VOL. 05 NO. 2,
AUGUST, 2024
E-ISSN 3027-1533
P-ISSN 3026-8648

African Scholar Publications & Research International
www.africanscholarpub.com

Journal of African Innovation & Advanced Studies (JAIAS)

Digital Literacy and Skills Development in Nigeria: Policies, Barriers and Recommendations

***Oladipupo Bello; & **Abdulazeez O. Ajao**

*National Board for Technical Education, Kaduna, Kaduna State, Nigeria. **The Federal Polytechnic, Offa, Kwara State, Nigeria.
Corresponding Author: *engroobello@gmail.com*

Abstract

Digital literacy and skills are becoming indispensable due to the ubiquitous nature of information and communication technologies (ICTs) and their wide-ranging applications in every aspect of human life. However, individuals must learn or acquire digital skills to enhance their standard of living and contribute to national development. This paper examines government policies formulated to facilitate digital literacy and skills development in Nigeria in the last two decades. We examined in detail the formal education approach to digital literacy and skills development, along with the barriers that hinder it. The empirical data results indicate that the majority of programmes offered in universities, polytechnics, and similar institutions provide basic and intermediate digital skills to their students, while the majority of programmes offered in colleges of education primarily focus on arts and humanities education, offering only basic digital skills at best. We consider this to be a primary cause for the inadequate teaching of digital skills in Nigeria's public basic education schools. Therefore, Nigeria should increase the number of programmes that train ICT or computer teachers for basic education. Interestingly, in order to reach a 95% digital literacy level in Nigeria by 2030, we've proposed some helpful suggestions to overcome obstacles to the growth of digital skills and equip Nigerians with the necessary digital skills to engage in the digital economy.

Keywords: Digitalization, Policies, Curricula, Frontier Technologies, Polytechnics.

Introduction

The Fourth Industrial Revolution is rapidly transforming economies worldwide. Many see it as a catalyst for national prosperity, economic growth, and widespread improvements in living standards, fueled by cutting-edge technologies (Langthaler et al.,

2020). Individuals and organizations, equipped with digital literacy and skills, are undoubtedly key drivers of this revolution. They promote the adoption of new technologies, boosting productivity, job security, and employment opportunities. Beyond economics, digital literacy empowers individuals to participate effectively as digital citizens, navigating online platforms and tools to engage in society, politics, and government (Sharma et al., 2016). Consequently, a nation with a critical mass of digitally literate citizens and workers is better positioned to reap the benefits of the digital economy and drive an equitable digital transformation.

Countries are increasingly focusing on fostering digital literacy and skills development through policies and programmes. However, these efforts are often hampered by challenges like inadequate funding, unreliable electricity, limited internet access, high maintenance costs, a lack of qualified personnel, resistance to change, and even a deficit of self-control (Ogunode & Ndayebom, 2023).

To address this need, the Coalition for Digital Intelligence created a globally recognized framework for digital literacy, skills, and readiness – the IEEE Standards for Digital Intelligence (DQ) Framework. This framework encompasses eight key competencies, including digital identity, use, safety, security, emotional intelligence, literacy, communication, and rights. It also emphasizes three levels of development: citizenship, creativity, and competitiveness. Digital intelligence is increasingly recognized as a fundamental human right, with the potential to fuel sustainable national development through inclusive growth, well-being, and prosperity (Boughzala et al., 2020). More than 80 countries have adopted the DQ Framework to enhance students' foundational digital skills, cultivate innovation ecosystems, and organize various digital skills education and training programmes (Jackman et al., 2021, Lombardi, 2023).

While numerous studies have explored digital skills in various contexts, there is a significant gap in research focused on understanding digital skills development in terms of policies and barriers, particularly in less industrialized nations. This study aims to address this gap by examining formal approaches to digital skills development in Nigeria. We will analyze government policies designed to promote digital skills acquisition, as well as the various barriers hindering this process. The findings of this study are expected to be of value to policymakers, ICT professionals, educational leaders, and public administrators, enabling them to develop solutions for enhancing digital skills development within the Nigerian education system, potentially extending these insights to address similar challenges across sub-Saharan Africa.

The remainder of this paper is structured as follows: Section 2 delves into national policies on digital literacy and skills development in Nigeria. Section 3 explores various methods and approaches used to promote digital literacy and skills development within the country. Section 4 specifically examines how digital skills are being developed within the formal education system. Section 5 highlights the key barriers hindering digital skills development in Nigeria. Finally, Section 6 concludes the paper and offers recommendations for improving the delivery of digital skills development programmes within the Nigerian education system.

National Policies on Digital Literacy and Skills Development in Nigeria

Nigeria possesses a range of policies that address digital literacy development. We analyzed four main documents:

i. **National Policy on Education (NPE, 2013):** Established in 1977 and revised in 2013, the NPE outlines the government's vision for the education system. It acknowledges the importance of information technology (IT) and aims to equip learners with digital literacy skills through appropriate training and teacher development initiatives (Federal Republic of Nigeria, 2013).
ii. **Nigerian National Policy for Information Technology (NNPIT, 2001):** Approved in 2001, the NNPIT seeks to position Nigeria as a leader in IT within Africa. This policy emphasizes the development of a skilled IT workforce and outlines strategies to achieve this goal, including integrating IT curricula into educational institutions (Federal Republic of Nigeria, 2001).
iii. **National Information and Communication Technology (ICT) Policy (2012):** This policy aims to streamline the ICT sector and leverage its potential for socio-economic development. It highlights the importance of digital skills development and proposes strategies like establishing competitive training institutions and integrating ICT into national education (Federal Ministry of Education, 2012).
iv. **National Policy on ICT in Education (NPCITE, 2019):** Developed by the Federal Ministry of Education, the NPCITE outlines plans for integrating ICT into the Nigerian education system. This policy aims to enhance teaching, learning, and assessment processes through the use of digital technologies (Federal Ministry of Education, 2019).

National Policy Landscape for Digital Skills Development

Education policies serve as blueprints for a nation's educational system, shaped by government initiatives to improve citizens' lives, address societal needs, and navigate evolving complexities. These policies translate into programmes developed by public authorities, informed by societal values and technological advancements. They impact all educational levels, from early childhood care to university. The Nigerian government has established a comprehensive framework for fostering digital literacy and skills development through various policies. This section explores these key policies and their implications.

National Policy on Education (NPE)

The first edition of the National Policy on Education (NPE) was published in 1977, aiming to address inconsistencies and a lack of standardization across the Nigerian educational system (Nwagwu, 2007). It was subsequently reviewed and updated in 2013 to reflect changing societal needs, technological advancements, and the importance of digital skills (Federal Republic of Nigeria, 2013). The NPE explicitly acknowledges the critical role of information technology (IT) in equipping learners with the knowledge and skills necessary to thrive in a knowledge-driven world. It outlines several provisions to ensure the integration of digital literacy and skills into the education system:

Infrastructure and Teacher Training: The policy mandates the government to provide adequate infrastructure and training facilities to support the use of IT in education. This

includes equipping schools with computer labs and well-trained teachers who can effectively utilize technology to deliver the curriculum.

Inclusive Education: The NPE emphasizes the importance of inclusive education by requiring special schools to provide computers with assistive technologies for students with visual impairments and special needs.

Computer Literacy Programs: The policy calls for initiatives to improve the computer literacy of both teachers and students at all levels of education.

Assessment and Testing: The NPE encourages the transition to computer-based testing (CBT) by requiring schools to establish e-testing centers.

These provisions demonstrate the government's commitment to equipping Nigerian students with digital skills and empowering teachers to leverage technology for effective teaching.

Nigerian National Policy for Information Technology (NNPIT)

In 2001, Nigeria approved the National Policy for Information Technology (NNPIT) with the goal of transforming the nation into an information technology (IT) leader in Africa by 2005 (FGN, 2001). This policy envisioned IT as the driving force for sustainable development and global competitiveness. It established the National Information Technology Development Agency (NITDA) to manage the implementation of the policy and its various sectoral applications. One of the NNPIT's key areas of focus is the development of a globally competitive workforce in IT and related fields. The policy outlines several strategies to achieve this goal, including:

Developing IT Professionals: The NNPIT aims to cultivate a pool of skilled IT professionals, including engineers, scientists, technicians, and software developers.

Attracting Talent: It recognizes the importance of attracting talent by fostering attractive career opportunities in the IT sector.

Building Local Expertise: The policy emphasizes building local capabilities in various aspects of IT, such as software development and computer components.

The strategies outlined in the NNPIT highlight the government's proactive approach to fostering a robust IT workforce in Nigeria.

National Information and Communication Technology (ICT) Policy

The National Information and Communication Technology (ICT) Policy was formulated in 2012 to streamline the ICT sector and leverage its potential for socio-economic development (FGN, 2012). This policy aligns with the vision of transforming Nigeria into a top 20 economy by the year 2020. Specifically, it focuses on several objectives that directly impact digital skills development:

Building Indigenous Capacity: The policy aims to develop a strong domestic capacity in ICT and software development.

Cybersecurity and Development: It emphasizes the critical role of ICT in enhancing national security and promoting development across various sectors.

ICT-Driven Transformation: The policy positions ICT as a key driver for energizing and supporting various programmes that contribute to Nigeria's socio-economic advancement.

These objectives highlight the government's understanding of ICT as a crucial tool for national development and economic growth. The ICT Policy also outlines specific strategies to achieve its digital skills development goals. These include:

Curriculum Development: Integrating ICT into the national education curriculum at all levels.

Skilled Workforce Development: Promoting the growth of a skilled workforce with strong ICT capabilities.

Public Sector Training: Facilitating the training of public sector employees to enhance their ability to deliver government services effectively using ICT tools.

National Policy on ICT in Education (NPICE)

The National Policy on ICT in Education (NPICE), developed by the Federal Ministry of Education in 2019, serves as a roadmap for integrating ICT into the Nigerian education system (FME, 2019). It outlines plans and strategies to leverage digital technologies for improved teaching, learning, and assessment processes. Ultimately, the NPICE aims to ensure that graduates at all levels possess the necessary competencies to thrive in a society driven by socio-economic development, self-reliance, and global competitiveness. The policy emphasizes several key areas, including:

ICT Workforce Development: Building and supporting the growth of a skilled workforce dedicated to integrating ICT effectively into education.

Infrastructure Development: Establishing and maintaining a robust and shared ICT infrastructure platform to support education at all levels.

Research and Development: Encouraging and promoting advancements in ICT research and development, specifically focused on the education sector.

The NPICE goes beyond infrastructure and workforce development. It emphasizes the importance of effective policy implementation through strategies such as:

Stakeholder Engagement: Promoting regular consultations, public awareness campaigns, and collaboration among stakeholders.

Legal and Regulatory Framework: Establishing a clear legal and security framework to ensure the responsible deployment of ICT in education.

Financing Models: Adopting innovative and sustainable financing models to support ICT initiatives in education.

Monitoring and Evaluation: Implementing robust monitoring and evaluation mechanisms to track policy implementation, service delivery effectiveness, and policy compliance.

National Digital Economy Policy and Strategy (NDEPS)

The National Digital Economy Policy and Strategy (NDEPS), spearheaded by the Federal Ministry of Communication and Digital Economy in 2019, serves as a blueprint for driving Nigeria's digital transformation and harnessing untapped digital economic opportunities (FMCDE, 2019). The NDEPS roadmap outlines eight pillars to accelerate Nigeria's emergence as a key player in the global digital economy. The second pillar of the NDEPS focuses specifically on digital literacy and skills. It emphasizes the need for comprehensive training

programmes to equip Nigerians from diverse backgrounds with the necessary digital literacy and skills to thrive in the digital age (FMCDE, 2019). Key objectives of the NDEPS related to digital skills development include:

Curriculum Integration: Integrating digital literacy and skills into the national education curriculum at all levels.

Public Sector Training: Providing training and capacity building for public sector employees in using digital tools and applications to improve service delivery.

Globally Certified Workforce: Creating a pool of Nigerians with internationally recognized digital skills certifications.

Bridging the Gap: Narrowing the gap between academia and industry in terms of skills development.

Accessibility: Reducing barriers to accessing digital tools for Nigerian citizens.

The NDEPS highlights the government's ambitious goals to cultivate a digitally literate citizenry, government workforce, and business community. Specifically, it aims to achieve a national digital literacy rate of 95% by 2030 and develop a robust digital education curriculum that aligns with the evolving needs of the digital economy.

An examination of these national policies reveals a comprehensive framework established by the Nigerian government to foster digital skills development. These policies outline a clear vision for integrating ICT into education, building a skilled workforce, and harnessing the potential of the digital economy. However, as the next section will explore, there are challenges that hinder the effective implementation of these well-designed policies.

Modes of Digital Literacy and Skills Development

This section explores the different modes of digital literacy (Figure 1), the essential skills needed to navigate the online landscape effectively.



Figure 1: Image representation of different modes of digital literacy (Meta AI, 2024)

Self-Directed Learning

In Nigeria, many individuals develop basic digital skills through self-directed learning methods (Giuseffi, 2017). This approach leverages readily available resources and fosters independent learning. Individuals can learn by observing others, listening to digital literacy tips shared through mass media, or reading online content. A Platforms like YouTube offer tutorials and learning channels on various digital skills. Advantages and disadvantages of different learning modes is highlighted in Table 1.

Table 1: Comparison of Self-Directed Learning Modes

Mode	Description	Advantages	Disadvantages
Exploration and Experimentation	Learning by doing through exploring features of digital devices.	Practical experience, hands-on learning.	May lack structure, require existing foundational knowledge.
E-Learning Platforms	Structured learning opportunities through online platforms. (Examples: Digital Nigeria Training Portal, Huawei ICT Academy, Google Skill Shop)	Flexible pace, self-directed learning, potential certifications.	Cost of data can limit access, unreliable power can disrupt sessions, requires strong self-motivation and time management.

Independent Training Centers or Institutes

The burgeoning demand for digitally skilled workers across various sectors has fueled the growth of training institutes in Nigeria (Agbai & Okechukwu, 2024). These institutes address the significant skills gap, with a large number of Nigerian youths lacking basic to advanced digital skills. Training programmes cater to diverse needs, ranging from introductory courses to in-depth certifications, with durations spanning from days to months.

These institutes offer a variety of learning delivery methods to accommodate different learning styles and preferences. Options include intensive short-term "boot camps," traditional classroom settings, blended learning (combining online and in-person elements), and fully online programmes. Boot camps, in particular, have emerged as a promising approach to bridge the digital divide and tackle youth unemployment in Nigeria (Agu, 2013). These focused programmes, typically lasting less than a year, equip individuals with specialized developer skills.

The main challenge associated with independent training centers lies in the accreditation process. While some institutions offer nationally or internationally recognized certifications, others might not have rigorous accreditation. This inconsistency can impact the recognition of these certifications, particularly for public sector employment (Auld & Gulbrandsen, 2010).

Given the potential of boot camps, increased investment and support from government agencies and corporate organizations are crucial. Boot camps effectively address the digital

skills gap and youth unemployment by providing specialized skills within a short timeframe (Arthur-Mensah, 2020). Furthermore, the rise of tech and innovation hubs fosters entrepreneurship by lowering entry barriers. These hubs provide aspiring business owners with essential resources such as internet connectivity, shared workspaces, skills training, mentorship, technical support, and even venture capital (Kabelele, Banele & Gomera, 2023). This comprehensive ecosystem empowers individuals to acquire digital skills at various levels and launch their own ventures. The digital skills offered in some of the centres include but not limited to the professional certifications and short courses listed in Table 2.

Table 2: Professional Certifications and Short Courses

Programmes	Subjects
Cisco Certified Network Associate (CCNA)	Network Fundamentals, Routing and Switching, WAN Technologies, Network Security
Microsoft Certified: Azure Fundamentals	Cloud Concepts, Core Azure Services, Azure Pricing and Support, Azure Security and Compliance
CompTIA Security+	Network Security, Threats and Vulnerabilities, Access Control and Identity Management, Cryptography
Digital Marketing	Search Engine Optimization (SEO), Social Media Marketing, Content Marketing, Email Marketing
Ethical Hacking	Penetration Testing, Network Security, Web Application Security, Cybersecurity Laws and Ethics
Python for Data Science	Data Analysis with Python, Python Libraries for Data Science (Pandas, NumPy), Data Visualization with Python, Machine Learning with Python
Blockchain Technology	Blockchain Basics, Cryptocurrencies and Smart Contracts, Blockchain Security, Blockchain in Business

Employer based/On-the-job training

The growing demand for digitally skilled workers in Nigeria has exposed a significant skills gap within the existing workforce (Ayodele, Oladokun & Kajimo-Shakantu, 2020). To bridge this gap and ensure employees can effectively perform their job roles, many Nigerian employers have adopted upskilling and reskilling initiatives (Ajayi & Udeh, 2024). These initiatives typically involve:

- **In-house training programmes**: Companies design and deliver training programmes tailored to their specific needs and the digital skills required for various positions.
- **On-the-job training:** Experienced staff mentor and coach colleagues, fostering a knowledge-sharing environment within the organization.

These initiatives focus on employee development aims to achieve several objectives:

Increased productivity: By equipping employees with the necessary digital skills, employers aim to enhance their efficiency and output.

Enhanced innovation: A digitally skilled workforce can contribute to a more innovative company culture, leading to new ideas and improved processes.

Competitive advantage: In today's dynamic market, investing in employee digital skills empowers organizations to stay ahead of the curve.

While employer-led training offers numerous benefits, some challenges remain. These include:

Training costs: Developing and delivering in-house training programmes can be expensive for companies.

Availability of qualified trainers: Finding qualified trainers with expertise in specific digital areas can be difficult in the Nigerian market.

Apprenticeship/Informal setting

The traditional apprenticeship model has served as a cornerstone for knowledge transfer and skill development in Nigeria for generations, predating formal education systems (Azubuike, Olubejide & Jeje, 2024). This system has been instrumental in passing down valuable knowledge, including "trading secrets" and business acumen, from experienced artisans to aspiring entrepreneurs (Ginn, 2021). In the digital age, this method has adapted to equip Nigerians with relevant skills, making apprenticeships a significant contributor to the country's digital skills development landscape.

Many Nigerian youths pursue digital apprenticeships under the guidance of experienced professionals within small and medium-sized enterprises (SMEs) offering Information and Communication Technology (ICT) services (Ugwu & Mbah, 2022). The duration of these apprenticeships varies, often concluding when the master trainer deems the apprentice competent to solve problems independently. This informal yet effective approach is prevalent in Nigeria's computer and mobile phone markets, evident in cities, towns, and even villages.

Table 3: Advantages and Limitations of Digital Apprenticeships

Advantages	Limitations
Accessibility	**Informal Structure**
Provides an alternative pathway to digital skills for those without access to formal education.	The lack of standardized curriculum or formal certification can make it difficult to measure skills gained.
Practical Learning	**Exploitation Risk**
Apprentices gain hands-on experience working on real-world projects within an SME setting.	Unethical practices by some "masters" can lead to exploitation of apprentices.

The digital apprenticeship model remains a significant contributor to Nigeria's digital skills development strategy. While challenges exist, promoting and improving these programmes can enhance their effectiveness in equipping young Nigerians with the skills they need to thrive in the digital economy.

Formal Education

The development of digital literacy and skills within the formal education system is a well-recognized pillar of Nigeria's digital transformation strategy (Federal Ministry of Education,

2019). Formal education offers a structured and widespread platform to equip young Nigerians with the digital skills needed to thrive in the digital economy.

The Nigerian curriculum, from basic to tertiary education, incorporates Information and Communication Technology (ICT) at various levels (Federal Ministry of Education, 2013). This includes dedicated ICT subjects, alongside the integration of digital technologies into the teaching and learning process for other subjects. This approach aims to not only introduce students to computer fundamentals and various applications but also equip them with the ability to leverage technology for effective learning and knowledge acquisition.

The formal education system offers opportunities for practical digital skills development beyond theoretical knowledge. One such initiative is the Students Industrial Work Experience Scheme (SIWES), funded by the Industrial Training Fund (ITF) (Industrial Training Fund Act, 2004). SIWES places students in relevant industry settings, including computer or IT-related fields, for practical training periods ranging from four to six months. This exposure allows students to gain hands-on experience, apply theoretical knowledge in real-world scenarios, and develop valuable workplace skills like teamwork and communication (Federal Ministry of Education & Industrial Training Fund, 2017).

Despite its strengths, the formal education system faces challenges in optimizing digital skills development. Socioeconomic factors can limit schools' access to technology and qualified ICT instructors, potentially hindering practical learning opportunities (Tiba, 2018). Addressing these challenges requires ongoing investment in infrastructure, teacher training, and curriculum development to ensure a balance between theoretical knowledge and practical application.

Digital Literacy and Skills in Basic and Post-Basic Education Levels

This section explores the efforts undertaken in Nigeria to equip students with digital literacy and skills across various educational levels, focusing on basic and secondary education. It also highlights the key challenges hindering the successful implementation of these programmes.

Integrating Digital Literacy in the Curriculum

The Nigerian Educational Research and Development Council (NERDC) has taken a crucial step towards fostering digital literacy by incorporating computer and information and communication technology (ICT) topics into the national curriculum for basic and secondary schools. Table 3 highlights the computers- and ICT-based subjects in the basic and post-basic education curricula. This integration lays the foundation for digital skills development, with parents and siblings often playing a significant role in nurturing these skills at a young age.

Table 3: List of computers- and ICT-based subjects in the basic and post-basic education curricula

Level	Subject/Craft Title	Remarks
Basic School (1-9)	Basic Science and Technology	Compulsory subject
Senior Secondary School (1-3)	Computer Studies	Elective science subject

Senior Secondary School (1-3)	Data Processing	Trade/Entrepreneurship subject
Technical College (1-3)	Information and Communication Technologies	Elective subject
Technical College (1-3)	Computer Craft Studies	Trade subject
Vocational Enterprise Institution (1-3)	Computer Studies	Trade/Programme

Despite the integration initiatives, the implementation of digital literacy programmes in public basic schools faces significant challenges. The most pressing issues include:

Despite these initiatives, the implementation of digital literacy programmes in public basic schools faces significant challenges. The most pressing issues include:

Lack of Resources: Public schools, which cater to the majority (over 80%) of students in basic and secondary education, often lack well-equipped computer laboratories. This hinders students' ability to learn and practice essential computer skills. The problem is particularly acute in small towns and rural areas.

Teacher Shortage: The limited number of qualified ICT teachers in public schools further impedes the effective delivery of digital literacy programmes.

These limitations create an uneven playing field, with private schools that possess the resources to establish computer labs and hire ICT teachers offering a clear advantage to their students. However, the cost of attending private schools often proves prohibitive for many Nigerian families.

The integration of digital literacy programmes into the Nigerian curriculum represents a positive step towards equipping students with the skills they need to thrive in the 21st century. However, significant challenges related to resource availability and teacher training in public schools need to be addressed to ensure equitable access to digital literacy education for all Nigerian students.

Digital Literacy Curriculum in Nigerian Tertiary Education

Nigerian tertiary institutions, encompassing universities, polytechnics, colleges of education, and specialized institutions, are mandated to equip all enrolled students with at least foundational digital skills. This section explores the structure of digital literacy programmes across various programme types, highlighting the range of courses offered and the distribution of skill levels.

All students, regardless of their chosen field of study, must take at least one introductory ICT course during their first year or before graduation. Common course titles include "Introduction to Computer Studies" or "Computing." However, delivering these mandatory courses effectively presents a challenge due to large class sizes and limitations in available computer laboratories. This lack of hands-on practice opportunities can hinder students' ability to develop practical digital skills. Students with access to personal laptops might be able to bridge this gap by independently exploring the practical aspects of these courses, albeit at their own expense.

In the absence of well-equipped computer labs, smartphones serve as a vital alternative for students to access the internet and explore the possibilities of digital technologies. This self-directed learning through smartphones can supplement the theoretical knowledge gained in mandatory ICT courses.

Nigerian tertiary education programmes are categorized into three main areas: Computer and Related Programs, Science, Technology, Engineering, and Mathematics (STEM) Programs, and Non-STEM Programs (encompassing arts, humanities, and social sciences). The depth and breadth of digital skills training varies significantly across these categories.

Computer and Related Programmes: These programmes provide the most comprehensive digital skills training, encompassing basic, intermediate, and advanced skillsets. Courses delve into areas like programming languages (C/C++, Java, Python), database management systems, operating systems, computer architecture, networking, and cybersecurity.

STEM Programmes: While the core focus lies in scientific and technical disciplines, STEM programmes integrate digital skills development alongside these core subjects. Students encounter courses in computer programming, networking basics, and data analysis, equipping them with foundational and intermediate digital skills.

Non-STEM Programmes: These programmes typically offer only a single mandatory introductory computer course during the first year, aiming to provide students with basic digital literacy.

Major Trends in Courses Distribution

An analysis of several key trends in courses' distribution across programme levels:

National Diploma (ND): These programmes focus on foundational skills, with courses like Introduction to Computer Science, basic programming languages, database management systems, and networking fundamentals.

Higher National Diploma (HND): Building upon the knowledge acquired during the ND programme, HND programmes introduce more advanced subjects like advanced programming, systems analysis and design, specialized web development areas (e.g., mobile app development), and emerging fields like artificial intelligence and machine learning. Some HND programmes in computer science offer further specialization options, diversifying the range of subjects available.

Undergraduate Programmes: These programmes delve deeper into advanced topics, encompassing computer science theory, compiler design, distributed systems (computer science), information systems analysis and design (information systems), data science specializations (e.g., data mining, big data analytics), and dedicated programmes in cybersecurity, data science, and artificial intelligence.

Limitations of the Analysis and Addressing the Gap in Basic Education

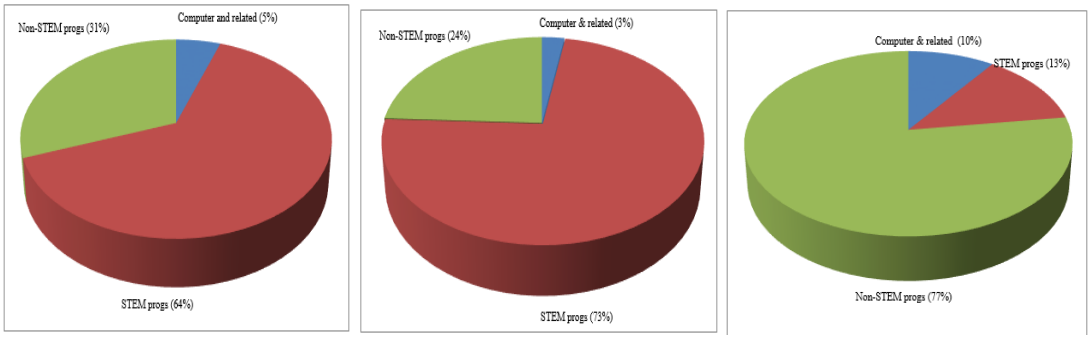
While the table provides valuable insights, it is essential to acknowledge its limitations:

Limited Scope: The table only reveals subject titles, not the depth or duration of each course. A more comprehensive understanding would require information on course content and instructional hours.

Representativeness: The analysis might not be fully representative of all Nigerian tertiary institutions. Further research is needed to ensure a broader picture.

The Challenge of Teacher Training in Colleges of Education

As shown in Figure 2, Colleges of Education have the lowest percentage of programmes offering courses that equip students with intermediate and advanced digital skills (23% compared to 69% and 76% for STEM and computer programmes, respectively). This deficiency stems from the fact that the majority of programmes offered in these colleges focus on arts, humanities, and social sciences. This lack of emphasis on digital skills training in Colleges of Education creates a critical gap in the preparation of ICT teachers for Nigeria's public schools, particularly at the basic education level. The limited number of programmes producing qualified ICT teachers creates a significant barrier to effective digital literacy education in these schools.



(a) Bachelor degree Programmes (JAMB, 2024) (b) ND & HND Programmes (NBTE, 2024a) (c)NCE Programmes (JAMB, 2024)

Figure 2: Percentages and classification of programmes offered in Nigerian tertiary institutions

Furthermore, one of the general problems with tertiary education is the ICT skills mismatch between the knowledge and skills possessed by graduates and the skills required by employers, coupled with over-enrolment in public tertiary institutions. ICT is a very dynamic field or profession. Every day, new digital technologies evolve, and our various institutions should reflect this evolution in the training they offer to students. The industry finds it challenging to find the right talent when hiring new staff. The skill gap or mismatch challenge provides an opportunity for tertiary institutions' academic staff to search for new ways to close the gap and train highly skilled people for the Nigerian digital sector. Additionally, many of these institutions attempt to evade accreditation of their programmes or neglect to rectify any observed deficiencies in their programmes following accreditation visits by regulatory agencies. This type of attitude should not be condoned to enhance the quality of digital skill training in the country.

To address this challenge, the Nigerian Commission for Colleges of Education (NCCE) should consider implementing the following proactive measures:

Curriculum Reform: Introduce and promote computer and STEM-based programmes within Colleges of Education. This will equip future educators with the necessary digital skills to effectively integrate technology into their teaching practices.

Faculty Development: Provide existing faculty members in Colleges of Education with opportunities for professional development in digital skills and technology integration in education. This will improve their capacity to deliver effective digital literacy training to future generations of students.

Collaboration: Foster collaboration between Colleges of Education and universities offering strong computer science and IT programmes. This collaboration could involve joint curriculum development, faculty exchange programmes, or shared resources for teacher training.

By implementing these recommendations, Nigeria can create a more robust pipeline for qualified ICT teachers, ultimately strengthening the delivery of digital literacy education in its public schools.

Barriers of Digital Literacy and Skills Development in Nigeria

Nigeria faces significant challenges in its pursuit of a digitally literate and skilled workforce. This section explores these barriers, highlighting their impact on various aspects of digital learning.

The Digital Divide

A critical barrier is the unequal access to affordable technology. This disparity creates a "digital divide" between those with financial resources and marginalized groups, often including women and girls due to socio-cultural norms (Mariscalet al., 2019). This gap hinders economic empowerment and overall progress. Bridging the digital divide is essential for promoting equality and youth development.

Unreliable Power Supply

Unstable electricity poses a serious challenge for educational institutions. Nigeria's limited power generation and distribution infrastructure makes it difficult for schools to provide consistent access to technology, hindering the development of advanced digital skills which require uninterrupted practice (Jacob, Somadina & Olatunde-Aiyedun, 2021). While solar power solutions exist, their high cost is a barrier for many institutions.

Limited Internet Connectivity

Reliable internet access is another hurdle. Quality internet service is primarily concentrated in urban areas, leaving rural communities with weak signals and slow speeds (Adediranet al., 2016). This makes it difficult to access educational content, download software, and participate in online learning activities. The high cost of data further restricts access for many institutions. While initiatives like the free broadband programme for select universities are commendable, continued funding and monitoring are crucial to ensure their effectiveness (Umezuruikeet al., 2015).

Shortage of Skilled Instructors

A global issue impacting Nigeria is the lack of instructors qualified to teach advanced digital skills. The majority of ICT teachers are proficient in basic skills, with limited availability of

those with advanced expertise. These experts are often drawn to higher-paying jobs in the private sector, creating a significant gap in educational resources (Idris & Mustapha, 2019). Closing this gap is essential for equipping Nigerian youth with the skills needed for the digital economy.

High Cost of Digital Devices

Developing digital skills requires consistent practice and access to devices with adequate specifications. However, many students cannot afford the laptops or computers needed for learning advanced skills. Furthermore, the lack of maintenance, upgrades, and security updates on existing devices can hinder progress and limit job opportunities. Addressing the affordability and accessibility of technology is crucial for empowering youths (Masimbe, 2019).

Outdated Curriculums

Educational institutions often struggle to keep pace with rapid technological advancements. Outdated curriculums fail to equip students with the skills demanded by contemporary employers. Regular curriculum updates for computer and related programmes are essential to ensure graduates possess relevant digital skillsets (Uduafemhe, Ewim, & Karfe, 2023). Additionally, a lack of training for academic staff on curriculum development further exacerbates this issue.

Corruption and Unethical Practices

Corruption within the education sector poses a significant threat to digital skills development. Misappropriation of funds intended for ICT programmes, procurement fraud, and bribery can hinder effective implementation of digital learning initiatives [reference about corruption in Nigerian education] (Akinniyi, Erinsakin & Emma-Ayire, 2021). Furthermore, the deterioration of donated ICT facilities due to lack of maintenance, expired software, and unavailable resources creates further challenges. Curbing corruption and ensuring ethical practices are critical for maximizing the impact of investments in digital education.

These interconnected barriers highlight the complex challenges hindering the development of a digitally literate and skilled workforce in Nigeria. Addressing these issues requires a multifaceted approach that prioritizes affordable technology, reliable internet connectivity, qualified instructors, updated curriculums, and a commitment to ethical practices within the education sector.

Conclusions and Recommendations

The rapid rise of technology is fundamentally reshaping how we interact, work, and navigate the world. In this era, often referred to as the Fourth Industrial Revolution, mastery of digital skills has become paramount. While material and financial resources remain important, a 2015 report by the OECD emphasizes that digital literacy is now a key driver of inclusive labor markets, innovation, and economic growth (Choi, 2019).

Nigeria, to effectively navigate this digital transition, must prioritize the development of a robust digital skills ecosystem. While digital skills may not be a panacea, integrating them into national educational policy is a crucial step. However, alongside promoting digital literacy, it is equally important to address potential misuse. Measures to deter cybercrime, plagiarism through AI-generated content, piracy, and online harassment are necessary to ensure responsible use of these skills.

Recommendations for Digital Skills Development Programmes

i. **Modernizing Infrastructure:** Equipping educational institutions and public spaces with modern digital infrastructure is a critical first step. Public-private partnerships can be leveraged through a corporate social responsibility (CSR) fund. Contractors and service providers could contribute a portion of their fees towards establishing ICT training facilities, accelerating the development of digital literacy and skills across Nigeria.
ii. **Multi-Stakeholder Collaboration:** The government, in collaboration with key players in the digital sector, can create a more effective digital skills development and training landscape. This partnership can provide exposure to workplace opportunities, internships, and subsidized training programmes, ultimately preparing youth for the workforce and fostering higher retention rates after employment (Giloth, 2019).
iii. **Curriculum Development:** Aligning educational curriculum with the evolving needs of the digital age is essential. This includes integrating relevant digital skills alongside behavioral and interpersonal skills that meet employer and global market demands (Van Laar et al., 2017).
iv. **Monitoring and Evaluation:** Implementing a robust monitoring and evaluation system allows for continuous tracking of progress, data collection on stakeholder involvement, identification of performance changes, and the detection of unintended consequences associated with ICT policies, ultimately leading to improved youth employment outcomes (Kombian, 2021).
v. **Early Exposure:** Incorporating subjects like coding and programming into the basic education curriculum fosters early digital literacy and skill development. This "catch-them-young" approach equips students with the confidence to utilize digital tools, create content, and cultivate problem-solving skills.
vi. **Teacher Training:** Equipping educators with the necessary digital literacy and skills is crucial. Partnerships with technology companies can provide training solutions that empower teachers at all levels to leverage digital tools for enhanced teaching and learning across educational institutions.
vii. **Reaching Out-of-School Youth:** Many young people classified as "not in education, employment, or training" (NEET) rely on the informal sector for their livelihood (Cieslik, Barford & Vira, 2022). Well-designed second-chance programmes can equip these youth with relevant digital skills, opening doors to opportunities within the digital economy.

viii. **Inter-Agency Collaboration:** Synergy across agencies and institutions with mandates related to digital literacy, skills development, job creation, and poverty alleviation is essential for maximizing impact.

ix. **Youth Engagement:** To empower young people as agents of change and leaders within the digital economy, it is crucial to actively involve them in shaping future policies. By integrating their aspirations and perspectives into the decision-making process, policies can be more impactful and responsive to their needs.

References

Adediran, Y. A., Opadiji, J. F., Faruk, N., & Bello, O. W. (2016). On issues and challenges of rural telecommunications access in Nigeria. *African Journal of Education, Science and Technology*, *3*(2), 16-26

Agbai, E. P., & Okechukwu, N. U. (2024). Tackling Talent Acquisition Challenges in Nigerian IT Sector: Problems and Prospects. *Universal Library of Multidisciplinary*, *1*(1).

Agu, M. N. (2013). Need to empower Nigerian children and youths through information technology. *International Journal of Soft Computing and Engineering*, *2*(6), 61-64.

Ajayi, F. A., & Udeh, C. A. (2024). Review of workforce upskilling initiatives for emerging technologies in IT. *International Journal of Management & Entrepreneurship Research*, *6*(4), 1119-1137.

Akinniyi, A. J., Erinsakin, O. A., & Emma-Ayire, S. O. (2021). Corruption in the Nigerian education sector: Causes and remedies. *KIU Interdisciplinary Journal of Humanities and Social Sciences*, *2*(2), 1-13

Arthur-Mensah, N. (2020). Bridging the industry–education skills gap for human resource development. *Industrial and Commercial Training*, *52*(2), 93-103.

Auld, G., & Gulbrandsen, L. H. (2010). Transparency in nonstate certification: consequences for accountability and legitimacy. *Global Environmental Politics*, *10*(3), 97-119.

Ayodele, T. O., Oladokun, T. T., & Kajimo-Shakantu, K. (2020). Employability skills of real estate graduates in Nigeria: a skill gap analysis. *Journal of Facilities Management*, *18*(3), 297-323.

Azubuike, C. M., Olubejide, I. S., & Jeje, E. (2024). Entrepreneurship Leadership Coaching: Indigenous Nigerian Approach. In *Critical Perspectives on the Intersections of Coaching and Leadership* (pp. 188-207). IGI Global.

Boughzala, I., Garmaki, M., & Tantan, O. C. (2020, January). Understanding how Digital Intelligence Contributes to Digital Creativity and Digital Transformation: A Systematic Literature Review. In *HICSS* (pp. 1-10).

Choi, J. (2019). DIGITAL TECHNOLOGIES. *The Future of Work in Africa*, 28.

Cieslik, K., Barford, A., & Vira, B. (2022). Young people not in employment, education or training (NEET) in Sub-Saharan Africa: Sustainable development target 8.6 missed and reset. *Journal of Youth Studies*, *25*(8), 1126-1147

Federal Ministry of Education & Industrial Training Fund. (2017). *Guidelines for the Students Industrial Work Experience Scheme (SIWES)*. [National Open University of Nigeria]. Retrieved from https://nou.edu.ng/students-industrial-work-experience-scheme-siwes/

Federal Ministry of Education. (2013). *National curriculum for basic education (Nigeria)*. Retrieved from https://education.gov.ng/

Federal Ministry of Education. (2019). *Education for Change: A ministerial strategic plan (2016-2019)*. UNESCO International Institute for Educational Planning. Retrieved from https://planipolis.iiep.unesco.org/en/2019/education-change-ministerial-strategic-plan-2018-2022-6719

Federal Ministry of Education. (2019). *National policy of information and communication technologies (ICT) in education*. Retrieved from https://education.gov.ng/wp-content/uploads/2019/07/NATIONAL-POLICY-ON-ICT-IN-EDUCATION-2019.pdf

Federal Republic of Nigeria (2001). Nigeria national policy for information technology. https://researchictafrica.net/

Federal Republic of Nigeria. (2013). *National policy on education*. NERDC Press, Abuja. Retrieved from https://educatetolead.wordpress.com/wp-content/uploads/2016/02/national-education-policy-2013.pdf

Giloth, R. (2019). Workforce policy for the future: Connecting skills and careers. *State and Local Government Review*, *51*(4), 267-274.

Ginn, W. T. (2021). *Philosophers and artisans: the relationship between men of science and instrument makers in London 1820-1860*. University of Kent (United Kingdom).

Giuseffi, F. G. (Ed.). (2017). *Emerging self-directed learning strategies in the digital age*. IGI Global.

Idris, A. M., & Mustapha, A. (2019, October). Issues Related to the Use of ICT's in TVET Teacher Education in the 21st Century in Nigeria. 2nd International Conference on Research and Innovation in Education (AICRIE), with the Theme: Rethinking Teacher Education and Management in the 21st Century and Beyond. Held at the College of Education and External Studies (CEES), University of Nairobi, Kenya.

Industrial Training Fund Act. (2004). https://www.placng.org/lawsofnigeria/view2.php?sn=205 (https://placng.org/lawsofnigeria/)

Jackman, J. A., Gentile, D. A., Cho, N. J., & Park, Y. (2021). Addressing the digital skills gap for future education. Nature Human Behaviour, 5(5), 542-545.

Jacob, O. N., Somadina, O. I., & 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.

Joint Admissions Matriculation Board. (2024). e-Brochures. https://www.jamb.gov.ng/ibass

Kabelele, D., Banele, S., & Gomera, W. (2023). Innovation hub a venture for students' entrepreneurial talents: a case of college of business education. *International Journal of Research in Business and Social Science (2147-4478)*, *12*(5), 362-371.
Kombian, S. F. (2021). *Effects of technology on the performance of monitoring and evaluation system in projects undertaken by non-governmental organizations' projects in Ghana* (Doctoral dissertation).
Langthaler, M., & Bazafkan, H. (2020). Digitalization, education and skills development in the Global South: An assessment of the debate with a focus on Sub-Saharan Africa (No. 28). ÖFSE Briefing Paper.
Lombardi, M. (2023). Digital Economy and Digital Divide. In *Global Handbook of Inequality* (pp. 1-27). Cham: Springer International Publishing.
Mariscal, J., Mayne, G., Aneja, U., & Sorgner, A. (2019). Bridging the gender digital gap. *Economics*, *13*(1), 20190009.
Masimbe, C. (2019). *Mobile internet access and affordability among youth in South Africa: rethinking universal service and access in the age of' digital mobility'* (Doctoral dissertation)
Meta AI. (2024). Image representation of different modes of digital literacy [AI generated image]. Meta AI.
National Board for Technical Education. (2024a). Directory of Accredited Programmes offered in Polytechnics, Technical and Vocational Institutions in Nigeria (Unpublished).
OECD. (2015). Skills for a digital world: From policy to practice. https://www.oecd.org/els/emp/Skills-for-a-Digital-World.pdf
Ogunode, N. J., & Ndayebom, A. J. (2023). Digitalization of Higher Education in Nigeria: Benefits, Problems and Solutions. Electronic Research Journal of Social Sciences and Humanities, 5, 31-47.
Sharma, R., Fantin, A. R., Prabhu, N., Guan, C., & Dattakumar, A. (2016). Digital literacy and knowledge societies: A grounded theory investigation of sustainable development. *Telecommunications Policy*, *40*(7), 628-643.
Tiba, C. A. (2018). *The ability of newly qualified teachers to integrate technology into their pedagogical practice* (Doctoral dissertation, Cape Peninsula University of Technology)
Uduafemhe, M. E., Ewim, D. R., & Karfe, R. Y. (2023). Adapting to the new normal: Equipping career and technical education graduates with essential digital skills for remote employment. *ATBU Journal of Science, Technology and Education*, *11*(4), 51-62
Ugwu, F. I., & Mbah, P. C. (2022). An assessment of Igbo apprenticeship schemes on development of SMES in Enugu State. *Advance Journal of Business and Entrepreneurship Development*, *6*(4).
Umezuruike, C., Oludele, A., Kuyoro, S. O., & Izang, A. A. (2015). Broadband Internet penetration in Nigeria: a review. *International Journal of Research Studies in Computer Science and Engineering*, *2*(1), 1-7
Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in human behavior*, *72*, 577-588