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INTEGRATING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN TEACHING AND LEARNING PROCESSES IN NIGERIAN EDUCATION SYSTEM FOR BETTER SCHOLARLY PERFORMANCE

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Abstract

The premium role of Information and Communication Technology (ICT) in the contemporary society can never be undervalued as its overwhelming effects is felt in virtual every facet of the society, including health, education, banking and military among others. Thus thrust of this paper is to examine the integration of Information and Communication Technology in teaching and learning processes in the Nigeria education system, especially the post primary schools by providing the teachers at this level of education with foundational understanding of Information and Communication Technology, especially its practical application in the advancement of teaching and learning at the secondary school level. By doing so, the paper x-rayed the concrete strategies that will enhance the effective and efficient ICT integration into the classroom and equally provide guidance on developing digital literacy among students. The paper however, discovered some of the challenges that may mitigate against the effective integration of Information and Communication Technology into Nigerian secondary education system to include, insufficient access to resources, resistance to

change, lack of training and professional development, curriculum integration, managing students engagement, and cyber security privacy concerns, among others and thus provides some prospects that will dispel the challenges which include increased integration of Artificial Intelligence (AI) and Machine Learning, enhanced professional development and collaborative tools, increased focus on cyber security and digital citizenship, among others.

Keywords: Integration, ICT, Teaching Activities, Learning Processes, Education System, Scholarly Performance, Nigeria.

Introduction

The global interest for advancement of education in both advanced and developing countries of the world has been challenged by Information and Communication Technology (ICT) as the unique nature of ICT has made it significant in the contribution to the development of students' knowledge, acquisition of skills in science subjects and other related subjects in the curriculum of studies (Elujekwute, Habib and Ogundipe, 2021). Thus, there is an urgent need for institutions of learning to be technologically-driven to avoid being eliminated from the global village of internet and intranet. The rapid evolution of Information and Communication Technology (ICT) has transformed numerous aspects of the society, particularly the educational sector. This transformation presents an array of opportunities and challenges for teachers at secondary education level to recognize the pivotal role of educators in shaping future generations, thereby necessitating the need to equip secondary school teachers with a comprehensive understanding of ICT tools.

According to Olorunsola (2007), educating teachers on the fundamentals of ICT aims to provide secondary school teachers with the understanding of Information and Communication Technology, from hardware and software, to data management and networking. Understanding these basics is crucial for teachers to effectively integrate technology into teaching and learning processes. Ajayi (2008) states that exploring the application of ICT in educational settings will highlight various tools and resources available to teachers such as educational software online learning platforms and multimedia tools and demonstrate how these can be employed to enhance learning methodologies through technology. Therefore, this effort aligns with broader educational goals of preparing students for a technologically driven world, ensuring they possess the necessary digital skills and knowledge to succeed.

The impact of Information and Communication Technology (ICT) has transformed the landscape of education, offering unprecedented opportunities to enhance teaching and learning processes as ICT has revolutionaries' educational practices through its tangible impacts on learning outcomes and its critical role in cultivating digital literacy among students. According to Elujekwute (2019), ICT has introduced a multitude of tools and methods that have transformed traditional classrooms into dynamic learning environments; technologies such as interactive whiteboard, digital textbooks, education software's and online learning platforms have enabled more interactive and enhancing teaching methods. These tools have facilitated a variety of learning modalities, including visual, auditory and kinaesthetic, which cater to diverse learning styles of students. For example, visual learners

can benefit from video tutorials and info graphics, while kinaesthetic learners can engage with interactive simulations and virtual lab exercises.

Furthermore, Information and Communication and Technology (ICT) allows for the implementation of traditional face to face instruction in combination with online resources and interactions. This model supports self-paced learning, enabling students to learn at their own speed, revisit difficult concepts and engage with additional resources outside of the classroom. Ofodu (2007) states that the use of ICT in education has been linked to improved students' achievements; it facilitates a more personalized learning experience, where teachers can quickly assess students' strengths and weaknesses using digital assessments and tailored instructions accordingly. Real-time feedback provided by education software helps students understand their learning progress which can enhance motivation and academic performance. Ofodu further maintains that the use of ICT can break down geographical barriers, providing access to high quality education materials and expertise regardless of location. This is particularly beneficial in remote or underserved areas where educational resources are limited. Thus, access to online courses and lectures from globally recognized instructions ensures that all students irrespective of their geographical location have the opportunity to receive a quality education.

In today's digital age, digital literacy is crucial as traditional literacy like reading, writing and mathematics. Hence, ICT in education plays a pivotal role in fostering these essential skills and integrating technology into everyday classroom activities, students learn to navigate various digital platforms and tools, which are vital skills for the workforce of the future. Digital literacy also involves critical thinking and decision-making skills, especially in discerning the reliability of online information and understanding digital etiquette and safety. By using ICT tools, students learn to evaluate online sources for academic purposes understand the implications of digital footprints, practice safe online behaviours and engage effectively in digital environments.

According to Bandele (2006), advanced and developing countries have also attested to the fact that ICT is a central focus for the educational policies, for use and integration in school curriculum. Yet, the Nigeria educational system has not adequately exposed students, teachers and institutions of learning to the realities of ICT tools and skills that would prepare them to face the challenges of the global world of internet and knowledge sharing within the shortest possible time. Because of the relevance of ICT to teachers in the implementation of school curriculum, it is argued that teachers should be adequately prepared, trained and equipped with relevant ICT tools / skills such as computer-mediated communication, internet, electronic publishing, video conferencing, and multi-media handling skills. (Elujekwute, Habib, Oigoche and Nnome, 2021). Though the Nigeria government has made some efforts towards the provision of basic tools for teaching / learning and application of ICT to schools, these efforts are limited only to very few institutions. The focus of this paper is on integrating ICT in teaching and learning processes in education system for a better scholarly performance.

Concept of Information Communication and Technology (ICT)

The term Information and Communication Technology (ICT) is broadly defined as technology used to convey, manipulate and store data by electronic means. This can include e-mail messaging, video chat and online social media. It also includes all the different computing

devices (for example Laptop computers and Smart phones) that carry out a wide range of communication and information functions. All these electronic tools constitute the Information and Communication Technology (ICT) which are used to convey, manipulate and store information. As a result of globalization the rate of interdependency among nations of the world has increased tremendously and such interdependency which is facilitated by Information Communication and Technology (ICT) has transformed the entire universe into a global village. Every facet of human endeavour requires adequate information for sustainable growth and development and ICT involves the use of a wide range of technologies such as computers, mobile telephones, satellite and World Wide Web among others in collection, storage, retrieval and transfer of information for human use. In other words, ICT involves the use of combination of technologies in generating information for effective teaching and learning. The efficacy of ICT integration in the classroom is related to the way teaching events are thoroughly related to their corresponding learning events associated media forms with their corresponding computer and non-computer based activities. The purpose of ICT thus, is to assist teachers by providing them with different forms of resources which can be used to support different learning approaches (Vermeulen, 2007). Supplying technologically based resources to schools is not a universal remedy. Hence, educational technology based resources should be appropriately matched to both teaching and learning activities to ensure maximum efficiency, since the success of teaching with ICT is dependent on the quality of the match between the learning purpose and the selected teaching approach.

Integration in Teaching

The functions of teaching in the education process is considered paramount, especially when we consider teaching and learning process as the acquisition of knowledge and skills by individuals to enable them become useful members of the society. ICT utilization includes evaluation of learning outcome and classroom management as its facilities could be used to prepare lesson plans, write students reports, store data, collect and analyse students' achievement. The use of ICT in classroom situation sees the teacher as facilitator rather than dispenser of knowledge since teachers serve as guide in the teaching and learning process. Some of the tools of ICT commonly used in classroom for educational purpose include Laptop computer, Local Area Network and the internet, among others. ICT is simply about sharing and having access to data with ease, and is said to be making a very informed and remarkable impact on the quality and quantity of teaching and learning in educational institutions. Aribisala (2010) opines that with the aid of Information and Communication Technology (ICT), teachers can take students beyond traditional limits, ensure their adequate participation in teaching and learning processes and create vital environment to experiment and explore. This new development is a strong indication that the era of teachers without ICT skills are gone however, cursory look at the secondary schools in Nigeria has shown that many teachers in the system still rely much on the traditional chalk and talk method of teaching rather than embracing the use of ICT.

Types of ICT Resources

ICT involves the use of combination of technologies in generating information and these technologies could be referred to as ICT resources, some of which are explained as follows:

1. Computer: It is an electronic device designed to process information. It performs complex tasks that can take human beings a life time to accomplish. Some of the characteristics of computers include speed of computation and retrieval of information,

accuracy of computation and transfer of information, storage capability and automatic processing. The computer based information system has four phases of activity named input, processing, output and storage. In the input phase data are captured and converted to a form that can be processed by a computer. The processing phase deals with manipulation and conversion of data into an appropriate form of information. In the output phase, necessary information are provided for use while in the storage phase, processed data are stored in usable form.

2. Electronic mail (E-mail): This refers to the process of sending, storing and receiving massages electronically through the computer system; the use of e-mail which was developed in the 1960's. E-mail is a faster, cheaper and safer form of sending mails across the globe. It enables the user to send electronic message or document through the computer system to a specific e-mail address. E-mail is faster as messages can be exchanged in few seconds or minutes unlike using postal mail which may take days, weeks or months to be delivered. E-mail can be used to send audio, video and text messages.

3. Internet: It is a large network of interconnected computers that make communication and cooperation easy. It is a collection of interconnected computer networks, linked by copper wires, fibber-optic cables, wireless connections among others. It is characterized by the use of internet protocol, network connectivity and public telecommunication system to securely share information. Internet comprises multitude of interconnected network of computers scattered all over the world linked together by some links called protocols.

4. World Wide Web (www): It is a global, interactive, and graphical information system that is used over the Internet. It contains digitized data stored in files called WEB PAGES. It is simply called web. WWW is a collection of interconnecting documents and other resources linked by hyperlinks and Universal Resource Locator (URL). It can only be accessed on the Internet and can be used to provide information on every facet of life. In the school system, it is used for online admission and registration of students, payment of school fees and checking of examination results. Various individuals, organizations and governments use the internet technology with sub-descriptions as www.un.tlm.ng' www.ubad.edu.ng; www.teni.com, among others as their website addresses.

5. Electronic Notice Boards: These involve the use of communication software to allow personal computers to act as public address systems. Electronic notice boards are created to link people who have the same interest for the purpose of information dissemination from time to time.

6 Teleconferencing: refers to a process whereby people conduct real-time discussion on the Internet. Here each participant will type his or her contribution to any discussion topic on the Internet and also read other people's contributions to the discussion and each participant in the discussion group can enter and leave the discussion he or she likes. This is made possible with the Internet relay chat.

7. Telephone: This is a communication device through which a conversation could be held with another person at an entirely different location from that of the initiator of the conversation. Talks are held with people far and near with the aid of telephones; The Global

System for Mobile Communication (GSM) phones enable the users to send audio, video and text messages easily to one another within few seconds.

8. Close Circuit Television: It is a television distribution system which the sender and the receiver are physically linked by wire. It does not operate through the airwaves. It may be between a single camera and a receiver within the same room for image magnification and could also be a link between a studio and several locations. It has the advantages of privacy multi-channel capacity and freedom of being set up by any one or organization channel capacity. It is used by law enforcement agencies for crime prevention and control. Commercial banks and other corporate organizations also use close circuit television to monitor people's activities in their premises for the purpose of crime prevention and control. It is also used in some tertiary institutions for teaching and learning.

9. Cable Television: This is the dissemination of television programmes by wire into homes and institutions. A favourably situated high mast antenna captures signals of the television. In the alternative, a capable company can originate its own channel live or from tape of film. Cable television facilitates people's access to high quality channels as fiber optics makes it theoretically possible to transmit 1,000 channels per cable and such channels can be encoded and made available on rented decoders. The broadcast of cable television is restricted to subscribers only.

Developing Information and Communication Technology Skills for Teachers

Developing Information and Communication Technology (ICT) skills for secondary school teachers in Nigeria is crucial for enhancing educational delivery and preparing students for the modern workforce. Effective integration of ICT into teaching practices not only enriches the learning experience but also promotes digital literacy among teachers and students. Here is a structured approach to developing these essential ICT skills among secondary school teachers in Nigeria.

1. Delivery of Training

i. Professional trainers: Engage ICT professionals to conduct training. This ensures high-quality instruction and up-to-date information.
ii. Blended Learning: Utilize a blend of face-to-face workshops, online courses, and hands-on sessions. This approach caters to different learning preferences and allows flexibility for teachers.
iii. Peer Learning: Encourage peer training sessions where teachers with more advanced skills help train their colleagues, fostering a collaborative learning environment.

2. Training Programme Design

i. Curriculum Development: Create a comprehensive ICT training curriculum that covers basic to advanced ICT skills. Topics might include basic computer literacy, internet usage, educational software tools, interactive whiteboard training, and advanced courses on using ICT for classroom management and lesson delivery.
ii. Modular Approach: Develop the training in modules, allowing teachers to progress at their own pace and according to their initial skill levels.

3. Needs Assessment

i. Identify skill Gaps: Conduct surveys or assessments to determine the current ICT skill levels of teachers. This helps in tailoring training programmes to meet specific needs.

ii. Assess Infrastructure: Evaluate the existing school ICT infrastructure to ensure it supports the training and eventual integration of ICT in teaching.

4. Increased Integration of Al and Machine Learning: Artificial intelligence (AI) and machine learning are poised to revolutionize the educational landscape by providing personalized learning experiences for students. For teachers, this means access to tools that can adapt to the learning pace and style of individual students, offer real-time feedback, and generate insights into student performance that can guide instructional strategies.

5. Incorporating Technology in the Classroom

i. Practical Application: Design part of the training to include practical tasks where teachers must develop and present lesson plans that integrate ICT tools. This ensures that the training is practical and immediately applicable.

ii. Tool Access: Provide teachers with access to various ICT tools during training, including software and hardware, to practice skills as they learn.

6. Monitoring and Evaluation

i. *Feedback Mechanisms:* Establish feedback channels to assess the effectiveness of the training programs. Feedback from teachers can help refine the training processes over time.

ii. *Continuous Assessment:* Regularly evaluate the progress of teachers through quizzes, assignments and practical projects that require the use of ICT skills.

7. Support and Resources

i. *Ongoing Support:* Offer ongoing support and refresher courses to help teachers keep up with new technologies and teaching methodologies.

ii. *Resource Provision:* Ensure that schools are equipped with the necessary ICT resources to allow teachers to implement their new skills.

8. Policy and Advocacy

i. *Policy Framework:* Advocate for policies that recognize the importance of ICT training in teacher professional development. This can include allocations for training in school budgets and official recognition of ICT competencies in teacher evaluations.

ii. *Partnerships:* Form partnerships with tech companies and NGOs that can provide additional resources, funding, or training materials.

9. Community and Parental Involvement

i. *Community Engagement:* Involve the community and parents in understanding the importance of ICT in education, which can help in gaining support for further investments in technology at schools.

ii. *Showcasing Benefits:* Regularly showcase the benefits of ICT integration in teaching to the community and parents through open classes, exhibitions and school events.

Challenges of Information and Communication Technology (ICT) in Education

Integrating Information and Communication Technology (ICT) into educational environments presents numerous benefits, such as enhanced learning opportunities, access to a wealth of information and improved communication. However, the deployment and use of ICT also bring forth significant challenges, especially for teachers. Understanding these challenges is crucial for effectively addressing them and ensuring successful technology integration in schools. Here are some of the key challenges teachers face when using ICT in education:

1. **Insufficient Access to Resources:** In many educational settings, especially in less affluent areas, there is a significant lack of access to ICT resources. This includes not just computers and software, but also high-speed internet connectivity and modern audio-visual equipment. Such resource limitation hinders the implementation of ICT-based teaching methodologies.
2. **Resistance to Change:** Some teachers may resist integrating technology into their teaching either because of unfamiliarity with new technology or due to skepticism about its educational value. This resistance is often rooted in a lack of understanding and fear that technology may eventually replace traditional teaching roles.
3. **Lack of Training and Professional Development:** Many teachers lack the necessary training to effectively use ICT tools in their teaching. This gap can lead to underutilization of available technology or ineffective use, which does not improve educational outcomes. Regular and comprehensive professional development is required to keep teachers updated on the latest technologies and how to integrate them into their pedagogy.
4. **Curriculum Integration:** Effectively integrating ICT into the existing curriculum is often challenging for teachers. They must redesign lesson plans to incorporate digital tools in a way that enhances learning without overshadowing fundamental teaching objectives.
5. **Managing Student Engagement:** While ICT can increase engagement, it also poses challenges in managing classroom dynamics. Teachers must address issues like digital distraction and ensure equitable use of technology among students, which requires constant attention and innovative teaching strategies.
6. **Technological Issues:** Technical problems such as software malfunctions, hardware, and connectivity issues can disrupt learning. Teachers often bear the brunt of these disruptions, which can detract from instructional tome and lead to frustration among students and teachers alike.
7. **Cyber Security and Privacy Concerns:** With the increasing use of digital platforms for educational purposes, issues related to data privacy and security have become more prominent. Hence, teachers need to ensure that student data is protected and that both they and their students understand the basics of digital security practices.
8. **Equity and Accessibility:** Even within a single classroom, disparities in student access to technology can be significant. Teachers must navigate these disparities and strive to provide equitable learning opportunities, which can complicate lesson planning and delivery.
9. **Keeping Pace with Technological Changes:** Technology evolves at a rapid pace, and staying current with the latest advancements can be overwhelming for teachers. Thus,

continuous learning and adaptation are required, which can be time-consuming and often unfeasible alongside teaching responsibilities.

10. **Assessment and Evaluation:** Adapting traditional assessment methods to accommodate ICT can be complex. Teachers may struggle with how to effectively assess digital projects and assignments, and how to ensure that technology-based activities meet learning objectives.

The Prospects of Information and Communication Technology in Education

Considering the secondary school teacher's angle, the future of Information and Communication Technology (ICT) for secondary school teachers in education holds immense potential for transforming teaching practices and enhancing student learning experiences. As technology continues to evolve and become more integrated into our daily lives, the role of ICT in education will also expand, bringing about significant changes in how education is delivered and managed. Here are some key trends and developments that could shape the future of ICT for secondary school teachers:

1. **Increased Integration of Al and Machine Learning:** Artificial intelligence (Al) and machine learning are poised to revolutionize the educational landscape by providing personalized learning experiences for students. For teachers, this means access to tools that can adapt to the learning pace and style of individual students, offer real-time feedback, and generate insight into student performance that can guide instructional strategies.
2. **Data-Driven Decision Making:** The future of ICT education will feature more sophisticated data analysis tools that can help teachers track student progress, identify areas where students are struggling, and adjust teaching methods accordingly. This move towards data-driven decision-making will enable more targeted and effective interventions.
3. **Enhanced Professional Development and Collaborative Tools:** As ICT becomes more prevalent, there will be a greater need for professional development that is focused on these technologies as this will likely be facilitated through online platforms that offer courses and certifications in specific technologies relevant to education. Additionally, collaborative tools will enhance professional sharing and collaboration among teachers across the globe, fostering a more interconnected educational community.
4. **Growth of Digital Curriculum and E-textbooks:** The use of digital textbooks and resources will likely increase, providing students with more up-to-date content that is also interactive and adaptable. For teachers, this means moving away from static textbooks to more dynamic teaching aids that can be easily updated and personalized for different learning needs.
5. **Expanding Role of Learning Management Systems (LMS):** Learning management systems will become more sophisticated, integrating various aspects of school management, student monitoring, content delivery and parent communication. For teachers, this means less time spent on administrative tasks and more on actual teaching and student engagement.
6. **Blended Learning Environments:** The blending of online and in-person teaching, which has been accelerated by the COVID-19 pandemic, is expected to continue growing. This model offers flexibility and accessibility, allowing teachers to integrate the best aspects of both free-to-face and digital learning.

7. **Virtual Reality and Augmented Reality (VR/AR) in Classrooms:** VR and AR technologies offer new ways for students to engage with content that is immersive and interactive. Teachers can use VR to table students on virtual field trips or simulate complex scientific experiments that would be impossible in the traditional classroom setting. AR can overlay information on real-world objects, enhancing learning and interaction within the classroom environment.
8. **Increased Focus on Cyber security and Digital Citizenship:** As the use of ICT increases, so does the need for robust cyber security measures and digital citizenship education. Teachers will need to be equipped with the necessary skills to educate students on staying safe online and managing their digital footprints.

Enhancing Teacher Involvement and Professional Growth/Strategies for Stakeholders

Encouraging secondary school teachers to become involved in Information and Communication Technology (ICT) and to pursue professional growth in this area is essential for the evolution of educational practices and for meeting the demands of a digitally-driven world. Here are several strategies and encouragements that educational institutions and policymakers can adapt to support and motivate teachers in this endeavour.

1. **Provide Necessary resources:** Ensure that teachers have access to the necessary ICT tools and resources to effectively integrate technology into their teaching. This includes not only hardware and software but also ongoing technical support and maintenance.
2. **Support from Educational Leadership:** Encourage school leaders and administrators to be proactive in their support for ICT education. This could include prioritizing budget allocations for ICT resources and professional development as well as setting school-wide goals for ICT integration.
3. **Encourage Peer Collaboration and Mentoring:** Promote networks and communities of practice among teachers to facilitate the sharing of ICT knowledge and experiences. Establishing mentorship programs where tech-savvy teachers guide their less experienced colleagues can also be highly effective.
4. **Recognize and Reward ICT Proficiency:** Incorporate ICT skills into teacher evaluation systems and provide tangible rewards for those who excel in integrating technology into their teaching practices. Rewards could include certificates, bonuses, or career advancement opportunities.
5. **Create a Supportive Culture:** Foster an institutional culture that values and supports the use of ICT. This could be achieved by having leadership zeal that demonstrates a commitment to ICT, by sharing success stories of effective ICT integration and by encouraging a collaborative environment where teachers can share ideas and resources.
6. **Establish ICT Competency Frameworks:** Develop and implement clear competency frameworks that outline expected ICT skills for teachers at various stages of their careers. This can helps teachers understand what is expected and provide a structured pathway for their ICT development.
7. **Provide Accessible and Relevant Training:** Offer comprehensive training programs that are accessible both in terms of location and time, such as online courses, workshops, and seminars that fit teachers' schedules. These programs should cover a range of topics from basic ICT skills to advanced applications in the classroom, ensuring relevance to their teaching needs and subject areas.

8. **Incorporate ICT into Professional Development Goals:** Make ICT skills a part of the personal professional development goals for each teacher. Encourage teachers to set specific measurable goals related to ICT each year and support them in achieving these goals.
9. **Lifelong Learning:** Promote the concept of lifelong learning and the continuous updating of skills as essential components of the teaching profession. Highlight the importance of keeping pace with technological advancements to remain relevant in the profession.
10. **Engage in Research and Innovation:** Encourage teachers to engage in research on the impact of ICT in education. Support them to publish their findings, present at conferences, or implement innovative projects that explore new ways of using technology in education.

Conclusion

The advent of Information and Communication Technology has changed the outlook of every facet of our society including health, education, banking, agriculture, and the military among others. In education, the incorporation of Information and Communication Technology is believed to facilitate the teaching and learning processes on both sides of the teacher and students. The Nigerian educational system, especially the post primary school has for long neglected the magic wand that ICT may incorporate to boost the standard of education at this level. The paper thus critically surveys the means through which Information and Communication Technology can be integrated into teaching and learning processes at the secondary school level in Nigeria, considering the challenges and prospects towards achieving this informed technological feat in the Nigerian educational system.

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