities and equipment. This finding aligns with the work of Omole and Ozoji (2014), who argued that the deficiencies in science education hinder the acquisition of practical skills due to limited funding, unqualified teachers involved in curriculum implementation, and a lack of adequate learning resources.

Similarly, the findings related to the second research question highlighted numerous skills that students are expected to acquire to promote effective science education. Among the skills identified were specific job skills, collaborative skills, communication skills, practical skills and their applications, technical skills, scientific skills, and problem-solving skills. These results correspond with Danjuma's (2019) study, which examined the relationship between science education and sustainable development in Nigeria, asserting that collaborative skills, communication skills, practical skills and their applications, technical skills, scientific skills, and problem-solving skills are essential for achieving a comprehensive understanding of science and its diverse applications within various economic and social contexts.

Additionally, the findings related to research question three highlighted several ways in which science education could be reformed to promote sustainable development. This includes the introduction of cutting-edge techniques, encouraging students to adopt a habit of lifelong learning, and fostering their ability to devise solutions to global challenges such as environmental degradation, climate change, and economic recession. It also involves guiding students to develop essential scientific skills and their practical applications, promoting inquiry-based learning, and providing real-world learning experiences. Furthermore, it is important to engage in partnerships with stakeholders involved in science education programs. This aligns with the work of Umore (2013), who emphasized that a strong foundation in science education, characterized by well-trained teachers, practical learning experiences, and collaboration among educators, policymakers, and industry stakeholders, is crucial for success.

Conclusion

The study concludes that science education faces numerous challenges, including inadequate government funding, a shortage of trained teachers, and students' disinterest in science subjects. Additionally, there is a lack of sufficient exposure to laboratory activities, poor remuneration and working conditions for teachers, and insufficient learning facilities and equipment. Furthermore, several crucial skills that enhance sustainability were identified, such as specific job skills, collaborative skills, communication skills, practical skills, technical skills, and problem-solving

skills. The study also revealed that effective strategies for reforming science education to support skill acquisition and promote sustainable development include encouraging students to pursue STEM careers, integrating cutting-edge technology, fostering a culture of continuous learning, developing students' ability to propose solutions to global challenges, and motivating them to cultivate and apply the appropriate scientific skills in their daily lives.

Recommendations

Based on the findings of the study, it was recommended that:

- The government should provide adequate funding for science education at all levels, offer in-service training for teachers, and ensure that those recruited are qualified and properly trained for their roles. Additionally, the government should enhance working conditions by offering better remuneration for educators. It is essential to create good facilities and a conducive learning environment for students.
- Teachers should focus on raising awareness and fostering students' interest in science-related careers, equipping them with the necessary skills for success in sustainable development.
- Educational stakeholders should be proactive in fostering collaboration among institutions, organisations, and the broader community. This collaboration will expose students to a variety of opportunities. They should also implement active learning methods in the classroom.

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