



Article

# Teaching and Learning of Cyber Security Programme in Tertiary Institution in Nigeria: Problems and Way Forward

Niyi Jacob Ogunode<sup>\*1</sup>, Conrad Ugochukwu Ukozor<sup>2</sup>, Okani Doris Ugo-onyeka<sup>3</sup>

1. Department of Education, University of Abuja, Nigeria

2,3 Department of Educational Management, Faculty of Education, University of Abuja, Nigeria

\* Correspondence: [Ogunodejacob@gmail.com](mailto:Ogunodejacob@gmail.com)

**Abstract:** This paper discussed the problems facing the teaching and learning of cyber security in Nigerian tertiary institutions. The paper is a review paper that depends on secondary data. The secondary data were collected from print and online publications. The paper revealed poor funding, shortage of academic staff, inadequate infrastructure facilities, shortage of instructional resources of cyber security, brain-drain, few tertiary institutions offering cyber security, and corruption are the problems facing the teaching and learning of Teaching and Learning of Cyber Security Programme in Tertiary Institutions in Nigeria. Based on these findings, the paper recommends an increment in the budgetary allocation to the tertiary institutions with a focus on the cyber security program, employment of adequate academic staff in all the departments, provision of adequate infrastructure facilities in all the departments, supply of adequate instructional resources on cyber security to all the departments, increase the salaries of staff of tertiary institutions and their allowances to prevent brain-drain in the system, national universities commission should direct more tertiary institution to start an academic program on cyber security and technology should be deployed for the fight against corruption in the various tertiary institutions in Nigeria by the government and stakeholders.

**Keywords:** Cyber Security, Learning, Tertiary Institutions, Teaching

## 1. Introduction

Tertiary education in Nigeria aims to provide accessible and affordable quality learning opportunities in both formal and informal settings to meet the diverse needs and interests of all citizens. Its goals include offering high-quality career counseling and lifelong learning programs that equip students with the knowledge and skills necessary for self-reliance and workforce success. Additionally, it addresses skill shortages by producing skilled manpower aligned with labor market demands, while promoting scholarship, entrepreneurship, community service, and fostering national unity and international understanding [1]. The term "tertiary" refers to the third rank or order, and in the context of Nigeria, tertiary education denotes the third level of education, commonly referred to as higher education [2]. Tertiary education in Nigeria is synonymous with higher education and is responsible for producing the human capital required for societal and national development [3].

Tertiary education, also known as higher education, refers to educational programs offered by universities, colleges, and other institutions beyond secondary education. It encompasses undergraduate and postgraduate studies, providing students with advanced knowledge, skills, and qualifications in their chosen field of study [4]. Tertiary education is an organized educational system that is consciously designed for manpower production, in-service training, and national development. Tertiary education is an education that

**Citation:** Ogunode, N. J., Ukozor, C. U., Ugo-onyeka, O. D. Teaching and Learning of Cyber Security Programme in Tertiary Institution in Nigeria: Problems and Way Forward. Pioneer: Journal of Advanced Research and Scientific Progress 2025, 4(1), 19-24.

Received: 15<sup>th</sup> Jan 2025

Revised: 20<sup>th</sup> Jan 2025

Accepted: 25<sup>th</sup> Jan 2025

Published: 31<sup>st</sup> Jan 2025



**Copyright:** © 2025 by the authors. Submitted for open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>)

advances teaching, research, and community services for national development. Tertiary education is an education industry that is meant for the production of manpower and national development via the implementation of teaching, research, and provision of community services [5]. From the above, tertiary education is the higher education that deals with knowledge creation and national development through the deployment of teaching, research, and provision of community services.

Tertiary institutions are saddled with the responsibility of developing academic programs that are useful to the nation of the country. Tertiary institutions offer a lot of academic programs to produce manpower for the management of public and private institutions. Nigerian tertiary institutions offer a lot of academic programs, which include cyber security programs. The cyber security program is offered in polytechnics, colleges of education, and universities. The cyber security program is offered with the objectives of producing manpower and providing training and training programs.

Recent developments, according to Nigerian Universities Commission [6], in computing, network technologies, internet, and cloud technologies have generated the need for reliable and secure exchange of digital information that is vital to most human activities such as banking, medicine, infrastructure management, and elections. As the use of information technology expands, so are the potential consequences of cyber-attacks, and the need for a skilled workforce to prevent and defend against them. However, the pool of available talent to build and certify applications designed to withstand attacks, diagnose, and prevent security intrusions is inadequate to meet the growing needs all over the world. Government agencies, business organizations, industries, and the military are scrambling to find qualified professionals to safeguard their systems, businesses, and infrastructures.

The focus of the cyber security program, according to the Nigerian Universities Commission (CCMAS) (2022), is to equip students with sufficient knowledge and skills to minimize and prevent cybersecurity threats and incidents. Students are also equipped with demonstrable abilities to gather, analyze, and present evidence of any cybersecurity bridges in the organization in a professional way. The graduates of this program will understand the impact of cybercrime on business and the public and be able to identify and implement specific security practices, features, and techniques to enhance the security of computers, computer-based systems, and cyberspace. It appears that the teaching and learning of cyber security programs in Nigerian tertiary institutions are facing a lot of challenges. This paper discusses the problems facing teaching and learning cyber security programs in Nigerian tertiary institutions.

## **Review of Literature**

### **Concept of Cybersecurity programme**

The cybersecurity program is the introduction of big data analytics, cyber threat intelligence and cyber conflict, deep and dark web security, cyber threat hunting, monitors and controllers, artificial intelligence cyber defense applications, and surveillance in cyber defense operations (Nigerian Universities Commission (CCMAS) 2022). The cybersecurity program is an academic program that focuses on cybersecurity

The Nigerian Universities Commission (CCMAS) (2022) stated that the philosophy of the cyber security program is to build capacity and develop human capital in the field of cybersecurity, to safeguard business transactions, corporate assets, critical infrastructure, and all cyber operations in cyberspace, nationally and globally and the objectives are to:

1. Produce graduates with requisite foundation knowledge of cybersecurity, skills, and strategies that would enable them to detect and prevent cyber-fraud
2. Empower graduates with the ability to analyze cybersecurity threats, attacks, and risks for organizations, with the capacity to develop detective codes and supportive software agents to address cybersecurity threats;

3. Develop graduates with knowledge of cryptography and steganography for the privacy of information on computer systems and digital forensic science techniques for the detection of cybercrimes;
4. Produce graduates who can think critically about cyber intelligence security issues, develop and implement tactics strategic to cybersecurity, drawing on national and international recent case studies;
5. Prepare graduates for the purpose of self-employment, cybersecurity-based job placement, and professional practice in government and industries.

The Nigerian Universities Commission (CCMAS) (2022) also observed that the cyber security graduates will have would be expected to have the following:

1. Soft skills of excellent presentation and communication skills, ability to clearly articulate complex cyber-concepts and usage of active listening skills.
2. Technical skills in understanding the architecture, administration, and management of operating systems, networking, and virtualization software; usability of firewalls and network load balancers; software development concepts and software analytics skills; common programming languages; and obtaining cybersecurity certifications essential and prerequisite for employment.
3. Implementation skills of cyber hunting, cyber intelligence, and cyber threat modeling; vulnerability assessment; identify the cybersecurity controls in place and how they are used; and use of the coding skills to write codes that automate cybersecurity tasks. Also, cybersecurity students will be required to have the following 21st-century skills: problem-solving skills, critical thinking, communication skills, creativity, collaboration, information literacy, global awareness, innovation skills, and social skills.

## 2. Materials and Methods

The paper examined problems facing the teaching and learning of cyber security in tertiary institutions in Nigeria. This paper depends on secondary data. The data were collected from print and online publications. Content analysis and elimination methods were used to select the literature used in the study.

## 3. Results and Discussion

### Data Analysis on Problems Facing Teaching and Learning of Cyber Security Programme in Tertiary Institutions in Nigeria

There are many problems facing the teaching and learning of teaching and learning of cyber security programs in Tertiary Institutions in Nigeria. Some of these problems includes; poor funding, shortage of academic staff, inadequate infrastructure facilities, shortage instructional resources of cyber security, brain-drain, few tertiary institutions offering cyber security and corruption.

#### Poor funding

One of the challenges facing the smooth teaching and learning of cyber security programme in the Nigerian tertiary institutions is poor funding of the programme. The budgetary allocation for the implementation of the curriculum of cyber security programme in the higher institutions is very low that it cannot support full implementation of the programme. Generally, poor funding have been linked to the tertiary institutions in Nigeria by [7], [8] and this poor funding have made the managers of the institutions not be able to develop the cyber security programme in their respective institutions. Remarkd that academic programme implementation in the Nigerian higher institutions is faced with budget constraints and this has affected the level of quality implementation of the programme [9].

#### Shortage of academic staff

Academic staff are the implementer of curriculum in the tertiary institutions. They are employed purposely to carry out teaching, research and provide community services. The academic staff and non-academic staff are very important in the implementation of curriculum like the cyber security programme. The academic staff and non-academic staff must meet up with some specification and requirement before academic programme like cyber security programme can be started in the departments. It is unfortunate that there are shortage of professional essentially in the field of cyber security in Nigeria due to the academic programme are still in the early stage of development in the higher institutions. Few academic staff are available nationwide for employment into the various institutions and this affects the teaching and learning of cyber security in most Nigerian higher institutions. Some department do not have adequate professors and senior lecturers to man the implementation of the programme. Concluded that shortage of academic staff is a seriously problem facing the teaching of cyber security programme in the universities in Nigeria [9], [10].

#### **Inadequate infrastructure facilities**

Inadequate infrastructure facilities is another major problem hindering the teaching and learning of cyber security programme in the tertiary institutions in Nigeria. Infrastructural facilities according to [11] are those facilities aiding the delivery of academic and non-academic services in educational institutions. Infrastructural facilities include; libraries, laboratories, halls, offices, administrative blocks, hostels, road facilities, water, electricity, internet etc.. [12], [13] pinned infrastructure as the operational inputs of every instructional programme and constitutes elements that are necessary for teaching and learning. Such include buildings, laboratories, machinery, furniture and electrical fixtures. These must be functional in relation to other aspects of the community, such as health centres, libraries, and good roads and must be large enough to allow for expansion as enrolments expand. These facilities are not adequately available for the implementation of cyber security programme.

#### **Shortage instructional resources of cyber security**

Shortage of instructional resources of cyber security is another issue that is posing problem in the teaching and learning of the cyber security programme in the tertiary institutions. Instructional resources are very important in the implementation of school academic programme like cyber security programme. Instructional resources assists the academic staff to deliver the lecture with ease and also aids students understanding of concepts and theories. Many departments offering the cyber security programme in the Nigeria tertiary institutions do not have adequate resources on cyber security programme and this is affecting the teaching and learning of the programme. Submitted that shortage of instructional materials in the higher institutions is hindering the teaching and learning of cyber security education in the institutions [14].

#### **Brain-drain**

Brain-drain is a very big problem in the implementation of the cyber security programme in the tertiary institutions. Brain-drain refers to the mass movement of professionals from the developing countries to developed countries for better placement. The brain-drain problem in Nigeria also affected the tertiary institutions. Many academic staff, non-academic staff and researchers are moving out of the tertiary institutions system because of poor motivation and unconducive learning environment. Confirmed the mass movement of lecturers from the Nigerian higher institutions and they concluded that the implication is that academic programme accreditation will be affected, quality assurance will be affected and it has led to high students-lecturers ratio in the various academic programme.

#### **Few tertiary institutions offering cyber security**

Another problem affecting the teaching and learning of the cyber security programme in the tertiary institutions in Nigeria is that the academic programme is only offered by few tertiary institutions. The implication of this is that only few manpower will be produced compared to other programmes in the various higher institutions. The few tertiary institutions offering programme in the cyber security only focus more on the first degree while only a small fraction are doing master and PhD in cyber security. This has affected the development of the programme in Nigeria [16], [17].

### Corruption

Corruption is another challenge to the teaching and learning of cyber security programme in the tertiary institutions in Nigeria. Funds released for the implementation of school curriculum are mismanaged and looted by some officials in the tertiary institutions system. The corruption practices in the management of tertiary institutions in Nigeria is responsible for shortage of both human and material resources that are needed for full implementation of academic programme. The non-availability of these resources as a result of corruption affected the quality of academic programme and slowed down the development of academic programme in the higher institutions. Lamented that the high rate of corruption in the tertiary institutions in Nigeria has affected the development of the entire system [18], [19], [20].

### Findings

The paper showed that poor funding, shortage of academic staff, inadequate infrastructure facilities, shortage of instructional resources of cyber security, brain-drain, few tertiary institutions offering cyber security and corruption are the problems facing the teaching and learning of teaching and learning of cyber security programme in tertiary institutions in Nigeria [21], [22].

## 4. Conclusion

This paper discussed the problems facing the teaching and learning of cyber security in the Nigerian tertiary institutions. The paper disclosed poor funding, shortage of academic staff, inadequate infrastructure facilities, shortage of instructional resources of cyber security, brain-drain, few tertiary institutions offering cyber security and corruption are the problems facing the teaching and learning of teaching and learning of cyber security programme in tertiary institutions in Nigeria.

Based on these findings, the paper recommends increment in the budgetary allocation to the tertiary institutions with focus on cyber security programme, employment of adequate academic staff in all the departments, provision of adequate infrastructure facilities in all the departments, supply of adequate instructional resources on cyber security to all the departments, increase the salaries of staff of tertiary institutions and their allowances to prevent brain-drain in the system, national universities commission should direct more tertiary institutions to start academic programme on cyber security and technology should be deployed for the fight against corruption in the various tertiary institutions in Nigeria by the government and stakeholders.

## REFERENCES

1. Federal Republic of Nigeria, *National Policy on Education*, 4th ed. Lagos: Nigerian Educational Research and Development Council, 2013.
2. N. O. Okai and A. S. Botimi-Slaboh, "Managing tertiary education in a depressed economy," *Journal of Social & Policy Research*, vol. 6, no. 2, pp. 187-196, 2019.
3. Proctoredu, "Tertiary education - definition & meaning," *Proctoredu*, 2023. [Online]. Available: <https://proctoredu.com/glossary/tertiary-education>.
4. N. J. Ogunode, "Benefit of digital literacy for academic staff and students of tertiary institutions in Nigeria," *American Journal of Alternative Education*, vol. 2, no. 2, pp. 43-53, 2025.

5. Nigerian Universities Commission, *Core Curriculum and Minimum Academic Standards (CCMAS) for Nigerian Universities: Computing*, Abuja, Nigeria, 2022.
6. I. F. M. Ifeyinwa and I. M. Okemute, "Anambra state tertiary institutions: A call for urgent reforms," *Chukwuemeka Odumegwu Ojukwu University Journal of Arts and Social Science Education (COOUJOASSE)*, vol. 3, no. 1, pp. 1-10, 2023.
7. O. Osho and A. Onoja, "National cyber security policy and strategy of Nigeria: A qualitative analysis," *International Journal of Cyber Criminology (IJCC)*, vol. 9, no. 1, pp. 120-143, 2015. doi: 10.5281/ZENODO.22390.
8. N. J. Ogunode, F. O. Akpakwu, and D. P. Ochai, "Cybersecurity and school management in Nigeria," *Unpublished*, 2025.
9. Tech-target Editorial Team, "What is cybersecurity?," *TechTarget*, 2024. [Online]. Available: <https://www.techtarget.com/searchsecurity/definition/cybersecurity>.
10. E. I. Ukhami and D. Abdulsalam, "Globalization and national security: Perspectives on cybersecurity threats in Nigeria," *Journal of Political Discourse*, vol. 2, no. 1, pp. 273-286, 2024.
11. N. J. Ogunode, "Administration of public universities in Nigeria: Problems and solutions," *Journal Sinestesia*, vol. 10, no. 2, pp. 86-96, 2020.
12. N. O. Ebehikhalu and P. Dawam, "Inadequacy of teaching and learning infrastructure: Reason Nigerian universities cannot drive innovations," *Australian Journal of Education and Learning Research SCIE Journals*, 2016.
13. C. N. Ejike and G. O. Ejike, "Challenges of curriculum implementation and the realization of national philosophy of education in Nigeria," *International Journal of Management, Social Sciences, Peace and Conflict Studies (IJMSSPCS)*, vol. 1, no. 1, pp. 62-67, Dec. 2018.
14. Y. Petere, "Cybersecurity education in Nigeria: Prospects and problems," Lagos, Nigeria, 2022.
15. N. J. Ogunode, H. F. Josiah, and T. S. Ajape, "Effects of corruption on public universities administration in Nigeria," *Journal of Educational Discoveries and Lifelong Learning*, vol. 2, no. 7, pp. 5-18, 2021.
16. B. Daniel-Kalio, "Policy implementation and the challenges of leadership in Nigerian universities," *International Journal of Scientific Research in Education*, vol. 12, no. 2, pp. 326-350, 2019.
17. NCC, "Cybersecurity awareness: NCC raises alarm over youths' involvement in cybercrime," *National Communication Commission*, 2020. [Online]. Available: <https://www.ncc.gov.ng/media-centre/news-headlines/774-cybersecurity-awareness-ncc-raises-alarm-over-youths-involvement-in-cybercrime>.
18. R. I. Asiyai, "School administrators strategies for combating corruption in universities in Nigeria," *Journal of Education and Learning*, vol. 4, no. 4, pp. 160-167, 2015.
19. R. S. Akande, "Corruption and state capacity in sub-Saharan African: A cross-country analysis," *International Journal of Economic, Commerce and Management*, vol. 5, no. 4, pp. 615-628, 2017. [Online]. Available: [www.ijecm.co.uk/wp-content/uploads/2017/04/5440.pdf](http://www.ijecm.co.uk/wp-content/uploads/2017/04/5440.pdf).
20. R. I. Asiyai, "Corruption in secondary schools: Administrative strategies for its management," *Journal of Educational and Social Research*, vol. 10, no. 1, pp. 106-116, 2020.
21. P. N. Ndubueze, "Cyberterrorism and national security in digital Nigeria," in *Terrorism & Counter Terrorism War in Nigeria: Essays in Honour of Lieutenant General Tukur Yusuf Buratai*, P. A. Adejoh and W. Adisa, Eds. University of Lagos Press, 2017, pp. 325-247.
22. Nwachukwu, "Nigeria: A failing state teetering on the brink," *The Punch News*, May 19, 2021.