

Adequate Funding Panacea to Science Education Problems in Nigerian Schools

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Abstract. *Funding is critical for the successful implementation of science education programs in educational institutions. Adequate funding is essential for realizing the objectives of science education in schools. This paper examines the importance of adequately funding science education in Nigerian schools. Secondary data were utilized, collected from government documents, print resources, and online publications. Content analysis was used to narrow the literature to the theme of the study. The findings indicate that adequate funding of science education in Nigeria will lead to the provision of infrastructure facilities, laboratories, ICT centers, libraries, science instructional resources, and employment of competent science teachers, effective capacity building, and the successful implementation of STEM education programs. The paper also highlights that proper funding can enhance the quality of education by enabling continuous teacher training, fostering innovative teaching methodologies, and improving overall student outcomes. Based on these findings, the paper recommends that the government should increase the budgetary allocation for education, with a specific focus on prioritizing science education to ensure sustainable development and global competitiveness.*

Key words: *Adequate, Funds, Science Education, Schools.*

Introduction

Inadequate funding is a significant impediment to the development of education in Nigeria. This challenge is particularly pronounced in the field of science education, where insufficient financial resources have led to suboptimal implementation of various educational programs. The chronic underfunding of science education has been identified as a critical issue undermining its progress and efficacy (Okwelogu, Ogunode & Abayomi, 2021).

The problem of inadequate funding pervades all levels of education in Nigeria, with severe implications for the administration and management of science programs. Previous studies, including those by Ogunode and Aiyedun (2020) and Okwelogu, Ndayebom, and Ogunode (2023), have highlighted that one of the major obstacles facing science education in Nigerian higher institutions is the lack of adequate financial support. The annual budgetary allocations for these programs are insufficient to meet the high costs associated with their effective administration. Science programs require substantial investment to ensure quality education, up-to-date laboratory facilities, and competent staff. Therefore, there is an urgent need for increased funding to enhance the implementation and sustainability of science education programs across higher education institutions in Nigeria.

In 2019, Dajal, and Mohammed observed that the challenge of inadequate funding is a persistence problem in science education in secondary schools. Most often, science curriculum changes face a lot of problems, because of inadequate funds to recruit qualified teachers, train and retrain the teachers, recruit capable technicians and supportive staff, build laboratories for practical to cope with the innovation. Ereh (2005) identified lack of funding as a major factor that militates against science curriculum changes and implementation. Where there is inadequate fund, the anticipated change will suffer a serious setback because it will be difficult to implement an innovation effectively and efficiently (Ughamadu, 2006; Dajal, & Mohammed, 2019).

At the Basic education, Ogunode (2020) noted that the challenge of poor funding has affected implementation of science education and in specifically STEM-education at the elementary level. Generally, Ereh (2005) identified lack of funding as a major factor that militates against science curriculum changes and implementation. Where there is inadequate fund, the anticipated change will suffer a serious setback because it will be difficult to implement an innovation effectively and efficiently (Ughamadu, 2006). There is gainsaying the fact that the success of any education programmes depends largely on financial support. This is because inadequate funding militates against the provision of quality education. Inadequate funding adversely affects the provision of infrastructure, facilities and sufficient number of workforce (teaching and non-teaching staff) needed to deliver quality science education for the recipients. It is based on this that this paper seeks to examine the adequate funding as panacea to challenges facing science education in Nigerian schools.

This paper aims to explore the ramifications of inadequate funding on science education in Nigeria and propose strategic solutions to address this persistent issue. By examining the funding challenges and their impacts, this study seeks to provide actionable insights for policymakers, educational administrators, and stakeholders committed to advancing science education in the country.

Concept of Science Education

Science education identifies natural phenomena appropriate to child interest and skills. Also, he went on to say that science education equips teachers, learners and the society with knowledge, skills, equipment and freedom to perform noble task useful for improving socioeconomic standard. In addition, he added that science education courses are designed to produce capable scientists who contribute meaningfully to academic excellence of the society to raise the economic level of nations (Lewis, 2015). Science as systematic investigations of nature with a view to understudy and harnessing them to serve human needs (Okoro, 2013). Science education involves the study of science in depth and in addition, educational knowledge and concepts are learnt and verified. It has been recognized worldwide as a pre-requisite in technological development (Okoli, et. al., 2013).

Science education is a veritable instrument for national development (Dajal, & Mohammed, 2019). Science is a way of seeking information (process) and also an accumulated knowledge resulting from research (products) (Okon–Enoh, 2008). Science education is described by Pember & Humbe (2009) as a process of teaching or training especially, in school to improve one’s knowledge about environment and to develop one’s skill of systematic inquiry as well as natural attitudinal characteristics. This implies that no country can be globally recognized without talking about its scientific advancements.

Science education is dedicated to the dissemination of scientific knowledge and methodologies to individuals not traditionally part of the scientific community. It plays a crucial role in driving transformative changes across various aspects of modern society and is anticipated to continue influencing future developments (Orukotan, 2007). As a foundational pillar of all sciences, science education encompasses disciplines such as chemistry, physics, mathematics, biology, physical and health education, and computer science. Olatunde-Aiyedun and Ogunode (2021a) highlight that science education is a core component of school curricula globally. It is vital for maintaining and advancing technical infrastructures, national security, and economic prosperity. When well-developed and effectively implemented, science education can produce a consistent flow of graduates equipped with advanced scientific knowledge and expertise, thereby fulfilling the demand for high-level professional roles that require such competencies (Millar, 2011).

Science education promotes intellectual respect for Mother Nature. This action can inform choices with regard to how technology is used to enhance the current living conditions for humans and other living things. Science education encourages learners to reason critically so as to make decisions that are well informed. There are no shortcomings in science education, good knowledge of science principles and facts are vital for a comprehensive education (Harry, 2011). Although there has been tremendous increase in the net enrolment of learners, the question is whether this increase has translated to qualitative education (Emechebe, 2012). Olatunde-Aiyedun, Chakraborty, and Mishra (2024) further emphasize the role of women in science education in the 21st century, particularly in Nigeria. They highlight that increasing female participation in science education is crucial for fostering diverse perspectives and innovations. Women in science bring unique insights and approaches that can lead to more holistic and inclusive solutions to global challenges. By promoting gender equality in science education, Nigeria can ensure a more equitable distribution of scientific knowledge and opportunities, ultimately contributing to national development and economic growth. This inclusive approach is essential for harnessing the full potential of science education to drive progress and innovation in the 21st century.

The search, collaboration, reporting and communication skills provided by science education can yield a whole generation of people who are more prepared for their careers, such people can make better contributions to the society. Furthermore, learners who have an in-depth knowledge in science education are more willing to use new ideas and technologies that can enhance and strengthen the economy. Through explaining and emphasizing the reliance of living organisms on one another and also on the environment, science education promotes intellectual respect for Mother Nature, This action can inform choice with regards to how technology is used to enhance the current living conditions for both humans and other living things (Christine & Hayatu, 2014).

The achievement that came about due to science education have resulted in longer and healthier lives. People who understand and honor or celebrate past scientific achievement are more likely to herald future inventions and discoveries that will enhance mental and physical health, beside, a healthier general public means a highly productive society. Science education encourages learners to reason critically so as to make better decisions that are well – informed. This makes them even more enlightened. The caution and responsibility provided by science education also assists people to become more responsible parents. There are no shortcomings of science education. In fact, good knowledge of science principles and facts is vital for a comprehensive education (Christine et al 2014).

Olatunde-Aiyedun (2024) emphasizes the integration of artificial intelligence (AI) into the science education curriculum in Nigerian universities. This integration aims to enhance the effectiveness of science education, making it more relevant and adaptive to the needs of the 21st century. By incorporating AI, educators can personalize learning experiences, optimize teaching methodologies, and equip students with the skills necessary to thrive in a technologically advanced world. The inclusion of AI in science education is poised to further drive innovation and progress, ensuring that Nigeria's education system remains competitive and capable of producing graduates who can meet the demands of the modern workforce. The integration of AI also prepares students for future challenges by familiarizing them with cutting-edge technologies. As AI continues to permeate various sectors, having a strong foundation in AI and its applications will be crucial for students entering the workforce (Olatunde-Aiyedun & Ayo, 2023). This forward-thinking approach to science education ensures that students are not only consumers of technology but also contributors to technological advancements.

Concept of Adequate Funding

According to Section 13 of the National Policy on Education (2004), it states that “Financing of Education” comes from traditional sources of revenue for educational establishments which include taxes, school fees, education levies, or rates and sometimes donations. The bulk of education revenue in Nigeria comes from the sales of liquid and solid natural mineral resources, the principal of which is the petroleum products (Noun, 2009). Ogunode, Ukozor, and Ayoko, (2023) and Ayuba, (2015) posited that adequate funding is critical for the development of any public institution. Adequate

funding is the key to the achievement of the institution's goals. Adequate funding is the life wire of any organization. No meaningful impact institutions can attain without adequate funding. Studies have shown that public institutions exceed their mandate when they are adequately funded by the government. Adequate fund refers to sufficient funds available for execution of a project or programmes. Adequate fund is the provision of excess money for the implementation of programmes. Adequate fund is the financial allocation above a minimum bench mark for implementation of a programme. Projects or programme are adequately funded when financial provision for the projects or programme is above the budget or equal to the planned budget. Adequate Funding is the act or process of continuous providing sufficient capital for the implementation of the project or programme (Ogunode & Mohammed, 2023). Olamoyegun, Olatunde-Aiyedun, and Ogunode (2022) emphasize the importance of funding science programs, noting that adequate financial support is essential for the effective implementation and sustainability of these programs. Ensuring that science education receives sufficient funding is crucial for fostering innovation, enhancing educational outcomes, and preparing students to contribute to technological and scientific advancements.

Funds are monies for implementation of programme in institutions. Funds are financial resources meant for the administration and management of an organization. Funds are monies use to implement educational services. Funds are very important in the administration of educational institutions (Ogunode & Musa, 2021). Funding for education remains one of the important resources that are needed to manage the school system. All levels of education; primary, secondary and tertiary require a sufficient level of funding to improve the standard of education provided in the country. When funding is not provided in the right quantity and at the right time, it affects the education sector in so many ways (Nwafor, Uchendu & Akani, 2015). The availability of funds plays a significant role in determining the provision of quality education at all levels. The number of funds made available during budgeting will go a long way in improving the quality of education provided. Adequate funding will be important in the provision of quality basic education (Nwafor, et al., 2015).

Adequate Funding Panacea to Science Education in Nigerian Schools

Adequate funding of science education in Nigeria will lead to provision of infrastructure facilities, laboratories, science instructional resources, employment of science teachers, effective, capacity building, motivation and effective implementation of stem education programme.

Provision of Infrastructure Facilities

Adequate funding of science education in Nigeria will lead to provision of infrastructure facilities, laboratories, ICT centres and libraries. Ogunode (2020) established that it is only adequate budgetary allocation that can help to fix the problem of inadequate infrastructure facilities. The availability of funds is very important in the actualization of the goals and programmes of the educational institutions. The provision of adequate funds for the commission will enable them to carry out its mandate. The adequate funding of the schools will aid the development of infrastructure. More funding will help the educational institutions in providing more facilities such as more furnished offices, ICT facilities, libraries and instructional materials. Available facilities will also be provided based on modern development while obsolete facilities will be discarded. This means that the higher the level of funding, the more the infrastructures that will be provided for teaching and learning (Ogunode, Ukozor & Ayoko, 2023).

Adams, Zubair, and Olatunde-Aiyedun (2022) highlight the effects of project (infrastructure facilities) abandonment in public tertiary education in Nigeria and suggest ways forward. They argue that consistent and adequate funding is necessary to prevent the abandonment of projects and ensure the completion and maintenance of infrastructure. Furthermore, Ogunode, Somadina, Yahaya, and Olatunde-Aiyedun (2021) discuss the deployment of ICT facilities, emphasizing the importance of ICT in modern education. Adequate funding will facilitate the deployment and maintenance of ICT facilities, enhancing the quality of education and equipping students with necessary technological skills.

Science instructional resources

Funding is critical in the provision of adequate science education resources in schools. Bello (2021) noted that instructional materials are facilities, equipment or materials that the teacher uses to illustrate, emphasize and explain the lessons for better comprehension by the students. UNESCO (2000) equally confirmed that instructional materials are important in the actualization of the curriculum. Some aspects of science are full of abstract concepts which pose problems to the students in their understanding. Therefore, availability and use of instructional materials in teaching such difficult concepts will make for better understanding and thus enhance the objectives of science education. Experiments also allow students to observe non-intuitive phenomena they can then study in the course of resolving the gap between their intuition and the underlying physics or chemistry of an experiment. In this setting, a well-equipped laboratory can take advantage of versatile probe-ware and handheld devices to capture real data that can be transferred to a computer for further analysis and inclusion in a report. Ogunode, and Aiyedun, (2020); Ezechi & Ogbu (2017) and Adeyegbo, (2004) recommended that government should provide adequate funds for the procurement of enough instructional resources.

Employment of Science Teachers

Competent science teachers are not sufficient in public schools in Nigeria. Nada (2008) as cited by Christiana (2012) observed that the status of competency in secondary school appears to be very low. Stressing that majority of teachers who are already in the system seem to lack initiatives and skills that are imperative to move science education standards forward to meet the global requirements. However, some may have the knowledge of science but lack the expertise of effective method of teaching. The problems of shortage of professional science teachers can be linked to poor funding of science programme in the schools. Ogunode, Olowonefa and Suleiman (2023); Ndayebom and Olamoyegun, (2022), and Ezechi, (2016) suggested to the government to increase the budgetary allocation to the science education to address the problem of inadequacies of professional teachers.

Ogunode, Olowonefa, and Suleiman (2023), along with Ndayebom and Olamoyegun (2022) and Ezechi (2016), have suggested that the government should increase the budgetary allocation to science education to address the inadequacies of professional teachers. Increased funding would enable better training, recruitment, and retention of qualified science teachers, ultimately improving the quality of science education. Olatunde-Aiyedun and Ogunode (2021b) also highlight the shortage of professional science and environmental education teachers in Nigeria, emphasizing the urgent need for strategic investment in teacher education and professional development to bridge this gap. Without adequate funding and support, the challenges of staffing science education programs with competent educators will persist, hindering the progress and effectiveness of science education in the country.

Effective capacity building

The issue of inadequate capacity-building programs for science teachers can be effectively addressed through sufficient funding of science education. With adequate financial resources, managers of science education programs can facilitate the training and retraining of teachers. Bello (2021) posited that the lack of teacher training and development poses a serious threat to the sustainability objectives of science education in Nigeria. Given that scientific knowledge, ideas, and concepts are dynamic and constantly evolving, it is imperative for teachers to undergo continuous training to stay updated with new and emerging facts and principles. A teacher equipped with adequate materials, sufficient time, and sound content knowledge still requires additional training in classroom and science experimental management skills to provide students with an excellent science education and achieve remarkable outcomes. Ohaeri, Olayinka, and Ogunode (2023); Ogunode and Jegede (2020); and David, Dallatu, and Yusuf (2018) have all emphasized that adequate funding of education will lead to effective capacity-building programs in educational institutions. Ogunode, Olatunde-Aiyedun, and Mcbrown (2022) also highlighted that adequate funding is crucial for the perception of academic staff and the improvement of educational institutions, which will, in turn, attract more international

students to Nigerian public universities. By ensuring that teachers are well-trained and equipped, the overall quality and sustainability of science education can be significantly enhanced.

Motivation

The problem of poor motivation of science teachers in the Nigerian schools can only be solved through adequate provision of funds for the implementation of science programme. Ajemba, Ahmed, Ogunode and Olatunde-Aiyedun (2021) and Orukotan (2007) observed that science teachers in Nigeria are poorly motivated. Bello (2021) noted that again, there is need for the government to rehabilitate and restore the image of science teachers by enhancing teachers' packages, housing/accommodation and utility allowances so as to retain and attract qualified teachers to teaching profession. Those teachers posted to rural areas are supposed to be receiving additional allowances in order to find the profession attractive and interesting.

Effective Implementation of STEM Education Programme

The STEM-Education programme implementation in the Nigerian schools is facing the problem of inadequate funding according to Ajemba, Ahmed, Ogunode and Olatunde-Aiyedun (2021). These problems can be solved by adequately funding the science education programmes in the Nigerian schools. Abubakar, Ogunseye and Ogunode, (2021) and Pember, et al. (2009) remarked that increment in the funding of education and in specific science education will assist the managers and administrators of science education to address all issues militating against the effective implementation of the ATEM-education programme in the various schools in Nigeria. A properly funded and well managed science programme will stimulate student's interest towards learning and relief parents of the burden of financing their children education. The teacher is the central wheel of education. A properly funded science education will change the attitude of the science teachers towards teaching science. They will also benefit from training programmes which will make them proficient teachers (Christine et al., 2014; Dajal, et al., 2019; Ogunode, Azarema & Ukozor, 2024).

Conclusion and Recommendations

Funding is critical for the implementation of science education programs in educational institutions. Adequate funding is essential for achieving the objectives of science education in schools. This paper examined the importance of adequately funding science education in Nigerian schools. The findings conclude that adequate funding of science education in Nigeria will lead to the provision of infrastructure facilities, the establishment of laboratories, the availability of science instructional resources, the employment of competent science teachers, effective capacity building, increased motivation among educators, and the effective implementation of STEM education programs.

Based on these findings, the paper recommends several key actions. First, the government should increase the budgetary allocation for education, with a specific focus on science education, to ensure sustainable development and global competitiveness. Prioritizing science education in national educational planning is crucial to enhancing the overall quality and effectiveness of science teaching and learning.

Investing in building and maintaining infrastructure facilities, including laboratories and ICT centers, is essential to support science education. Ensuring the employment of qualified science teachers and providing continuous professional development to keep them updated with the latest scientific knowledge and teaching methodologies are also vital steps. Supplying adequate instructional resources and materials necessary for effective science education is imperative. Furthermore, supporting the effective implementation of STEM education programs through proper funding and resource allocation is necessary to achieve educational goals.

The implications of this study are profound for policymakers, educators, and stakeholders in the education sector. By prioritizing and adequately funding science education, Nigeria can enhance the quality of its educational system, produce a well-equipped workforce, and drive national development. The study underscores the need for a strategic approach to funding that addresses both immediate educational needs and long-term goals, ensuring that science education remains a cornerstone of the nation's progress and innovation.

References

1. Abubakar, Z., Ogunseye, A.A & Ogunode, N.J. (2021). Administration of science programme in Nigerian public secondary schools: Problems and way forward. *Central Asian Journal of Literature, Philosophy and Culture*, 02 (11), 58-65
2. Adams, S.O., Zubair, M.A. & Olatunde-Aiyedun, T.G. (2022). Effects of project (infrastructure facilities) abandonment in public tertiary education in Nigeria and the way forward (EGNES), 1(2), 41-46. <https://doi.org/10.26480/egnes.02.2022.41.48>
3. Adeyegbo, S. C. (2004). Research into STM curriculum and school examination in Nigeria. The State of the Art *45th Annual Conference Proceeding of STAN pp 70-79*.
4. Ajemba, H.E., Ahmed, F.M., Ogunode, N.J. & Olatunde-Aiyedun, T.G. (2021). Problems facing science teachers in public secondary schools in Nigeria and way forward. *International Journal of Discoveries and Innovations in Applied Sciences*, 1(5), 118-129. <http://openaccessjournals.eu/index.php/ijdias/article/view/280>
5. Bello, M.A. (2021). Issues and trends in science education for sustainable economic development in Nigeria. *New Trends in Science, Technology, Management and Social Sciences in Africa; 3rd International Conference of Villanova Polytechnic, Imesi-Ile, 2nd to 4th June, 2021*.
6. Christine. A. & Hayatu, S. J. (2014). *Universal Basic Education (UBE) in Nigeria problems and prospects in learning basic science in the upper basic: a case study of Kajuru local government area of Kaduna State*. Thesis submitted to the University of JOS Faculty of Education, Department of Science and Technology Education
7. Dajal, R.G. & Mohammed, A.U. (2019). Issues and challenges of science education curriculum in Nigerian primary and secondary schools: the way forward. *Global Science Journal*, 7(10), 370-376.
8. David, E., Dallatu, Y.R. & Yusuf, A. (2018). Science, Technology, Engineering and Mathematics (STEM) education for sustainable national economic growth. *59th Annual Conference Proceedings, STAN*, 33-40.
9. Emechebe, S.N. (2012). Achieving universal basic education in Nigeria: Issues of relevance, quality and efficiency. *Global voice of Educators*, 1(1), 5.
10. Ereh, C.E. (2005). Teacher Characteristics and School Curriculum Implementation in `Nigeria Secondary Schools. A Theoretical Review. *Journal of the Nigeria Academy of Education*, 3(1), 111-120.
11. Ezechi, N.G. (2016). Revisiting secondary school science teachers' motivation: A positive step towards the transformation of Nigerian science education for global challenges. *Journal of Resourcefulness and Distinction*, 13, (1), 86-94.
12. Ezechi, N. E & Ogbu, C. C. (2017). Science Education in Nigeria: challenges and the way forward. *International Journal of Progressive and Alternative Education*, 4(1), 1-11. 9.
13. Harri, D. (2011). *Benefits of science education*. Retrieved from <http://benefitsofscienceeducation>
14. Lewis, A. (2015). *Science teaching in Africa*. London: Heineman Educational Book Ltd.
15. Ndayebom, A.J. & Olamoyegun, S.O. (2022). Review of challenges facing the teaching and learning of science education in Nigerian Tertiary Institutions. *European Multidisciplinary Journal of Modern Science*, (8), 89-995
16. Ogunode, N. J. (2020). Investigation into the challenges facing administration of STEM education in Gwagwalada Universal Basic Education Junior Secondary Schools in FCT, Nigeria. *International Journal of Research in STEM Education (IJRSE)*, 2(1), 59-75 .

17. Ogunode, N.J. & Aiyedun, T.G. (2020). Administration of science programme in Nigerian higher institutions: issues, challenges and way forward. *Middle European Scientific Bulletin*, 6, 94-99. https://www.researchgate.net/publication/346653519_Administration_of_science_progra
18. Ogunode, N.J., Azarema, I. & Ukozor, C.U. (2024). Adequate funding panacea for the development of teachers' education in Nigeria. *American Journal of Education and Evaluation Studies*, 1(1), 1-27
19. Ogunode, N. J. & Jegede, D. O. (2020). Administration of professional development programme in Nigerian higher institutions: challenges and way forward. *Intercathedra*, 3(44), 147–155. <http://dx.doi.org/10.17306/J.INTERCATHEDRA.2020.00102>
20. Ogunode, N.J. & Mohammed, Y.D. (2023). Adequate funding panacea for development of educational administration and planning programme in tertiary institutions in Nigeria. *Pubmedia Social Sciences and Humanities*, 1(3), 1-13
21. Ogunode, N. J. & Musa, A. (2021). Inadequate funds for the administration of public secondary schools in Nigeria: Causes, effects and way forward. *Central Asian Journal of Social Sciences and History*, 02(12), 53-64
22. Ogunode, N.J., Olatunde-Aiyedun, T.G. & Mcbrown, R.I. (2022). Perception of academic staff on reasons for low patronage of Nigerian public universities by international students. *Modern Journal of Social Sciences and Humanities*, 5, 51–56. Retrieved from <https://mjssh.academicjournal.io/index.php/mjssh/article/view/207>
23. Ogunode, N. J. Olowonefa, J. A & Suleiman, S (2023). Benefits of funding tertiary education in Nigeria. *European Journal of Artificial Intelligence and Digital Economy*, 1(3), 5-16
24. Ogunode, N.J., Somadina, O.I., Yahaya, D.M. & Olatunde-Aiyedun, T.G. (2021). Deployment of ICT facilities by Post-Basic Education and Career Development (PBECD) during Covid-19 in Nigeria: Challenges and way forward. *International Journal of Discoveries and Innovations in Applied Sciences*, 1(5), 19–25. Retrieved from <http://openaccessjournals.eu/index.php/ijdias/article/view/280>
25. Ogunode, N.J., Ukozor, C.U. & Ayoko, V.O. (2023). Adequate funding of national universities commission for effective universities supervision in Nigeria. *Journal of Economics, Finance and Innovation*, 2(1), 1-10.
26. Ohaeri, N.C., Olayinka O.T. & Ogunode N.J. (2023). Enhancing research institutes' development through adequate funding in Nigeria. *World of Science: Journal on Modern Research Methodologies*, 2(2), 7-16
27. Okoli, S. O., Obiajulu, A.N. & Ella, F.A. (2013). Science education for sustainable development in Nigeria: Challenges and prospects. *Academic Journal of Interdisciplinary Studies Published by MCSER-CEMAS-Sapienza University of Rome*.(2)6.
28. Okon–Enoh, E.E (2008). Realizing the goals of National Economic Empowerment and development strategy (NEEDS) and millennium Development goals (MDGS) Implication for science *Education Journal of Science Education*, 8(1), 1-12.
29. Okoro, S.U.C. (2013). Attaining the MDGs through effective STAN education delivery. STAN 54th annual conference proceedings. 108-118.
30. Okwelogu, I.S., Ndayebom, J. & Ogunode, N. J. (2023). Plight of science academics in public universities in Nigeria: Implications for university administrators to make right decisions for university development and sustainability. *Horizon, Journal of humanities and artificial intelligence*. 2(1), 1-12.
31. Okwelogu, I.S., Ogunode N.J. & Abayomi, A. (2021). Science Education in Nigerian Public Universities: Challenges and way forward. *International Journal on Economics, Finance and Sustainable Development*, 39-45.

32. Olamoyegun, S.O., Olatunde-Aiyedun, T.G. & Ogunode, N.J. (2022). Funding of science programme in public secondary school in Federal Capital Territory, Abuja, Nigeria. *European Journal of Innovation in Nonformal Education (EJINE)*, 2(2), 1-7. <http://innovatus.es/index.php/ejine/article/view/246>
33. Olatunde-Aiyedun, T.G. (2024). Artificial intelligence (A.I) in education: integration of AI into science education curriculum in Nigerian universities. *International Journal of Artificial Intelligence for Digital*, 1(1), 1-14. <https://ssrn.com/abstract=4733349>
34. Olatunde-Aiyedun, T.G. & Adams, S.O. (2022). Effect of blended learning models on students' academic achievement and retention in Science Education. *Education, Sustainability & Society (ESS)*, 5(2), 74-80. <http://doi.org/10.26480/ess.02.2022.74.80>
35. Olatunde-Aiyedun, T.G. & Ayo, V.A. (2023). Effectiveness of word processing on student learning outcomes in science education: A comparative analysis of direct, inquiry-based, and project-based instructional approaches. *Best journal of innovation in science, research and development*, 2(7), 516-524. <http://www.bjisrd.com/index.php/bjisrd/article/view/489/452>
36. Olatunde-Aiyedun, T.G., Chakraborty, T. & Mishra, N. (2024). Women in science education in the 21st century with special reference to Nigeria. In T. Chakraborty, N. Mishra, D. Kumari, A. Natarajan, & S. Ray (Eds.), *Gender equality: An international perspective* (pp. 57-73). Nova Science Publishers, Inc.
37. Olatunde-Aiyedun, T.G. & Ogunode, N.J. (2021a). Shortage of professional science and environmental education teachers in Nigeria. *Asian Journal of Science Education*, 3 (1), 1-11. https://www.researchgate.net/publication/350819014_Shortage_of_Professional_Science_and_Environmental_Education_Teachers_in_Nigeria
38. Olatunde-Aiyedun, T.G. & Ogunode, N.J. (2021b). School administration and effective teaching methods in Science Education in Nigeria. *International Journal on Integrated Education*, 4(2), 145- 161. [10.13140/RG.2.2.11502.54080](https://doi.org/10.13140/RG.2.2.11502.54080)
39. Orukotan, A.F. (2007). Curriculum enrichment of STM education as a basis for sustainable development. *50th Annual Conference Proceeding of STAN*. Pp. 3235.
40. Pember, S. T. & Humbe, T. T. (2009). Science Education and National Development. Being a paper presented at the ASSUTIBS maiden National Conference at CEO Katsina- Ala 6th -9th October.