



## EFFECTIVE USE OF SCIENCE EDUCATION IN ERADICATING POVERTY IN A GLOBAL ECONOMY

SONDE, Patrick Olanrewaju, AYOOLA, Emmanuel Abiodun

<sup>1</sup>Integrated Science Department, NCE Part-Time Unit, Federal College of Education, Osiele, Abeokuta, Ogun State, Nigeria.,

Department of Natural Science Education, Lagos State University of Education, Otto Ijanikin, Lagos State, Nigeria.

### Abstract

Poverty eradication has for a long time been set up as a crucial socio-economic, political, and ethical humanity exercise expected to be mainstreamed in line with international standards into nations' policies. Accelerating global actions for a world without poverty through science education becomes imperative as science education is a veritable tool for any nation's advancement to the 21st-century standard. This paper examined the multifaceted roles of science education and how they can be effectively used in tackling poverty at its core. It was concluded that science education is one of the major components of national development capable of fostering creativity, innovation, and problem-solving skills which can contribute to socioeconomic growth, and equal opportunities with a sustainable and prosperous future. Recommendations were proffered towards the improvement of science pedagogy, adequate funding, creativity in curricular content, real-life application of science, and ethical entrepreneurial application of scientific knowledge to develop human ability for self-reliance and poverty eradication in the country.

**Keywords:** Science Education, Poverty Eradication, Effective Use, Global Economy

**Word Count:** 157

**Corresponding Author Email:** patricksonde@hotmail.com



## Introduction

The world and global economy are affected by a long-time pervasive phenomenon called poverty which makes a person incapable of accessing desirable basic amenities of life. Despite the diverse size and severity of poverty on individuals and the global economy, the quality of life is reduced and eventually, if not tackled, the economy of countries is negatively affected. Poverty continues to pervade not only Nigeria, but also many developing and developed countries even in the 21<sup>st</sup> century (World bank, 2023; National Bureau of Statistics [NBS], 2023; Ezinwa & Eyindah, 2022). Improving the quality of life through human efforts for the global economy became national exercise and this is reached through poverty eradication (Josiah, 2013). On one hand, globally, poverty eradication is a greatest challenge for the world (Poruțiu & Prilă, 2021) while on another, especially for the developing economies, poverty eradication is a core requirement for sustainable development (Ayoo, 2022).

Eradicating poverty on the globe has long been identified as a crucial human effort through ethical, social, economic, political activities embedded in line with international standards into national systems and policies. Ayoo (2022) identifies different poverty eradication policies and strategies by different countries. In other words, poverty eradication through the Sustainable Development Goals (SDGs) are people's agenda and an action plan tailored at eradicating poverty everywhere in whatever proportions leaving no one behind (Kamruzzaman, 2016). The international community through the United Nations in the past decades have made laudable attempts in eradicating poverty through the famous "Decade for the eradication of poverty" programmes. This was greeted with uneven success, especially the first decade (1997 – 2006) (UN, 2018). In 2013, 783 million people in the world live below \$ 1.90 per day which was in comparison with 1.867 billion people in the year 1990 (Castañeda, Doan, Newhouse, Nguyen, Uematsu & Azevedo, 2016)

Despite the global efforts and the past accomplishment, a population of almost 700 million people globally live in extreme poverty, that is, living below \$2.15 a day (World bank, 2022) and 47% of the world population, live below \$6.85 a day (a measure for the upper-middle-income countries) (World bank, 2023). The first SDG of the United Nations is to eradicate poverty by 2030 (Spada, Fiore & Galati, 2023). Through the third decade (2018 – 2027) - "accelerating global actions for a world without poverty", the international community targets eradication of poverty by 2030 (UN, 2018). This means all countries are expected to make efforts. Though there is no one-size-fits-all approach to eradicating poverty (Quinn, 2020), education has been reported by several research to be a potential for poverty eradication (Ofordum & Onyekwena, 2019; Oranga & Obuba, 2020) and for national development (Bhoje (2014) as cited in Ayeni, 2021) and as one with lasting legacy and multiple impacts in one's life, career and future (Al-Shuaibi, 2014). The focus of education is another key factor to consider in relationship to the potential of human development for realities capable of eradicating poverty. Andersen (2023) noted that humanity has been using nature to drive socioeconomic transformations. Poverty can therefore be eradicated through knowledge and education on nature (ecosystem).

Nature has the wealth and resources to eradicate the rampaging global poverty, create Jobs and enhance economic prosperity, yet we still live in a world of poverty. Establishing the link between eradication of poverty and nature, the (United Nation Environment Assembly [UNEA]) posited that global economic growth and resilience depend on ecosystems, which include farmlands, forests, and oceans. The earth's ecosystem according to (United Nations Environment Programme [UNEP], 2022) are the foundation of resources, services, and industries and if they are well harnessed, nature through all these features has the central potential of eradicating poverty. Biodiversity conceptually has the



potential of increasing the well-being (quality of life) and the livelihoods of people globally through ecosystem provisioning services (Billé, Lapeyre & Pirard, 2012). Poor health, poor housing conditions, inadequate quality of life, and employment dislocations are the indicators of poverty, others have been categorized as monetary poverty, capability poverty and social exclusion (Duflo & Banerjee, 2011; ERS, 2023; Spada, Fiore & Galati, 2023; NBS, 2023). Justifying the emerging consensus on biodiversity and poverty with static evidence, Life on earth (biodiversity) and ecosystem services enhance the quality of life through protection from natural hazards; provision of food and food security with quality water; provision of medicines, timber, and fuel; regulation of infectious diseases (Ash & Jenkins, 2007) as cited in (Billé et al., 2012). Nature is indeed beautiful and an amazing phenomenon we live in and with. Therefore, prioritizing nature-based solutions remains a key enabler of SDGs (Andersen, 2023).

Although poor management of nature or wrong intentioned policies around it may be a bane for humanity thereby leading to global impoverishment. Several debates have ensued like those of climate change, etc. In this line were the two critical questions asked, on whether biodiversity conservation is a route to poverty alleviation and if poverty alleviation is a route to better biodiversity management (Billé et al., 2012), and those of nature crisis by UNEP. The crux of this matter is understanding how nature functions and how biodiversity can be worked with effectively, efficiently, and safely. Channeling our education toward understanding nature cannot be a misplaced priority. The place of educating the world about science becomes paramount.

Science is the study of nature. Science encompasses not only the essential activities experienced in our community and daily life, but also elaborate parts like the production of technology; increasing the efficiency and effectiveness in the use of natural resources, enhancing socio-cultural change, and discovering the keys to a longer and quality life (Rull, 2014). The present globe and the various societies in it have been powerfully shaped with the help of science (Reiss, 2014). Since education has been proven as a vehicle for eradicating poverty (Spada et al., 2023), educating the citizens in science plays a key role on an individual's personal and professional development as well as in the advancement of nations (Ilgaz, Eskili & Vural, 2019). This type of education is referred to as Science Education (Keswet, Agbowuro, Jimwan & Gisilanbe, 2017), It encompasses the knowledge from Science Technology Engineering and Mathematics (STEM) (Kazu & Yalcin, 2022; Reiss, 2014). The globe is governed by the laws of science as seen in Physics, Chemistry and Biology, the science teacher needs to provide relevant and adequate information with factual arguments and empirical evidence capable of justifying to students the usefulness of these laws to them and to the society and how they can be utilized for a sustainable future (Onyia & Iketaku, 2014; Olteanu et al., 2023). It is therefore high time we began looking attentively at how science education can be effectively used for different population of the society by instructing them about scientific knowledge, how to carry out research, and by stimulating them to see the potential and the roles science play in shaping and sustaining the world and those of human civilization. Doing this makes individuals and nations capable of making informed decisions and ensuring the continuity of the ecosystem (Rull, 2014). From this background, science education matters in the eradication of poverty globally, however science education is being challenged by several factors (Ayeni, 2021), poverty inclusive. Effective teaching and learning about STEM are far more complex beyond what any policy makers, the entire public and even the teacher realize (Clough, 2015). This makes it crucial to rethink harnessing several features of science education for an effective use in eradicating poverty everywhere.



## SCIENCE EDUCATION

Science education goes beyond teaching and learning of science subjects. The aim and goals of science can only be achieved through effective education. Agbowuro, Oriade & Shuaibu (2015) conceived science education as a field concerned with sharing science content and processes with individuals not traditionally considered part of the scientific community. One of the main purposes of science education is to equip the learners with the right scientific skills and knowledge which makes them to be self-reliant and function effectively in the community at large. Age's 1-12years learn science by being involved not only with its content, but also with learning experience. The field of science education includes work in science content, science process and teaching pedagogy. Science process skills incorporates mental and physical abilities and competences which serve as tools needed for an effective STEM as well as problem (Nwosu & Nwaocha, 2014).

The knowledge of science also helps in understanding and explaining better the day-day activities. Science education is veritable tool in promoting a culture of scientific reasoning and motivating citizens to use evidence-based thinking for decision making; ensuring citizens have the confidence, knowledge and skills to participate actively in an increasingly complex scientific and technological world; developing the competencies for problem-solving and innovation, as well as analytical and critical thinking necessary to empower citizens to lead socially responsible, professionally-engaged and Personally fulfilled lives. Furthermore, it involves inspiring learners of all ages and talents to aspire for careers in science and other occupations and professions underpinning our knowledge and innovation-intensive societies (Ajayi, Achor & Otor, 2019). For this reason, the scientific knowledge and skills acquired by the students could be applied into meaningful entrepreneurial skills and ideas tailored towards being self-reliant through creation of job opportunities for oneself and others globally thereby eradicating poverty.

## FEATURES OF AN EFFECTIVE SCIENCE EDUCATION

**PEDAGOGY:** Science education incorporates the teaching of science across levels of education (Reiss,2014) and uses different approaches, methods, and strategies capable of instilling scientific knowledge and abilities into its recipient (Darling-Hammond, Flook, Cook-Harvey, Barron & Osher, 2020). Science Education fosters skills and methods such as Demonstration, Project based, Inquiry, Problem-solving, Experimentation, etc. Effective use of pedagogy in science education inculcates and develops creativity in learners. Creativity is associated with innovations, statistical awareness and uniqueness of solutions tailored to a particular event (Guliford as cited in Mazeh, 2020). Creativity is an important skill because the future of work is hinged on it and as such helps humanity to find new opportunities while adapting to a dynamic environment (Cropley, 2011). In a world rampaged by food scarcity, pandemics, climate change, economic doldrums and inequities orchestrated by poverty, human endeavours must be creative to solve these global challenges (Oppert, O'Keefe, Bensnes, Grecu & Cropley, 2023). The 21<sup>st</sup> century economy can be sustained by creativity. Most educational systems support creativity for competence (Trnova, 2014).

**SCIENCE CURRICULUM:** Scientific knowledge organization in curricula considers each country's unique needs, vision, and educational philosophy. Age, learners' levels, and global context influence curriculum design. Reiss (2014) notes that globally, science is a core subject in school curricula, adapting to each country's specifics. The curriculum reflects nature, scientific knowledge, and technological inventions, aiming for individual, community, national, and global application. For example, biology and chemistry, focusing on matter's structure, composition, and interactions, play a



crucial role in science education (Shana & Abulibdeh, 2020). The organized STEM curricula ensure comprehensive learning, fostering understanding of the world.

**SCIENCE FACILITY, INFRASTRUCTURES, EQUIPMENT AND RESOURCES:** Exploring nature in science education for various purposes has been made easy with the advent of basic and advanced infrastructural equipment and devices which are useful for understanding and engaging in different science-based activities and research. Complex and abstract natural phenomenon are not only domesticated by humans through artificial medium but also in video simulations. Such facilities and resources include but are not limited to Botanical and Zoological gardens, Laboratories, technical workshops, equipment, Libraries and Archives, Computers, electronics, audiovisual and digital devices, robotics and artificial intelligence. Oyovwi (2022) posited that science education demands an intensive application of resources capable of maximizing the teaching and learning of science, and they include things or materials in the school or the environment that can facilitate science education. The effective use of these resources can make science education a good instrument for eradicating poverty

**SCIENCE EDUCATION EXPERTS:** The historical evolution of science, documented through the exploration of nature by scientists, highlights the critical role of science education in transmitting knowledge across generations. Successful documentation can be attributed to the understanding and teaching of scientific processes. As global challenges appear, the advancement of science relies on the expertise of both scientists and educators. Emphasizes has been placed on the importance of preparing teachers who can make well-informed pedagogical decisions, underscoring the significance of knowledgeable educators in the progress of science (Clough, 2015). Science teachers are therefore pivotal contributors to the development of science education in any nation (Kola, 2013).

**ENTREPRENEURSHIP AND CAREER:** Engaging learners in science education during secondary school is pivotal for motivating and preparing them to pursue careers in STEM fields. This period is very vital in shaping students' passion and goals in science (Chiovitti, Duncan & Jabbar, 2017). Entrepreneurship in science, including commercializing skills and findings, becomes a means of livelihood for scientists, and of contribution to the advancement of science. Kola (2013) highlights how STEM graduates can become producers and service providers. Entrepreneurship in science not only helps individual livelihoods but also enhances quality of life, addresses global challenges, and contributes to the global economy on a broader scale.

**SCIENCE PUPILS/LEARNERS:** The knowledge of science is undermined with overtime substantial drop in enrollment. There must be learners who are willing to study and practice science to keep it as a field, process, and body of knowledge. Reiss (2014) argues that science can bring about human advancements through the pupils. Reiss (2014) reveals that many countries of the world are interested in many of their young ones developing passion for sciences. The author reveals that most of the politicians, leaders and business tycoons are of the opinion that a country may be lowered in rank in the global league if most of her learners are not enrolled in STEM. Science education is paramount to the socioeconomic and welfare of any nation as the level of sustainable development of any human society is linked with the quality of the science education which is learned and applied by the citizenry (Ofordum et al., 2019).

## **BENEFIT OF SCIENCE EDUCATION**

**Technological Advancement and Innovations:** The importance of science education for global scientific and technological progress is widely acknowledged. Science education equips students with



essential knowledge and skills, laying the foundation for technological advancements (Udu, 2018). Technology, a byproduct of science, has transformed the world into a global village, enhancing economic and health aspects and eradicating poverty. Notably, technological innovations in communication, transportation, media, computing, and beyond contribute to an improved quality of life. The United States of America, Switzerland, South Korea, Sweden, Netherlands, and China in the year 2022 were ranked as the top six out of the 25 most technologically advanced countries (Haqqi, 2022). Their advancement, prowess, success can be attributed to effective science education (Obiadazie & Obi, 2020). Technological advancement boosts a country's economy and can be a tool for poverty eradication.

**It Improves healthcare systems, human health, and the quality of life:** Healthcare systems are vital for enhancing life quality, eradicating poverty, and fostering global economic growth. Poor health can lead to poverty as individuals become unable to work and contribute to the economy. Basic education is integral to health (Hahn & Truman, 2015). Science education, particularly health literacy, plays a crucial role in overall well-being (Zeyer, 2013). Furthermore, Science education has a dual role in disease prevention and management (Ghaffar, 2022). Continuous research in healthcare is empowered by effective science education, leading to advancements in diagnostics, treatments, and life support technologies. STEM education fosters computer, electronics, physics, and technology knowledge, yielding innovations in clinical procedures and disease management.

**It enhances research capacity:** Chaffee et al. (2021) as cited in Habig & Gupta (2021) reported many informal science education learning programmes equip learners with capacity for authentic science and STEM research. The science field continues to increase in knowledge through education and research. This cut across the research in physics, chemistry, biology, computing, technology, agriculture, mathematics, etc. It has made humans more intimate with nature. Critical thinking and creativity have increased in the field of mathematics, computer and statistics paving ways through manipulation of numbers, codes, etc. for unprecedented processes and products competent of increasing social economic welfare of the world. The skills learners gain through effective science education foster creativity and capacity for innovative research capable of making global economic impacts. Scientific research contributes to the economic development of any country (Kinh & Clinton, 2020).

**Development of national security and resources:** Science education has raised human ability to produce weapons and other instruments capable of individual protection and defending sovereignty of nations. The knowledge of physics, chemistry, biology, mathematics, and computers helps in harnessing most natural and artificial materials in the development of resources for security (Onwubumpe & Akunna, 2021). The field of aeronautics has contributed to security and warfare with the development of airplane, drones, rockets, and fighter jets which has enhanced surveillance and fight against terrorists. A country torn apart with insecurity will soon experience poverty, an example is Yemen (World bank, 2022). Science education contributes to National security in no small measure (Udu, 2019).

**It promotes economic development and sustainability:** Educating people in science prepares a nation towards getting sustainable returns. Countries skilled in one area or the other commercialize their scientific skills and technological products, getting in return raw materials, other services, and foreign exchange earnings. Also, various organizations using science and technologies to supply products and services will contribute to job creation and the economic development of their host country, both local and international. This no doubt will contribute to a nation's GDP thereby eradicating poverty. Most of what contributes to the global economy comes from the exploration of



nature. The pharmaceutical gets theirs from nature (chemicals, plant, animals and petrochemicals mostly), Cement industry from limestone, Bakery and breweries from plants, Cotton from timber (also plants), Petroleum from crude oil. Nguyen et. al. (2017) as cited in Kinh et al. (2020) reported that in Australia, advances in science led to 20 -30% growth in their economic activities, exports, and employment.

**Agricultural development and food security:** Investing in science education has long-term implications for agriculture and the global economy. The knowledge of science has paved the way to successful research into the best crop farming and animal husbandry practices. In addition, soil and irrigation technologies, genetic modifications, and adaptation of food production to climate change have been introduced through the knowledge of STEM education. The development of digitalized farm equipment, robotics, artificial intelligence, and machines that foster automated and mechanized farming are now current agricultural practices (United Nations Conference on Trade and Development [UNCTAD], 2017). This type of farming encourages large-scale farming, guarantees crop protection, food production, and abundance, and ensures global food security. Famine and drought, capable of causing poverty, can be overcome in farming with irrigation technologies. Effective use of science education in this direction prepares an individual for different agriculturally based professions and abilities for sustainable global economy through agricultural development and food security.

**Exploration of natural resources:** Science education is crucial for identifying and utilizing natural resources. Chemistry imparts knowledge of elements, while biology covers plants and animals, and physics addresses light, motion, electricity, etc. Integrating nature-based teaching experiences (Schilhab, 2021) into science education prepares students for diverse science careers. Earth's varied, untapped resources offer opportunities for economic growth, job creation, and poverty reduction. Nations must develop human capacity for resource identification, exploration, and commercialization to avoid excessive reliance on other economies. Failure to recognize and exploit natural resources can lead to economic losses, emphasizing the critical role of science education in fostering appreciable global economic self-sufficiency.

**Provides relevant knowledge on conservation and biodiversity:** Once nature is affected, the human population, environment and the global economy (\$577 billion in annual global crop production) are also affected significantly (UNEP). Hence nature must be conserved to ensure the continuous balancing of the ecosystem. Schilhab (2021) asserted that science education trains learners about conservation of nature. Knowledge of nature is very crucial to all humans, especially those in rural communities. Protecting wide life, the plants and forest etc. and keeping a good environment enhances the quality of life of humanity and a viable economy.

**Facilitate career development:** Equipping learners with quality and effective science education advances their curiosity and interest about nature and science, sustains their disciplinary engagement towards attaining scientific career heights (Habig & Gupta, 2021). This a way of getting employed and or of Job creation (Kola, 2013). Continuous quality study in science develops the science field and the economy of a nation. More importantly, science education promotes in learners the interest of becoming a science teacher. Science education is a prerequisite for studying science related disciplines at the university. Career development fosters self-reliance and poverty eradication.

**It enhances skills and personal development:** Science education cultivates truth-seeking and decision-making skills, using the scientific process to understand the past, present, and forecast the future. Engaging in science education fosters creativity, analytical thinking, problem-solving, and



manipulative skills. Clough (2015) suggests that teaching science through inquiry, though challenging, encourages students to articulate their ideas effectively. These skills gained through science education transcend beyond scientific careers, helping individuals in various fields. Whether pursuing scientific careers or concluding science education at the secondary school level, individuals gain skills applicable to other endeavors, capable of personal and national growth.

### THE STATE OF SCIENCE EDUCATION IN NIGERIA

In Nigeria, science education, crucial for national development and human capital, faces a decline in quality attributed to factors like inadequate funding, poor infrastructure, low enrollment, and a shortage of qualified teachers. According to the World Bank (2014), Nigeria shows one of the lowest levels of science and mathematics achievement in sub-Saharan Africa, with a TIMSS (Trends in International Mathematics and Science Study) average score of 254 in 2015 compared to the international average of 500. PISA (Programme for International Student Assessment) ranks Nigeria 78th out of 79 countries in science literacy (353 out of 1000), far below the OECD (Organization for Economic Co-operation and Development) average (489) (World Bank, 2014). Addressing these challenges is paramount for sustainable progress. They are detailed below:

**FUNDING:** Insufficient funding and infrastructure pose significant challenges to science education in Nigeria. Report shows that only 6.7% of Nigeria's public expenditure was allocated to education in 2017, falling below the African Union's recommended 15-20%. Additionally, a mere 0.6% of the GDP was dedicated to research and development in 2018, well below the 2.4% global average (United Nations Educational, Scientific and Cultural Organization [UNESCO] Institute for Statistics, 2020). Inadequate funding results in schools lacking essential facilities like classrooms, laboratories, equipment, libraries, and ICT resources. National Bureau of Statistics (2019) data shows a deficit in electricity supply (35% for primary, 53% for secondary) and computer availability (25% for primary, 36% for secondary) in public schools. Poverty eradication demands adequate budgetary allocation for science education.

**ENROLLMENT:** In Nigeria, science education encounters a challenge with low enrollment and retention, particularly among girls and rural students. Data from the Federal Ministry of Education (2019) reveals only 28% of junior and 18% of senior secondary students enrolled in science subjects in 2018. 22% of Junior secondary school students and 14% of senior secondary school students had credit and above scores in the national science examination. Likewise, barriers for girls and rural dwellers include poverty, early marriage, cultural norms, gender stereotypes, and distance. Ogunniyi et al. (2016) reports limited interest in pursuing science careers among 16% of females and 12% of rural students after secondary school.

**DEARTH OF ADEQUATE QUALIFIED SCIENCE TEACHERS:** A critical shortage of qualified science teachers exists in Nigeria with a deficit of approximately 250,000 science teachers at basic and secondary levels (Teachers Registration Council of Nigeria [TRCN], 2019). The inadequately trained and unqualified nature of many current science teachers is underscored by (EDOREN, 2020) with findings, indicating that only 51% and 45% of junior and senior secondary science teachers, respectively, possess a minimum qualification of National Certificate in Education or B.Ed. Additionally, a mere 39% of science teachers at both levels have received any in-service training in the past two years, highlighting the pressing need for interventions to address these gaps.

**CURRICULUM ISSUE:** The current science curriculum in Nigeria, rooted in the 1950s British colonial model, lacks necessary adequate updates to align with the evolving needs of Nigerian society





and economy. This curriculum overload presents a challenge, with many disjointed topics and concepts. Moreover, it does not address local context, culture, and values. Okebukola (2018) revealed limited incorporation of local examples or problem-solving activities by science teachers. Urgent intervention is needed to address the crisis in science education, emphasizing the need for increased funding, improved infrastructure, qualified curriculum experts, and enhanced quality teacher recruitment and training for an effective science education curriculum process.

### **THE STATE AND CHALLENGES OF SCIENCE EDUCATION GLOBALLY**

Globally, the challenges of science education are clear, with urgent needs in nations like Brazil and Paraguay due to prevalent poverty levels. Purposeful science education, tailored to local contexts, is identified as a crucial tool for addressing these issues (Sadler, Gil, Sifredo, Valdes & Viches, 2015 as cited in Keswet et al., 2017). Latin American countries, including Colombia, Argentina, and Chile, face shortages of science professionals and struggle with memorization-centric education (Keswet et al., 2017). Europe contends with funding cuts and uneven science literacy (Atwater & Mutegi, 2021). Disparities persist in the science performance of students, such as those of African ancestry in the United States (Atwater & Mutegi, 2021). Latin America's scientific output is disproportionately low, and Bolivia exemplifies challenges in resource-limited science education (Ferreira, Carosso, Montellano Duran, et al., 2019). In Africa, issues range from theoretical coverage to inadequate resources, security concerns, corruption, and insufficient teacher quality (Ayeni, 2021; Keswet et al., 2017).

### **CONCLUSION**

Poverty is a global issue, and although various solutions exist, there is no one-size-fits-all approach. Nature, the essence of existence, holds the key to eradicating poverty. Science, the study of nature, is crucial for understanding and using its wealth. Science education, encompassing the teaching of science subjects, plays a vital role in national development, supplying a pathway to poverty eradication and the advancement of a sustainable global economy. Given the diverse state of science education in different countries, it is imperative that stakeholders effectively use the quintessential science education in eradicating poverty.

### **RECOMMENDATION**

The following recommendation were considered for the effective use of science education in eradicating poverty in a global economy:

1. Governments of all nations should invest more in science education.
2. Students should be encouraged to study science.
3. Teachers should endeavour to develop themselves professionally and remain current.
4. Science should be taught in schools with nature and real-life examples.
5. The curriculum should be tailored towards the immediate environment.
6. Functional and ethical entrepreneurship should be introduced in science subjects.
7. Adequate instructional materials should be supplied to enhance science education.
8. Science Students of all levels should be encouraged to embark on scientific projects for career advancement, poverty eradication, etc.
9. Ethical issues with respect to the scientific products and process should be taught and students should be encouraged to apply scientific knowledge only to save the world.
10. Co-curricular activities that can ease the study of science should be made mandatory for the teaching and learning of science.



## References

- Agbowuro, C., Oriade, L. T., & Shuaibu, S. (2015). The Nigerian child, science and technology education, current challenges, and possible solutions. *International Journal of Education, Learning and Development*, 4(1), 60-69.
- Al-Shuaibi, A. (2014). The importance of education. [https://www.researchgate.net/publication/260075970\\_The\\_Importance\\_of\\_Education](https://www.researchgate.net/publication/260075970_The_Importance_of_Education)
- Andersen, I. (2023). A radical shift to working with nature. Speech delivered for nature driving economic transformation: Leveraging the power of biodiversity and nature to drive equitable economic progress (SDG action weekend, acceleration day, high impact initiatives). <https://www.unep.org/news-and-stories/speech/radical-shift-working-nature>
- Anthony, C., Duncan, J. C., & Jabbar, A. (2017). Promoting science in secondary school education. *Trends in Parasitology*, 33(6), 416-420. <https://doi.org/10.1016/j.pt.2017.02.003>
- Ayeni, M. (2021). The challenges and prospects of science education development in Africa. *Mediterranean Journal of Social Sciences*, 12, 120. <https://doi.org/10.36941/mjss-2021-0033>
- Atwater, M. M., & Mutegi, J. W. (2022). Science education and the African diaspora in the United States. *Cult Stud of Sci Educ*, 17, 1–7. <https://doi.org/10.1007/s11422-022-10103-w>
- Ayoo, C. (2022). Poverty reduction strategies in developing countries. *IntechOpen*. doi: 10.5772/intechopen.101472
- Billé, R., Lapeyre, R., & Pirard, R. (2012). Biodiversity conservation and poverty alleviation: a way out of the deadlock? *S.A.P.I.E.N.S [Online]*, 5(1). <http://journals.openedition.org/sapiens/1452>
- Castaneda Aguilar, R. A., Doan, D. T. T., Newhouse, D. L., Nguyen, M. C., Uematsu, H., & Azevedo, J. P. W. (2016). Who are the poor in the developing world (English). *Policy Research Working Paper* (No. WPS 7844). Washington, D.C.: World Bank Group. <https://documents.worldbank.org/curated/en/187011475416542282/Who-are-the-poor-in-the-developing-world>
- Clough, M. (2015). A science education that promotes the characteristics of science and scientists. *K-12 STEM Education*, 1, 23-29. 10.14456/k12stemed. 2015.23
- Clough, M. (2015). A science education that promotes the characteristics of science and scientists: features of science teacher preparation. *K-12 STEM Education*, 1 .10.14456/k12stemed. 2015.27.
- Cropley, A. J. (2011). Definitions of creativity. In M. A. Runco & S. R. Pritzker (Eds.), *Encyclopedia of creativity*. 511-524. San Diego, CA: Academic Press.
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 24(2), 97-140. <https://doi.org/10.1080/10888691.2018.1537791>
- EDOREN. (2020). Science teacher quality and student learning outcomes in Nigeria: Technical report. *EDOREN Report No. 25*. Abuja: EDOREN.
- Ferreira, L. M. R., Carosso, G. A., Duran, N. M., Bohorquez-Massud, S. V., Vaca-Diez, G., Rivera-Betancourt, L. I., Rodriguez, Y., Ordonez, D. G., Alatrisme-Gonzalez, D. K., Vacaflones, A., Auza, L. G., Schuetz, C., Alvarado-Arnez, L. E., Alexander-Savino, C. V., Gandarilla, O., & Mostajo-Radji, M. A. (2019). Effective participatory science education in a diverse Latin American population. *Palgrave Commun*, 5, 63. <https://doi.org/10.1057/s41599-019-0275-0>
- Ghaffar, A. (2022). The role of science education for combating and preventing diseases. [https://www.researchgate.net/publication/362302937\\_the\\_role\\_of\\_science\\_education\\_for\\_combating\\_and\\_preventing\\_diseases](https://www.researchgate.net/publication/362302937_the_role_of_science_education_for_combating_and_preventing_diseases)
- Habig, B., & Gupta, P. (2021). Authentic STEM research, practices of science, and interest development in an informal science education program. *IJ STEM Ed*, 8, 57. <https://doi.org/10.1186/s40594-021-00314-y>



- Hahn, R. A., & Truman, B. I. (2015). Education improves public health and promotes health equity. *International Journal of Health Services*, 45(4), 657-678. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4691207/416-420>.
- Haqqi, T. Y. (2022, December 24). 25 Most technologically advanced countries in the world in 2022. *Yahoo Finance*. <https://finance.yahoo.com/news/25-most-technologically-advanced-countries-173131431.html>
- Kamruzzaman, P. (2016). A critical note on poverty eradication target of Sustainable Development Goals. *European Journal of Sustainable Development*, 5, 87-110.
- Kazu, I. Y., & Yalcin, C. K. (2021). The effect of STEM education on academic performance: A meta-analysis study. *The Turkish Online Journal of Educational Technology*, 20(4).
- Keswet, L. A., Agbowuro C., Jimwan, C. S., & Gisilanbe, N. A. (2017). Development of Science Education in a Globally Depressed Economy. *International Journal of Innovation and Research in Educational Sciences*, 4(1), 2349–5219.
- Kola, A. J. (2013). Importance of science education to national development and problems militating against its development. *American Journal of Educational Research*, 1(7), 225-229. <https://pubs.sciepub.com/education/1/7/2/index.html#Cor>
- Mazeh, Y. (2020). What is creativity and why it is so Important? *Open Access Library Journal*, 7, 1-11. doi: 10.4236/oalib.1105562.
- National Bureau of Statistics. (2019). Education statistics: National and state level. Abuja: NBS.
- National Bureau of Statistics. (2023). The Multidimensional Poverty Index (MPI). Data On multidimensional and monetary poverty in Nigeria. <https://www.nigerianstat.gov.ng/>
- Nwosu, E. J. & Nwaocha, C. (2014). Entrepreneurship education: Enhancing or discouraging graduate start-up at the university of Pretoria. *Africa Education Review*, 13(2), 96-114.
- Ofordum, M. C., & Onyekwena, C. N. (2019). Science education: A tool for sustainability in Nigeria's development. *Multidisciplinary Journal of Education, Research and Development*, 3(1), 71.
- Ogunniyi, M. B., Jegede, O. J., Ogawa, M., Yandila, C. D., & Oladele, F. K. (2016). Factors influencing students' attitudes and aspirations towards science across selected African countries. *International Journal of Science Education*, 38(18), 2718-2742.
- Okebukola, P. (2018). Science education in Nigeria: challenges and way forward. *Journal of Science Education and Technology*, 27(4), 283-291.
- Okoli, O., & Anazodo, O. (2022). Science education as a tool for combating insecurity in the country. *International Journal of Development Studies in Humanities and Social Sciences*, 12(1), 109-118.
- Olteanu, R. A., & Gorghiu, G. (2023). Increasing the students' interest in science by implementing a Science Action Dedicated to Plastics Biodegradability. *Proceedings of the 5th International Baltic Symposium on science and technology education*, BalticSTE2.
- Onwubumpe, B. N., & Akunna, O. A. (2021). Use of science and technology in provision of security for sustainable development in Nigeria: Value of mathematics. *International Journal of Pure and Applied Science. IJPAS*, 197, 20(9).
- Onyia, C. N., & Iketaku, I. R. (2014). The role of science education in meeting the challenges of tertiary institutions in national development of Nigeria. *Continental J. Education Research*, 7(1), 30-34. <https://doi.org/10.5707/cjeducres.2014.7.1.30.34>
- Oppert, M. L., O'Keeffe, V., Bensnes, M. S., Grecu, A. L., & Cropley, D. H. (2023). The value of creativity: A scoping review. *Journal of Creativity*.
- Oranga, J., & Obuba, E. (2020). Education as an instrument of poverty eradication in Kenya: successes and challenges. *Open Journal of Social Sciences*, 8, 410-424. <https://doi.org/10.4236/jss.2020.89031>



- Oyovwi, O. (2022). Resource management in science education for sustainable development in Nigeria.
- Poruțiu, C., & Prilă, M. (2021). The great challenge of the 21st century – poverty eradication across the world. *Journal of Public Administration, Finance and Law*. <https://doi.org/10.47743/jopaf1-2021-20-18>.
- Quinn, L. (2020). Global report: Forests underrated as allies to curb rural poverty. ACES News, College of Agriculture, Consumer and Environmental Sciences. <https://aces.illinois.edu/news/global-report-forests-underrated-allies-curb-rural-poverty>
- Reis, M. J. (2014). What place does science have in an aims-based curriculum? Perspectives on the science curriculum, *SSR*, 95(352).
- Rull, V. (2014). The most important application of science: As scientists must justify research funding with potential social benefits, they may well add education to the list. *EMBO Reports*, 15(9), 919-922. <https://doi.org/10.15252/embr.201438848>
- Schilhab, T. (2021). Nature experiences in science education in school: Review featuring learning gains, investments, and costs in view of embodied cognition. *Front. Educ.*, 6. <https://doi.org/10.3389/educ.2021.739408>
- Shana, Z. J., & Abulibdeh, E. S. (2020). Science practical work and its impact on students' science achievement. *Journal of Technology and Science Education*, 10(2), 199-215. <https://doi.org/10.3926/jotse.888>
- Spada, A., Fiore, M., & Galati, A. (2023). The impact of education and culture on poverty reduction: Evidence from panel data of European countries. *Soc Indic Res*. <https://doi.org/10.1007/s11205-023-03155-0>
- Teachers Registration Council of Nigeria. (2019). Report on the status of science teachers in Nigeria. TRCN, Abuja.
- Trnova, E. (2014). IBSE and creativity development. *Science Education International*, 25(1), 8-18.
- Udu, D. A. (2018). Innovative practices in science education: a panacea for improving secondary school students' academic achievement in science subjects in Nigeria. *Global Journal of Educational Research*, 17, 23-30. <https://dx.doi.org/10.4314/gjedr.v17i1.4>
- Udu, D. A. (2019). Utilization of science education for promoting national security in Nigeria: A study of Ebonyi state. *International Journal of Integrated Research in Education*, 244-253. <https://doi.org/10.36265/ijired.2019.010134>.
- UNCTAD. (2017). The Role of Science, Technology and innovation in ensuring food security by 2030. UNCTAD/DTL/STICT/2017/5. [https://unctad.org/system/files/official-document/dtlstict2017d5\\_en.pdf](https://unctad.org/system/files/official-document/dtlstict2017d5_en.pdf)
- UNESCO Institute for Statistics. (2020). Education spending. Retrieved from <http://data.uis.unesco.org/index.aspx?queryid=181>
- UNEP (n. d). Facts about the nature crisis. <https://www.unep.org/facts-about-nature-crisis>
- UNEP (2022, October 10). Biodiversity: Our solutions are in nature. <https://www.unep.org/news-and-stories/story/biodiversity-our-solutions-are-nature>
- United Nations. (2018). Implementation of the third United Nations decade for the eradication of poverty (2018–2027). Report of the Secretary-General.
- Vincent, C. E., & Ezinwa, C. (2022). Poverty alleviation in Nigeria in the 21st Century. *Khazar fssrn.com/abstract=4270446*
- World Bank. (2014). A decade of development in sub-Saharan African science, technology, engineering and mathematics research. <http://documents.worldbank.org/curated/en/237371468204551128/A-decade-of-development-in-sub-Saharan-African-science-technology-engineering-and-mathematics-research>



World bank (2022). Poverty and shared prosperity 2022: Correcting course. *Overview booklet*.

<https://www.worldbank.org/en/publication/poverty-and-shared-prosperity>

World bank (2023, October 17). Understanding poverty.

<https://www.worldbank.org/en/topic/poverty/overview#3>

Zeyer, A. (2013). Health education and science education. 10.1007/978-94-007-6165-0\_389-4.