

ENHANCING ELECTRONICS EDUCATION FOR SUSTAINABLE TECHNOLOGICAL DEVELOPMENT IN NIGERIA

Okafor Ikenna Anthony

*Federal College of Education Technical, Umuze, Anambra State

Abstract

Electronics education is essential for advancing sustainable technological development in Anambra State, Nigeria. This survey-based study investigates the current state of technology education in Anambra, identifying barriers such as outdated curricula, inadequate infrastructure, and limited industry collaboration. By analyzing responses from educators, students, and industry stakeholders, the research proposes strategies to align electronics education with sustainable development goals (SDGs), promoting regional innovation and employability.

Introduction

Electronics education in Nigeria is a critical component of the country's efforts to develop a skilled workforce capable of driving technological innovation and economic growth. However, the sector faces numerous challenges, including inadequate infrastructure, outdated curricula, and a shortage of qualified instructors. Nigeria's ambition to become a technology-driven economy hinges on its ability to produce skilled professionals in electronics engineering. However, the current state of electronics education is plagued by insufficient funding, a lack of modern equipment, and a disconnect between academic training and industry needs (Okafor, 2023). With the global push toward sustainable technological development, as outlined in the United Nations' SDGs, there is an urgent need to enhance technology education to support renewable energy systems, innovative infrastructure, and green manufacturing in Nigeria.

Recent studies highlight the critical role of electronics education in technological advancement. Adebayo and Musa (2024) argue that Nigeria's tertiary institutions lack practical training in embedded systems and the Internet of Things (IoT), which is vital for modern industries. Similarly, Okonkwo et al. (2023) emphasize the need for curriculum updates to include renewable energy technologies and sustainable design principles. Globally, countries like South Korea and India have successfully linked technology education to sustainable development by integrating hands-on learning and industry partnerships (Kim & Patel, 2024). In Nigeria, however, challenges such as poor electricity supply and limited access to digital tools hinder progress (Eze, 2025).

The curriculum for electronics education in Nigeria is often criticized for being outdated and not aligned with global standards. According to Okoro and Koko (2015), the curriculum in many Nigerian institutions does not adequately cover emerging technologies such as the Internet of Things (IoT), robotics, and renewable energy systems. This gap limits students' ability to compete in the global job market. Traditional teaching methods, which are heavily reliant on theoretical instruction, are still

prevalent. Practical, hands-on training is often limited due to inadequate laboratory facilities and equipment (Adeyemi, 2018).

A significant barrier to effective electronics education in Nigeria is the lack of adequate infrastructure. Many institutions lack well-equipped laboratories, modern tools, and up-to-date software necessary for practical training (Ogunleye, 2017). Access to electricity is another critical issue. Frequent power outages disrupt laboratory sessions and hinder the effective teaching of electronics, which relies heavily on practical demonstrations (Eze, 2019). There is a shortage of qualified instructors in the field of electronics. Many educators lack the necessary training and experience to teach modern electronics concepts effectively (Okoro & Koko, 2015). Brain drain is another issue, as many skilled professionals in the field of electronics emigrate to other countries in search of better opportunities, further depleting the pool of qualified instructors (Adeyemi, 2018).

There is a significant disconnect between academia and industry in Nigeria. Many electronics programs do not align with the needs of the industry, resulting in graduates who are not job-ready (Okoro & Koko, 2015). Collaboration between educational institutions and industry players is limited, restricting students' opportunities to gain practical experience through internships and industry projects (Adeyemi, 2018). Inconsistent government policies and a lack of clear regulatory frameworks for electronics education further exacerbate the challenges faced by the sector (Ogunleye, 2017). There is a need for more robust policies that promote the development of electronics education, including incentives for private sector investment and partnerships with international institutions (Eze, 2019).

Recent research emphasizes the role of electronics education in regional development. Nwosu and Ezeh (2024) note that Anambra's tertiary institutions lag in teaching the Internet of Things (IoT) and embedded systems, limiting innovation. Okeke (2023) highlights the absence of renewable energy training despite Anambra's potential in solar technology. Globally, survey-based studies in regions like Tamil Nadu, India, show that integrating practical training with industry needs boosts sustainable development (Rao & Singh, 2024). In Anambra, issues like unreliable power and limited digital tools persist (Ibeh, 2025), necessitating targeted research.

Objective of the Study

The primary objective of this study is to evaluate the strengths and weaknesses of electronics education in Anambra State and recommend strategies to enhance its capacity to support sustainable technological development. Specifically, it aims to identify gaps in curriculum, infrastructure, and industry engagement, and propose interventions to align education with local and global sustainability needs.

Method

This study surveyed 150 participants in Anambra State, including 50 educators, 70 students, and 30 industry professionals from institutions and tech firms in Onitsha, Awka, and Nnewi. The survey, administered in January and March 2025, used structured questionnaires to assess curriculum relevance, infrastructure quality, and industry collaboration. Responses were analyzed quantitatively (using percentages) and qualitatively (through thematic coding) to derive insights.

Results and Discussion

The survey results highlight three critical areas: curriculum gaps, infrastructure deficits, and weak industry ties. Table 1 presents the findings and their implications.

Table 1: Survey Results on Electronics Education in Anambra State

Area of Focus	Survey Findings	Implications	Proposed Solutions
Curriculum Relevance	78% of respondents say curricula lack IoT, robotics, and renewable energy	Hinders innovation in sustainable technologies like solar and smart grids	Update syllabi with modern, local-relevant topics
Infrastructure Quality	65% report labs lack modern digital tools; only 20% are fully functional	Limits hands-on training for smart systems and green tech	Equip labs with solar-powered tools
Industry Collaboration	85% note minimal partnerships with Anambra's tech firms	Graduates lack skills for sustainable technology jobs	Launch tech hubs and internship programs

Discussion

The findings align with Nwosu and Ezeh (2024), confirming that outdated curricula restrict Anambra’s technological advancement. The infrastructure deficit, noted by 65% of respondents, corroborates Ibeh (2025), while the 85% reporting weak industry ties reflects a broader Nigerian trend (Okafor, 2023). These gaps undermine sustainable technological development, but targeted interventions can address them. The results corroborate with Adebayo and Musa (2024), who note that without modern curricula, Nigeria risks falling behind in sustainable technological development. The lack of functional labs, as reported by Eze (2025), exacerbates the skills gap, while weak industry ties limit practical exposure. These findings suggest that a multi-faceted approach is necessary to bridge these gaps.

Practical Implications

Updating curricula with IoT and renewable energy will equip students to design sustainable solutions, such as solar-powered systems for Anambra’s markets. Improved infrastructure and industry ties will produce graduates ready for jobs in Nnewi’s manufacturing sector, boosting local GDP. Training in sustainable technologies will support Anambra’s transition to cleaner energy, reducing reliance on fossil fuels and aligning with SDG 7 (Affordable and Clean Energy).

Recommendations

- Integrate IoT, renewable energy systems, and sustainable design into electronics education programs by 2026, in line with SDG 4 (Quality Education) and SDG 9 (Industry, Innovation, and Infrastructure).
- Allocate government and private-sector funding to equip at least 50% of Nigerian institutions with modern labs by 2027.
- Foster collaborations between universities and tech firms to provide internships and co-develop sustainability-focused projects.

Conclusion

Enhancing electronics education in Nigeria is essential for achieving sustainable technological development. By addressing curriculum gaps, improving infrastructure, and strengthening industry ties, Nigeria can produce a workforce capable of driving innovation in renewable energy, innovative systems,

and beyond. This aligns with global trends and positions Nigeria as a leader in Africa's technological landscape.

References

- Adeyemi, T. O. (2018). Challenges and Prospects of Technical and Vocational Education in Nigeria. *Journal of Education and Practice*, 9(12), 45-52.
- Eze, C. (2019). The State of Electronics Education in Nigeria: Issues and Solutions. *International Journal of Engineering Education*, 35(4), 1123-1130.
- Ibeh, C. (2025). "Power Supply Challenges and Technical Education in Anambra State." *Southeast Technology Journal*, 9(1), 15–23.
- Nwosu, P., & Ezeh, T. (2024). "Electronics Education in Anambra: Bridging the Skills Gap." *Journal of Nigerian Engineering Research*, 13(2), 34–48.
- Okafor, P. (2023). "Funding Gaps in Nigerian Technical Education." *Education Today*, 19(4), 77–85.
- Okeke, J. (2023). "Renewable Energy Education in Southeast Nigeria: Opportunities and Barriers." *Sustainable Development Review*, 6(3), 19–30.
- Ogunleye, A. O. (2017). Infrastructure and Funding Challenges in Nigerian Universities: Implications for Quality Education. *African Journal of Education, Science and Technology*, 4(2), 78-85.
- Okoro, O. M., & Koko, M. N. (2015). Curriculum Development and Implementation in Nigerian Universities: The Case of Electronics Engineering. *Journal of Curriculum and Teaching*, 4(1), 23-30.
- Rao, K., & Singh, M. (2024). "Regional Models of Technology Education for Sustainability." *Global Education Insights*, 10(1), 88–102.