



Article

Cyber Security Education in Nigerian Schools: Importance, Problems and Way Forward

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Abstract: Cyber security education is crucial for Nigerian schools in order to combat the growing number of cyber threats and attacks. However, there are various problems that hinder the implementation of effective cyber security education in Nigerian schools. These problems include inadequate funding, inadequate infrastructure, shortage of instructional resources, poor research, inadequate professional teachers and poor training are the problems facing the teaching and learning of cyber security education in the Nigerian schools. This paper discussed the importance of cyber security education in Nigerian schools and address the various problems that need to be tackled in order to improve cyber security education in the country. The paper provided potential solutions and recommendations for addressing these problems, in order to ensure a safer and more secure digital environment for Nigerian schools.

Keywords: Cyber Security Education, Importance, Schools

1. Introduction

Education varies as widely in its forms, philosophy, contents, and methods as there are different societies in the world. Education is a life-long process that has interpretation in purpose, type and level. It is a means of socializing people into the community, for upholding customs and traditions as well as for the modification or changing of same in conformity with existing ideologies, ideological expansion or reformation. Nigerian government in her national policy on education adopted education as an instrument for effecting national development. Education can be defined as production and reproduction of knowledge of people's way of life (i.e. their culture) with the aim of preserving and maintaining the social structure that will be able to guarantee social order and changes in the society (NOUN, 2012). Education is the process where an individual acquires or imparts basic knowledge to another. It is also where a person develops skills essential to daily living, learns social norms, develops judgment and reasoning, and learns how to discern right from wrong. The ultimate goal of education is to help an individual navigate life and contribute to society once they become older [1].

Education is a process that transfer knowledge, skills, and character traits that comes or manifests in various forms to empower the individual to be socially and economically useful to himself or herself and the society. Education is an organized and planned process that leads to the acquisition of knowledge from an institute of learning for personal and national development. Education is an organized learning process that facilitate acquisition of general knowledge, development of intellectual and skills for personal development as well as community development. Education involves the transmission of

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knowledge, values, and skills from one generation to another, ensuring the continuity and advancement of civilizations. Education goes beyond formal schooling, extending to informal and non-formal learning experiences. Education is the acquisition of information that include cultivation of critical thinking, creativity, problem-solving abilities, and ethical decision-making. Education empower individuals to become lifelong learners, adaptable to the challenges of a rapidly evolving world [2].

Education in Nigeria covers cyber security. Cyber security education commences from the basic education to the tertiary education in Nigeria. Cyber security education is a form of education that educate the learners with practical skills and knowledge to protect data or information from attacks. Cyber security education is the branch of computer education that deals with the teaching and learning of how to secure and protect against attacks over the internet. Cyber security education is the instruction in the school that equips individual with the knowledge of computer, network protection against theft and attacks on hardware, software or information. The teaching and learning of cyber security in Nigerian schools seem to be facing a lot of challenges. Ukhamsi, and Abdulsalam [3], established that there are many challenges facing teaching and learning of cyber security education in the schools. Based on this, this paper seeks to explore the challenges facing the teaching and learning of cyber security education in the Nigerian schools.

Conceptualization:

School

A school is a social institution for the implementation of teaching and learning and other extra-curriculum activities. A school is an institutions designed for impartation of knowledge. A school is a micro part of the society curve out for the purpose of teaching and learning. A school is a formal and non-formal institutions that brings together teachers, students and school administrators for the purpose of teaching and learning. A school is considered a second home for students, and teachers as a second set of parents [4].

School refers to an institution that provides education to individuals. It is a place where students learn various subjects and skills in order to further their knowledge and career prospects. Schools typically consist of teachers, students, and support staff who work together to create a conducive learning environment. There are different types of schools such as elementary, middle, high schools, and universities, catering for students of different age groups and academic levels. The curriculum at schools includes various subjects like math, science, arts, and languages, designed to provide a well-rounded education. Some schools also offer extracurricular activities and special programs for students to explore their interests and talents [5].

The School is an organized social institutions meant for impartation of knowledge. The purpose or objective of the school is to provide a medium were instructors meet with learners to effect change of behaviors. The school provide avenue for conducive teaching and learning to take place between the teachers and students. The Schools are designed to have service providers (school administrators, teachers and non-teaching staff) and services receiver (learners). The school stakeholders which include school administrators, teachers and non-teaching staff are providing services that demands them to always upgrade their skills and knowledge [6].

Cyber Security Education

Cyber security education is a branch of education that focuses on teaching individuals and organizations how to protect their computer systems, networks, and data from cyber-attacks. It covers a wide range of topics such as risk assessment, incident response, network security, cryptography, and ethical hacking. This type of education is crucial in today's digital age as cyber -attacks have become increasingly common and sophisticated. By understanding the fundamentals of cyber security, individuals and

organizations can learn how to identify potential vulnerabilities, prevent attacks, and respond effectively in case of a security breach. With the rise of cyber threats in recent years, cyber security education has become a critical component in the fight against cyber-crime and protecting sensitive information. Through this tool, you can generate academic abstracts on different aspects of cyber security education, providing valuable insights and knowledge for researchers, educators, and students alike [7].

Cyber security education is the process of receiving or giving systematic instruction at a school or university or online on the proper use of technologies, processes and networks and data from cyber-attacks. It is the awareness given users of the internet through a formal approach (teaching) on how to secure their devices, data and networks etc. from cyber-attacks [8]. Cyber security education is the act of inculcating and passing of an organized instruction to learners on the best practices, measures, processes and application to use in safeguarding digital assets against cyberattacks. The aims of cyber security education is to provide the learners with skills to protect information and preserving the integrity and availability of systems. To also prepare the learners with the knowledge to protect themselves against potential attacks [9].

The primary aim of cyber security education is to provide the learners with practical skills to protect systems, networks, and data from cyber threats. To ensure the learners gained the knowledge of data safety and protection of sensitive information. To equip the learners with skills and knowledge of designing policies and measure to prevent unauthorised access, data breaches, and other malicious activities that can cause significant harm [9].

The need to include cyber security education in our curriculum according to [8] is very important because every individual who is connected to the internet can become vulnerable at different times and these vulnerabilities are the target of cyber criminals/cyber attackers. As more students and instructors have their presence in the cyber space, so also do the cybercriminals. Cybercriminals are increasingly multiplying their effect and presence on the internet and this has become a reason to educate instructors and learners on the need to stay safe in the cyberspace. Understanding how to stay safe on the internet is pivotal to enjoying the dividends and enormous resources it provides [8]. Cyber awareness and education remain a key defense in the protection of people, systems and networks [10]. "Cyber security is an important subject for everyone, not just corporations. It's also vital for our children to understand how to stay safe online, and the need to be aware of any dangers that might come their way" [11]. Noted that "Cybercrime against children and adolescents is certainly a concern for parents, as they sometimes do not realize their child is a victim of cybercrime" [12].

The objectives of cyber security education in schools includes; to promote awareness of cyber security risks and threats, provide students with the knowledge and skills to protect themselves and others online, and to promote ethical and responsible use of technology. This includes teaching students about safe internet browsing, password protection, and protecting personal information online. Additionally, cyber security education in schools aims to develop critical thinking and problem-solving skills in students, as well as to prepare them for careers in the rapidly growing field of cyber security. By educating students about cyber security, schools are helping to create a safer and more secure digital environment for both individuals and organizations [13].

From the above, cybersecurity education in this paper can be seen as the process of transferring skills and knowledge of protection of networks, devices, and data from unauthorized or unintended access or illegal use to students in educational institutions. Cybersecurity education is important for practical transmission of knowledge and skills for the development of programs, applications and best practices for the protection against cyber-attacks.

The Objectives of Cyber Security Education includes:

1. Cyber security education aimed to build essential skills in risk mitigation, incident reporting and technical solutions for maintaining security;
2. To provide students with knowledge of security compliance measures and to understand how to implement practices that meet regulatory standards of conduct and usage.
3. Cybersecurity education is an organized instruction in schools to transfer knowledge and skills of protecting internet-connected systems such as hardware, software and data from cyberthreats.
4. Cybersecurity education provide individual with the practical knowledge of protection against unauthorized access to one' data centers or institution data.
5. Cyber security education covers the following; application security, information or data security, Network security, disaster recovery and business continuity planning, operational security, Cloud security, critical infrastructure security, physical security and end-user education.

The importance of cyber security education in Nigerian schools cannot be overstated. With the increasing reliance on technology in every aspect of our lives, it is crucial that students are equipped with the necessary knowledge and skills to protect themselves and their information in the digital world. Cyber security threats are constantly evolving and becoming more sophisticated. Nigerian schools need to prioritize educating their students about these threats and how to prevent them. By doing so, we can help create a safer online environment for the future generation.

Not only does cyber security education protect individuals, but it also plays a vital role in safeguarding the country's critical infrastructure and economy. With the rise of cyber-attacks on government agencies and organizations, it is imperative that students are educated on how to defend against such threats. Moreover, cyber security education in Nigerian schools can also help bridge the digital divide. Many students in Nigeria do not have access to technology at home, making them vulnerable to cyber-attacks once they enter the workforce. By educating students on cyber security, we can ensure that they are better prepared for the digital world and have equal opportunities for success.

Cyber security education can also foster a culture of responsible and ethical technology use. Students will learn not only how to protect themselves but also the importance of respecting the privacy and security of others. This mindset can have long-lasting effects and contribute to a safer and more trustworthy online community.

2. Materials and Methods

This paper discussed importance and problems facing the teaching and learning of cyber security education in Nigerian schools. Among other things discussed was the concept of school, cyber security, cyber security education and importance of cyber security education in Nigeria. The study used secondary data. The content analysis method was adopted for the selection of data. The data were collected from the following sources review of published articles from reputable international journals such as CEON, Elsevier, Hindawi, JSTOR, IEEE, Learn Techlib SAGE, Nebraska and Springer amongst others adopted from [6].

3. Results and Discussion

Importance of Teaching Cyber Security Education in Schools

According to the importance of cyber security education includes [14]:

1. Cybersecurity education empowers individuals to protect themselves online, ensuring their data and privacy remain secure. One key aspect of cybersecurity education is teaching people about strong password practices

2. Cybersecurity education helps the Individuals to learn how to create complex passwords and avoid using the same password across multiple sites. This simple step significantly reduces the risk of unauthorized access to personal accounts.
3. Cybersecurity education provides the knowledge for an individual to recognize phishing attempts.
4. Cybersecurity education helps individuals identify suspicious emails and links that could lead to malware or data breaches. By being vigilant, they can avoid falling victim to these common cyberattacks.
5. Cybersecurity education provides the skills to the individuals on the importance of software updates. Regular updates patch security vulnerabilities, making it harder for hackers to exploit weaknesses.
6. Cybersecurity education covers the use of antivirus software and firewalls. These tools provide an extra layer of defense against cyber threats. Knowing how to configure and use these tools effectively enhances an individual's ability to protect their digital assets.
7. Cybersecurity education empowers individuals to protect themselves online. This knowledge ensures that their data and privacy remain secure. For academic purposes, cybersecurity education is equally important. Cybersecurity education equips learners with best practices that can prevent data breaches and protect sensitive information. This reduces the financial and reputational damage that can result from a cyberattack.
8. Cybersecurity education promotes a culture of awareness and vigilance. When students understand the threats and know how to respond, they become proactive in protecting themselves and their organizations. This proactive approach is essential in staying ahead of cybercriminals.

Also, noted that cybersecurity education helps to create a cyber security culture due to the spread of technology and the increase in cybercrime [15]. Education is crucial to fostering a culture of cyber security as well as raising awareness of the issue. Cybersecurity education provides students with techniques and tactics for fending off cyberattacks. This entails becoming knowledgeable about current cyber threats, how to spot them, and how to put in place reliable security measures. Cyber security education is crucial since it can keep them informed of the newest trends and advancements in the field. Cyber security education assist individual in comprehending the legal and regulatory frameworks that control cyber security as well as the possible repercussions of breaking the law,

Cyber security education according to [15] exposes individuals and organizations on different dangers and hazards associated with cyber security as well as how to defend themselves from these attacks by promoting education of the significance of cyber security. This entails being aware of the significance of using strong passwords, the risks associated with using public Wi-Fi, and the necessity of routinely updating security and software. Many best colleges for law engage in creating awareness on cyber-crime and how to protect oneself from frequent cyber-attacks. This in turn helps masses to educate themselves on cyber security.

Challenges facing the Teaching and Learning of Cyber Security Education in Schools in Nigeria

The problems facing the teaching and learning of cyber security education in the Nigerian schools includes; inadequate funding, inadequate infrastructure, shortage of instructional resources, poor research, inadequate professional teachers and poor training

1. Inadequate Funding:

Inadequate funding is a major problem hindering the development of cyber security education in the Nigerian schools. The budgetary allocation to education which include cyber security education in Nigeria is not adequate to implement the curriculum. The allocation of financial resources to primary schools, secondary schools and tertiary

institutions is insufficient, leading to a lack of basic equipment, infrastructures, and personnel for the implementation of the cyber security education.

2. Inadequate Infrastructure

Another problem hindering the development of cyber security education in the schools in Nigeria is the lack of adequate infrastructural facilities. Infrastructural facilities are school facilities that aid the delivery of the teaching and learning process in the schools. Infrastructural facilities enable the teachers to teach well, prepare their lessons, and deliver them online using information and communication technology (ICT) which is very relevant for instructions in cyber security education [16]. These facilities are not adequate to support the teachers to deliver the lectures in the classrooms. The shortage of facilities have also affected students from learning too because effective teaching and learning depends on the provision of adequate and accessible facilities in the schools. Many basic schools, secondary schools and tertiary institutions are in need of renovation and upgrading to provide a conducive teaching and learning environment for both teachers and students.

3. Shortage of instructional resources

Shortage of instructional resources on cyber security in educational institutions across Nigeria is also affecting the teaching and learning of cyber security education. Instructional resources are supportive resources that enable instructors to present the lesson well in the classroom and students will understand it. Instructional resources are planned educational materials used by the teachers to implement the curriculum. They are very important instrument in the classrooms for aiding teaching and learning. The lack of these essential resources in many schools across the country is militating against effective implementation of cyber security curriculum in the various schools [17].

4. Poor Research

Another problem facing the teaching and learning of cyber security in the Nigerian schools is the poor research in the cyber security education. Research is the process of investigating a problem in order to discover new knowledge and information about the product or goods. Research is one of the component of cyber security education. The poor investment in cyber security education research has affected the development of cyber security education in Nigeria. Currently, Nigeria lacks the harmonization of research, development, and innovation efforts in its cybersecurity ecosystem. This militates against safe cyberspace in Nigeria [18]. Thus synchronizes the efforts of stakeholders including incubation centers, global community, academia, government, and private research institutions [19].

5. Inadequate professional teachers

Inadequate professional teachers is also a major problem facing the teaching and learning of cyber security education in the schools in Nigeria. Professional teachers in cyber security education are those persons trained and that have acquired necessary skills and knowledge and have been certified to teach cyber security programme in the schools. These professional are in short supply in Nigeria [20], [21]. Many schools do not have adequate teachers to teach cyber security programme in the schools. The inability of these schools to employed adequate teachers for the implementation of cyber security education in their respective schools have affected the quality of education and have hindered smooth implementation of cyber security curriculum in the schools [17]. Noted that lack of adequate instructional resources on cyber security in schools across Nigeria.

6. Poor training

Poor training and retraining programme for cyber security teachers has also contributed to poor development of cyber security education in the schools in Nigeria. Chand, (undated) affirmed that training constitutes a basic concept in human resource development. It is concerned with developing a particular skill to a desired standard by

instruction and practice. Training is a highly useful tool that can bring an employee into a position where they can do their job correctly, effectively, and conscientiously [22], [23]. Training is the act of increasing the knowledge and skill of an employee for doing a particular job. The teaching of cyber security in the schools demands constant training programme for the teachers of cyber security education. The cyber security programme is technological inclined that requires that teachers of such programme should always upgrade their knowledge and skills. It is unfortunate that most teachers teaching the cyber security programme in the Nigerian schools are not constantly been exposed to training programme which have affected the teaching and learning of cyber security education.

4. Conclusion

The paper revealed that inadequate funding, inadequate infrastructure, shortage of instructional resources, poor research, inadequate professional teachers and poor training are the problems facing the teaching and learning of cyber security education in the Nigerian schools. In conclusion, cyber security education plays a crucial role in Nigerian schools, providing both benefits and challenges. It is essential for schools to invest in proper resources and training to ensure the safety and security of their students, faculty, and data. Through effective cyber security education, Nigerian schools can reap the benefits of technology development and advances career development in cyber security education which directly will lead production of manpower in cyber security and cyber technology in Nigeria.

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