

ARTIFICIAL INTELLIGENCE SECURITY EDUCATION AS A STRATEGIC TOOL FOR NATIONAL REFORMATION AND SUSTAINABLE DEVELOPMENT IN CROSS RIVER STATE, NIGERIA

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Abstract

The study accessed the role of Artificial Intelligence (AI) Security Education towards National Reformation as well as Sustainable Development in Cross River State, Nigeria. The study made use of descriptive survey research design. The population of the study comprised 820 security stakeholders, consisting of ICT professionals, computer science and ICT educators, cybersecurity personnel and government policy officers for public institutions and agencies in Cross River State, Nigeria. These categories of stakeholders were considered appropriate for the study because they are directly involved in the development, implementation, management, regulation, and utilisation of artificial intelligence and digital technologies within the State. A sample size of 265 respondents was selected using the simple random sampling technique. Questionnaire titled "Artificial Intelligence Security Education, National Reformation and Sustainable Development Questionnaire (AISENRSDQ) was the instrument used for data collection, this instrument reliability was ascertained using the Cronbach Alpha reliability method yielding average reliability coefficient of 0.88. For data analyses, simple linear regression analysis was used both hypotheses

tested at 0.05 significant level and 263 degrees of freedom. The result showed significant influence of AI Security Education on National Reformation and Sustainable Development in study area. Sequel to the results of the study, the researchers recommended among other that the Cross River State Government, educational institutions, and relevant agencies should integrate artificial intelligence security education into educational curricula and professional development programmes to strengthen digital security and foster sustainable development.

Keywords: Security Education, National Reformation, Sustainable Development, Cybersecurity Education.

Introduction

Artificial intelligence (AI) came up to be one of the most transformative technologies in 21st century, reshaping governance systems, education, security operations, industrial production, and socio-economic development across the world. The concept of AI refers to a system which is capable of handling tasks which requires human intelligence, such as reasoning, learning, perception, decision-making as well as problem-solving. As Russell and Norvig (2021) puts it AI systems has evolved and is now foundational infrastructures that modern digital economies thrive on presently. In similar line of thoughts, Dwivedi et al. (2023) opined that generative AI fundamentally has changed knowledge production, communication systems as well as global organisational decision-making processes.

The increasing adoption of AI technologies brings in both opportunities as well as risks, especially as it regards cybersecurity, governance in addition to national development. Just as AI promotes efficiency, predictive capacity in addition to automation, it equally brings in numerous security challenges example data breaches, algorithmic manipulation, deepfake threats, privacy violations as well as cybercrimes. Maslej et al. (2024) in the Stanford AI Index Report noted that the rapid global deployment of AI system outpaced regulatory as well as educational preparedness, bringing about governance as well as security gaps significantly. Sequel to these, scholars in addition to policymakers increasingly are emphasising the need for structured AI education which will bring in security awareness, ethical reasoning in addition to risk management competencies.

Responding to the emerging issues, the concept of Artificial Intelligence Security Education (AISE) is now being introduced. AI security education has to do with structured development about knowledge, skills as well as competencies needed in understanding, securing, managing, and ethically deploying artificial intelligence systems usage. These brings in cybersecurity awareness, data protection principles, algorithmic transparency, risk assessment in addition to ethical AI governance. Aligning with UNESCO (2021; 2024), they stress that AI education has to move beyond technical literacy to include ethical as well as security dimensions which prepare learners as well as professionals in managing AI responsibly. Similarly, the OECD (2023) stressed that trustworthy AI systems is based mainly on human capacity development, institutional learning as well as continuous education in digital security in addition to governance.

According to Kasneci et al. (2023), while generative AI tools example as ChatGPT promotes learning efficiency, they simultaneously bring about challenge that as to do with academic integrity, data privacy in addition to overdependence on systems that re automated. In like manner, Holmes et al. (2024) emphasise that AI literacy with responsible use education are very important towards the prevention as well as misuse of AI and enhances its ethical contribution positively in

educational outcome collectively suggesting that without adequate AI security education, societies risk amplifying vulnerabilities as they advance the use of modern technology that AI affords.

Globally, institutions have increasingly prioritised AI governance as well as risk management education system. Example The National Institute of Standards and Technology (NIST, 2023) recently developed the concept of “AI Risk Management Framework”, this framework highlights the importance of governance, mapping, measurement in addition to management of AI-related risks within and across institutions. The framework is about technical safeguards of human-centered education as well as institutional awareness of the ethical safe use of AI. Floridi et al. (2018) as well as Floridi and Cowls (2019) stressed that ethical AI development needs a “digital governance ecosystem” built on education, accountability as well as transparency.

The relationship between AI and development has been reviewed widely in sustainability literature. Vinuesa et al. (2020) gives evidence claiming that AI can directly contribute to bringing about the achievement of all 17 Sustainable Development Goals (SDGs), especially in the area of health, education, climate action as well as economic growth. That notwithstanding, they equally caution that AI systems adopting may equally worsen inequality, environmental degradation in addition to social exclusion. This varied nature of AI brings about the need for AI security education that ascertains responsible use of AI aligned with ethical principles. According the study by Yang et al. (2024) as well Abulibdeh et al. (2024) opined that AI adoption within developing economies is heavily dependent on readiness of the institutions, human capital development as well as digital literacy. This research affirms that technological advancement without adequate education as well governance structures can widen development gaps rather than reduce them. Hence, AI security education is now an important intervention towards ensuring inclusive as well as sustainable technological transformation.

Also, the concept of National reformation is now a central policy as well as scholarly concern regarding contemporary development discourse especially in developing nations that are aspiring to strengthen governance, institutional efficiency as well as socio-economic development. National reformation implies deliberate restructuring of political, economic, educational as well as technological systems towards improving accountability, transparency, service delivery as well as competitiveness nationally. Regarding the era of Fourth Industrial Revolution, digital transformation implies key driver towards national reformation having artificial intelligence affording central role in reshaping governance systems as well as public administration. Schwab (2017) stressed that emerging technologies afforded by AI are altering governance structures and economic systems fundamentally, needing nations to rethink institutional design in addition to human capacity development. However, efficiency of AI regarding the driving of national reformation largely depends on the availability of skilled human capital capable of managing, regulating in addition to securing AI systems. As stated by OECD (2023), nations investing in AI literacy, cybersecurity education as well as digital governance frameworks more assuredly can achieve sustainable institutional reforms.

In Nigeria for example, the correlation between artificial intelligence and national reformation is still emerging but equally significant. Increasingly, Nigeria has witnessed rapid digital changes across sectors example in banking, education, telecommunications, healthcare in addition to public administration. Although the present transformation comes with some ills such as rising cybersecurity threats, including phishing attacks, identity theft, ransomware incidents as well as

digital fraud. The evolution and intervention of Nigerian National Information Technology Development Agency (NITDA, 2023) stressed the rising need of digital literacy and cybersecurity awareness as critical components of national development towards a presuming governance reform. But notwithstanding the efforts so far, there remains a gap in structured AI security education across institutions responsible for implementing as well as managing AI adoption.

The concept of sustainable development is one key outcome variable in this study. It has to do with development which meets present needs and also not compromising the ability of future generations to meet their own needs also while promoting economic growth, social inclusion, as well as environmental protection. Most recently, AI has been identified to be a powerful tool towards bringing about sustainable development based on its ability to optimise resource allocation, bring about the improved healthcare systems, promote agricultural productivity as well as the area of support climate monitoring. The study of Vinuesa et al. (2020) demonstrated AI could enhance the actualisation of the whole Sustainable Development Goals (SDGs), especially in the area of poverty reduction, education quality as well as climate action. In like manner Li et al. (2022) noted that AI-Driven systems are increasingly being used to enhance sustainable urban development, energy efficiency as well as environmental monitoring.

Notwithstanding the present benefits, AI equally presents sustainability challenges when not ethically used. Challenges example bias of algorithmic, consumption of energy on large-scale models, data privacy to AI technologies may heighten social inequalities. Dwivedi et al. (2023) stressed that generative AI systems, while powerful, need robust governance frameworks towards ensuring responsible as well as equitable utilisation. Hence, AI security education becomes needful towards ensuring that individuals as well as institutions can harness AI responsibly toward sustainable development.

Within Africa as a continent, the recent adoption of AI into governance as well as development systems is still within early stage, but increasing investments in digital transformation is seen across many countries. According to Oluwatobi and Bello (2023) as well as Akinwale et al. (2024) they stressed that digital skills gaps, inadequate cybersecurity awareness as well as limited institutional capacity are still major barriers toward effective AI utilisation in many African countries. In Nigeria for example, the challenges are further compounded via infrastructural deficits as well as uneven access to digital technologies. Sequel to these, strengthening AI security education is important toward bridging the gap between technological adoption as well as sustainable development outcomes.

Within Cross River State, the concept of digital transformation initiatives is presently seen across education, tourism, agriculture, healthcare as well as public administration. The challenges of the state government in adopting digital platforms for governance, revenue collection as service delivery. Although, the present heightened reliance on digital systems equally exposes institutions towards cyber risks, data breaches as well as system issues. The educators, ICT professionals, cybersecurity personnel in addition to policymakers hence need adequate AI security education towards ensuring that the technological adoption enhances positively towards government reform as well as sustainable development in Cross River State.

Notwithstanding this global discourse on AI, cybersecurity as well as sustainable development, significant empirical gap remains regarding the role of artificial intelligence security education

towards the promotion national reformation as well as sustainable development, especially in sub-national areas as seen in Cross River State, Nigeria. Some existing research in this area focused on AI adoption (Kasneci et al., 2023), AI ethics (Floridi & Cows, 2019), digital literacy (UNESCO, 2024) as well as cybersecurity awareness in total terms, with limited attention to AI-specific security education regarding its developmental implications. Also, there is a lack of empirical research that shows the way AI security education relates or influences both national reformation as well as sustainable development outcomes within key stakeholder's example ICT professionals, educators, cybersecurity personnel as well as government policy officers in Cross River State. The main goal of this study is to examine artificial intelligence security education as a strategic tool for national reformation and sustainable development in Cross River State, Nigeria. Specifically, the study seeks to:

1. Examine the influence of artificial intelligence security education on national reformation in Cross River State, Nigeria.
2. Determine the influence of artificial intelligence security education on sustainable development in Cross River State, Nigeria.

Research Hypotheses

The following null hypotheses will be tested at 0.05 level of significance:

1. Artificial intelligence security education has no significant influence on national reformation in Cross River State, Nigeria.
2. Artificial intelligence security education has no significant influence on sustainable development in Cross River State, Nigeria

Method

The descriptive survey research design was adopted for the study. This design was considered appropriate because it enables the researcher to collect data from a defined population in order to examine the influence of artificial intelligence security education on national reformation and sustainable development in Cross River State, Nigeria. The study was carried out among security stakeholders in Cross River State, Nigeria. The study population is made 820 stakeholders, including ICT professionals, computer science teachers, ICT teachers, cybersecurity personnel as well as government policy officers selected public institutions as well as agencies within research area. The institutions have to do with important ministries, government departments, educational institutions in addition to ICT-based agencies in Cross River State. The present groups were selected hence they were directly involved in the development, implementation, management, regulation as well as utilisation of AI.

The sample of the study was 265 respondents selected using the simple random sampling technique without replacement, making sure that every stakeholder within the population had an equal chance of being selected. The sampling approach was adopted towards the need to reduce bias as well as ensuring representativeness of respondents selected across the different stakeholder sampled. The data in the study was secured with a structured questionnaire termed: "Artificial Intelligence Security Education, National Reformation and Sustainable Development Questionnaire (AISENRSDQ)." The questionnaire was grouped into sections A and B. "A" contained demographic information of respondents' example category of stakeholder, institution as well as years of professional experience. Section "B" contained 40 items that measures AI security education, based on dimensions example AI security awareness, cybersecurity

competence as well as ethical AI knowledge. Section C harbours items that measures national reformation, while Section D measured sustainable development within the context of Cross River State. The instrument was structured on a 4-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D) as well as Strongly Disagree (SD).

The research instrument was face as well as content validation using three lecturers in Educational Measurement and Evaluation as well as specialists within Information and Communication Technology to ensure clarity, relevance as well as appropriateness of the items for the research objectives. Their adjustments as well as suggestions were duly incorporated into the final draft of the instrument. In establishing the instrument reliability, a trial test was carried out with 30 respondents selected within similar institutions within neighbouring state that were not part of the actual study. The collected data was analysed with Cronbach Alpha reliability method. This yielded a reliability coefficient of 0.88, making the instrument good for this study.

The data collected were analysed using simple linear regression analysis to determine the extent to which artificial intelligence security education predicts national reformation and sustainable development in Cross River State, Nigeria. The two hypotheses formulated for the study were tested at 0.05 level of significance, with a degree of freedom of 263. The hypotheses focused on the influence of artificial intelligence security education on national reformation, and the influence of artificial intelligence security education on sustainable development among stakeholders in Cross River State, Nigeria.

Results

Hypothesis One

Artificial intelligence security education has no significant influence on national reformation in Cross River State, Nigeria.

The hypothesis was tested using simple linear regression analysis. As shown in Table 1, artificial intelligence security education significantly predicted national reformation in Cross River State, Nigeria ($F(1,263) = 62.41, p < .05$), with an R^2 value of 0.192, indicating that 19.2% of the variance in national reformation is explained by artificial intelligence security education. The null hypothesis was therefore rejected, implying that artificial intelligence security education has a significant influence on national reformation in Cross River State, Nigeria.

Table 1: Simple Linear Regression Analysis of Artificial Intelligence Security Education on National Reformation (N = 265)

Source of Variation	SS	Df	MS	F	p-value
Regression	158.742	1	158.742	62.410*	.000
Residual	668.115	263	2.541		
Total	826.857	264			

Significant at 0.05 level, $R^2 = 0.192$; Adj. $R^2 = 0.189$

Hypothesis Two

Artificial intelligence security education has no significant influence on sustainable development in Cross River State, Nigeria.

Simple linear regression analysis was used to test this hypothesis. Table 2 reveals that artificial intelligence security education significantly predicted sustainable development in Cross River State, Nigeria ($F(1,263) = 74.86$, $p < .05$), with an R^2 value of 0.222, indicating that 22.2% of the variance in sustainable development is explained by artificial intelligence security education. The null hypothesis was therefore rejected, indicating that artificial intelligence security education has a significant influence on sustainable development in Cross River State, Nigeria.

Table 2: Simple Linear Regression Analysis of Artificial Intelligence Security Education on Sustainable Development (N = 265)

Source of Variation	SS	df	MS	F	p-value
Regression	201.336	1	201.336	74.860*	.000
Residual	707.521	263	2.691		
Total	908.857	264			

Significant at 0.05 level, $R^2 = 0.222$; Adj. $R^2 = 0.219$

Discussion

Artificial Intelligence Security Education and National Reformation

Hypothesis One result indicated that AI security education influences significantly and positive influences national reformation within Cross River State. It therefore implies that stakeholders especially ICT professionals, educators, cybersecurity personnel as well as government policy officers that has enough AI security education could most likely effectively contribute towards governance improvement, institutional transparency as well as digital development. This finding therefore suggests that AI security education promotes stakeholders' capacity towards the management of cyber risks, ensuring ethical use of digital technology in addition to strengthening institutional accountability.

This result agrees with the views of UNESCO (2024), that stressed that AI literacy in addition to cybersecurity education are both needful towards the building of resilient institutions that is capable of supporting national development at this digital era. Similarly, NIST (2023) in the AI Risk Management Framework highlights that effective governance of AI systems depends on human capacity development, risk awareness, and structured security education. Dwivedi et al. (2023) also noted that generative AI and related technologies require strong governance and user competence to prevent misuse, misinformation, and institutional vulnerabilities. These studies collectively support the present finding that AI security education is a critical driver of national reformation.

However, despite these positive outcomes, gaps still exist in structured AI security education within many public institutions in developing contexts such as Nigeria. Limited training opportunities, inadequate policy enforcement, and insufficient integration of AI security curricula

may reduce the effectiveness of national reform efforts. This suggests the need for stronger institutional frameworks that embed AI security competencies into workforce development programmes.

Artificial Intelligence Security Education and Sustainable Development

Hypothesis two findings showed that artificial intelligence security education has a significant positive influence on sustainable development in Cross River State, Nigeria. This indicates that stakeholders who are better educated in AI security principles are more capable of ensuring secure, ethical, and efficient use of AI technologies that support economic growth, environmental protection, and social development. The result further implies that AI security education contributes to safeguarding digital infrastructure, improving innovation capacity, and promoting responsible AI adoption, all of which are essential pillars of sustainable development.

This finding aligns with Vinuesa et al. (2020), who demonstrated that artificial intelligence can contribute positively to all Sustainable Development Goals when properly governed and ethically deployed. Similarly, Abulibdeh et al. (2024) emphasised that AI integration in education and development sectors supports sustainability, innovation, and productivity, but requires adequate ethical and security frameworks. Kasneci et al. (2023) also noted that while AI tools enhance efficiency and access to knowledge, their misuse or overdependence without proper education can undermine learning integrity and long-term developmental outcomes. Despite these benefits, the study also highlights challenges such as uneven digital literacy, inadequate cybersecurity awareness, and limited access to structured AI training among stakeholders. These gaps may hinder the full realisation of sustainable development objectives if not properly addressed through continuous education and policy intervention.

Conclusion

Sequel to the results of this study, the researchers concluded that artificial intelligence security education plays a significant role in promoting both national reformation and sustainable development in Cross River State, Nigeria. Specifically, AI security education enhances stakeholders' ability to support institutional reforms through improved cybersecurity awareness, ethical AI usage, and digital resilience. It also contributes to sustainable development by strengthening digital infrastructure protection, promoting innovation, and ensuring responsible adoption of artificial intelligence technologies. However, the effectiveness of these contributions is still limited by gaps in training, policy implementation, and institutional capacity development. The study therefore emphasises the importance of structured AI security education as a strategic tool for achieving long-term governance improvement and sustainable development outcomes.

Recommendations

In line with the findings of the study, the following were recommended by the researchers that:

1. The Cross River State Government, in collaboration with relevant ICT and educational agencies, should integrate artificial intelligence security education into staff training and capacity-building programmes for ICT professionals, educators, cybersecurity personnel, and policy officers in order to strengthen national reformation through improved cybersecurity awareness, ethical AI practices, and digital resilience.
2. Educational institutions, government agencies, and professional bodies in Cross River State should organise continuous AI security education workshops and training programmes to

enhance stakeholders' competencies in the secure and responsible use of artificial intelligence technologies, thereby promoting sustainable development through improved digital infrastructure protection and innovation capacity.

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