Original Research Paper

Navigating Challenges and Maximizing Benefits in the Integration of Information and Communication Technology in African Primary Schools

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Abstract: The integration of Information and Communication Technology (ICT) in the educational systems of both public and private primary schools in Africa has become a crucial factor in enhancing teaching and learning. This paper explores the role of ICT tools in education, including computers, interactive whiteboards, learning management systems, educational apps, online collaboration tools, television, and online assessment tools. It discusses their applications and the advantages they offer, such as fostering creativity, improving academic performance, increasing motivation and responsibility, and promoting teamwork. However, it also acknowledges the challenges associated with ICT integration, including distractions, excessive usage, exposure to false information, data theft, reduced human contact, and cyberbullying. Moreover, the paper highlights key challenges in African education, such as the lack of computer literacy among instructors, low teledensity, unstable power supply, inadequate financing, and the absence of a comprehensive ICT curriculum. It concludes by emphasizing the need for a holistic approach to ICT integration, addressing infrastructure, teacher training, curriculum development, and organizational support to realize the full potential of ICT in education especially at the Primary school level.

Keywords: Enhancement, Information and Communication Technology, Primary Schools, Public and Private, Teaching and Learning.

1. Introduction

The most challenging and difficult task facing some teachers in some public and private schools in Africa is the inability to use 21st century instructional materials effectively. Teaching and learning in this era are computer-oriented and therefore need computer-literate resource teachers. One of the most commonly used teaching methods in this 21st century involves the use of computers and other communication technologies; this is what [1] referred to as the workability principle. The researcher in [2] views Information and Communication Technologies (ICT) as the technology used to exchange, process and communicate information and knowledge by electronics ranging from radio and television to telephones (fixed and mobile), computers and the internet. According to [3], ICT may consist of computers, computer networks, and other pieces of hardware. In addition, ICT consists of software that facilitates the abilities of the system to manage information in a way that is useful to managers, administrators and employees in the organization.

Information and Communication Technologies (ICT) Can be defined as a different set of Technological tools and resources used to communicate, create, disseminate, store and manage information [4]. ICT has a pivotal role to play in human life ranging from cyber security to speech translations [5][6][7]. However, its role in an educational system in which primary education is the basic can never be neglected. Information and Communications Technology (ICT) can be used to enhance Pupil learning when teachers queue into these digital concepts and understand how to integrate them into the curriculum. This communication can be through Zoom, GSM, or Google Meet [8][9][10]. Accordingly, the Nigerian national policy on education places emphasis on the provision and utilization of ICT as it stipulates that considering the prominent role of ICT in advancing knowledge and skills necessary for effective functioning in the modern world, there is an urgent need to integrate ICT in education [11][12]. Scholar in [13], states that "In Africa for instance, there are issues that have to do with national policies and plans. Many of the countries do not have national ICT policies.

This paper focuses on how Information and Communication Technology (ICT) can be used as a tool to facilitate teaching and learning in both public and private primary Schools in Africa. In order to achieve this, some basic concepts will be discussed. These include; Some essential ICT tools that can be used to facilitate teaching and learning, the applications of these tools in the teaching and learning process, the advantages and disadvantages of these tools used to impact this knowledge to the Pupils, some various strategies for ICT integration in the Nigerian education system, the challenges faced by the Teachers from achieving the full advantage offered by ICT applications and finally, the remedies to these challenges.

2. Literature Review

ICT tools for effective teaching and learning
- Computers
- Interactive Whiteboards and Projectors
- Learning Management Systems (LMS)
- Educational Apps and Software
- Online Collaboration Tools,
- Televisions and
- Online Assessment Tools.

For clarity purposes, the above-listed ICT tools are discussed, to enable the teachers and the learners to apply them to where it fits in the teaching and learning process.

2.1. Application of ICT Tools To Teaching and Learning

ICT tools to teaching and learning, are:
1) Computer

A Computer is an electronic device that accepts data as an input, processes it and displays the information as an output. Computers have become the backbone if not all, many ICT tools used in the classroom. When educational software is installed and internet access is activated, can serve as a powerful tool which enables the Teachers to prepare interactive lessons, take the Pupil's assessment records, store information, equip the teachers with the necessary application programs to create multimedia presentations, and manage the available instructional resources effectively and efficiently. For the Students/Learners, it's used to

conduct research, writing of assignments, and engage themselves in team or collaborative work. This tool reduces the workload on both the teachers and the students to a minimum cost thereby facilitating the teaching and learning process.

2) Interactive Whiteboards and Projectors

Interactive Whiteboards and Projectors are electronic devices placed on the wall that make content presented by the teacher more visible to the learners. These tools can be used to present/project or display diagrams, pictures and videos. Instead of coming to draw on the board, pictures can be projected thereby bringing the image closer to the learners that are far from the board for the sake of visibility. The visual appeal of interactive whiteboards and projectors captures Pupil's attention and fosters better understanding and retention of what is being taught.

3) Learning Management Systems

Learning Management Systems (LMS) have made the educational process more efficient and effective by providing a centralized platform for course management and content delivery. This ICT tool allows Teachers to organize lesson materials, prepare assignments and quizzes, and monitor pupils' learning progress easily. For students, LMS helps the learners to have access to learning materials, interactions between the learners (Pupils) and their teachers, and submitting assignments. This tool has been of help during the pandemic period of COVID. These systems have also facilitated the online learning process, enabling remote education and flexible learning to take place.

4) Educational Apps and Software

Educational apps and software have to do with a very wide coverage of subjects and learning levels. This ICT tool enables the pupils to engage in mathematical games, and spelling app games, practice foreign language skills and pronunciation with language learning apps, and learn virtual science experiments with simulation software. Educational apps are very good ICT tools that facilitate different learning preferences for the Pupils considering the urge children have for games.

5) Online Collaboration Tools

This idea of online Collaboration is an imperative skill that has added a very big value to this contemporary workforce, these tools play a vital role in promoting competency. Platforms like Google Workspace (formerly G Suite) created by Google can give one access to Gmail on his/her preferred domain with 30GB of Google Drive storage per user. This enables Students/Pupils to do collaborative work on documents, slideshows, and spreadsheets in real time. Here Students/pupils can provide feedback, can also modify each other's work, and collectively, make reasonable input to group projects. These tools foster teamwork and critical thinking while preparing Students/Pupils for collaborative work environments in their future careers thereby facilitating teaching and learning.

6) TV (Televisions)

Television can be kept in the ICT rooms or in the classrooms. It is an electronic device that can be used to show images, videos, or animations. This looks like a computer monitor; it has many channels on it when connected to satellite and can be used to display Programmes that are educative. Television can be of help to Pupils, especially in junior classes in primary school. Videos like Cartoon can be useful to the Pupils on how to pronounce words and in sentence making.

7) Online Assessment Tools

Online assessment tools have bridged the gaps in the stress Teachers undergo while assessing their Students/Pupils. Online assessment tools are ICT tools that enable teachers to organise online quizzes and tests for the learners, which are automatically graded. This makes the students/pupils get instant feedback. This online assessment also enables the teachers to identify the learning gap of each student/pupil and can effect corrections where necessary.

2.2. Advantages of Using ICT Tools

The advantages of using ICT tools, are:

- ICT provides the pupils with new skills development to become more creative. It stimulates the development of their imagination as well as their initiative. This is a valuable tool for producing work, both in terms of content and form.

- The use of ICT tools in the teaching and learning process improve pupils' academic performance in their classroom experience. The classroom will not be only a Teacher-centred classroom.
- Motivation and higher levels of attention are increased, thereby contributing to greater effectiveness in the learning process.
- Increases Pupils' responsibility and sense of autonomy. In this case, it provides the Pupils with the right of self-engagement to new skill acquisitions.
- The use of Tablets as a work tool at home, gives rise to the incorporation of new learning methodologies, such as online education, inverted classroom, etc…
- It increases the Pupils' interest. The use of educational Apps and Software can equip the Pupils with different instructional materials such as videos, graphics and games that are closely related to their various subjects which can be educative. Actually, educational multimedia content is a very useful tool to bring different subjects closer to the Pupils in an entertaining way.
- Teamwork is inculcated in the Pupils. Collaborative work is clearly enhanced with the different ICT tools. These tools provide the pupils with an easier way than ever to create team projects, cooperate and learn from each other.
- Close dialogue between pupils and teachers is encouraged through different channels, in a more spontaneous and less formal way even outside the physical classroom.

2.3. Disadvantages of Using ICT Tools

ICT tools are not perfect; just as they bring many benefits to teaching and learning in primary schools and in all education systems at large, they also have some disadvantages to be considered [14].

- Distractions and lack of attention. As it has to do with digitalisation, which gives the user unlimited access to multiple resources and sources of information, such as web pages, social networks or chats, and therefore, they take attention away from the subject matter. In this case if not properly guided, can serve as a distraction to the Pupils.
- Excessive impact. Excessive and inappropriate use can lead Pupils to an irresistible relationship with technology, which can lead to an inability to control consumption and as a result, have adverse effects on the pupil's health, social, family and academic life.
- Consumption of false information. Exposure to false information available on the internet and mostly, television programmes that are not meant for children can also be a death trap to the pupils.
- Theft of personal data. A lack of knowledge about the dangers of cybercrime can unintentionally expose pupils' data, especially if they are minors, for example, by sharing photos with strangers.
- It reduces human contact. With the incorporation of new technologies such as the use of online collaboration tools, the learning process becomes more distant and the physical relationship with teachers and classmates decreases. As a consequence, by reducing human contact, isolation can appear and become an obstacle to Pupil's personal development.
- It amplifies bullying. This is a complex subject to deal with and one of the biggest risks is bullying.

According to UNICEF, (Humanitarian aid organization) Cyberbullying is bullying with the use of digital technologies. It can take place on social media, messaging platforms, gaming platforms and mobile phones. It is repeated behaviour, aimed at scaring, angering or shaming those who are targeted. Examples include: spreading lies about or posting embarrassing photos or videos of someone on social media, sending hurtful, abusive or threatening messages, images or videos via messaging platforms impersonating someone and sending mean messages to others on their behalf or through fake accounts. Therefore, the lack of physical contact can lead to a loss of assertiveness and misuse of online tools and platforms, which can lead to cyberbullying by the pupils [7].

3. Methodology

The type of this research is summarizing scholarly literature, by using keywords ICT, Information and Communication Technology, Primary Schools, Teaching and Learning.

4. Finding and Discussion

4.1. Adopted ICT Integration Strategies

The researcher in [15], proposed the following strategies for ICT integration in the Nigerian educational system.

1) Policymakers in Nigeria would do well to start by figuring out the educational reasons that technologies are to serve before they are brought on board when planning for ICT integration in education. Clarifying general educational policy is necessary since it should provide the justification and direction for integrating technology. Remember that technology is just a tool and cannot, therefore, make up for flaws in educational policy [16].

2) Once national education objectives have been defined, policymakers must choose which ICT integration strategy to use. Three such approaches, which are used in Asia Pacific nations, were identified by [17] as being useful for the Nigerian educational system.

   a. teaching ICT as a subject in its own right, usually beginning at the upper secondary level, to develop a labour force with ICT skills;

   b. integrating ICTs across the curriculum to improve teaching and learning; and

   c. using ICTs to foster learning anywhere and anytime as part of the development of a knowledge society in which all citizens are ICT savvy. Each of these has different infrastructural, personnel, and management requirements among others.

3) Partnerships between the public and private sectors to test or expedite ICT-based projects have become more popular among ministries of education in developing nations. These collaborations can take many different shapes, such as private sector subsidies with matching public contributions, corporate equipment donations to schools, and the provision of technical support help for grassroots planning, management, and enhancement of human resources. The financial yardstick for ICT-based projects is their ability to continue operating after donor funding is exhausted. Because the government failed to provide the necessary money, many ICT-based education programs supported by assistance organizations could not continue. Therefore, a two-pronged approach; government assistance and local community mobilization is essential.

4) Balancing instructional objectives with economic realities is one of the biggest obstacles to ICT adoption in education. ICTs in educational programs demand significant financial inputs; as a result, care must be taken when deciding what ICT use models will be adopted and how to maintain economies of scale. Therefore, the question is whether the value added from using ICTs outweighs the expense in comparison to alternatives. In other words, given the available financial, human, and other resources, is ICT-based learning the most efficient strategy for accomplishing the desired goals, and if so, what is the modality and scale of implementation that can be supported? [18] suggests the following possible sources of funds and resources for ICT use programs: (1) grants, (2) public subsidies, (3) private donations and fundraising events, and (4) community support.

5) A good strategy for ICT integration in education should involve teachers' professional development in five areas: (1) skills with particular application, (2) integration into existing curriculum, (3) curricular changes related to the use of IT (including changes in instructional design), (4) changes in teachers' roles, and (5) underpinning educational theories [18]. Teachers are essential to ICT-based learning. Even the most experienced teacher must continually update their abilities to keep up with emerging technology like ICTs and adhere to global best practices.

4.2. Challenges to Effective Integration of ICT in the Education system

Some of the challenges to effective integration of ICT in the Nigerian education system include:

- A significant portion of the instructors and support personnel in several schools in Africa lack computer literacy. The researcher in [19] correctly noted that a significant portion of instructors and lecturers in Nigeria's science fields lack computer literacy. From this vantage point, it is evident that such teaching personnel would have a very tough time implementing these ICT tools in their instruction and training.

- Low teledensity is a significant obstacle to ICT integration. For instance, there is still limited access to communication tools like computers, the Internet, and telephones. With 20 million subscribers, Nigeria has the second-largest telecommunications sector in Africa (after South

Africa), according to [20]. However, the country has a teledensity of less than 15%, compared to Canada's l07% despite having a far lower population.

- Nigeria's power grid is unstable. ICT infrastructure is powered. When there is a power supply in metropolitan areas, it is erratic, which prevents ICT facilities from being used to their full potential.
- Lack of financing has led to inadequate ICT infrastructure in schools. According to [21], education financing in Nigeria is egregiously inadequate, which has an impact on a number of sectors including the funding of ICT projects, the training and retraining of instructors, and the creation of software. The supply of ICT equipment in schools is significantly hampered by the existing level of financing for education in Nigeria and the declining budgetary allocation to the sector. For instance, Nigeria's government's financial contribution to education has consistently fallen well short of the 26% spending guideline for the sector set by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). In higher institutions, where computers are required for instruction and access to the Internet, the impact of inadequate finance is especially noticeable.
- On a more serious issue, ICT has not been adequately incorporated into Nigeria's basic and secondary curricula. The issue won't go away until the national education policy is updated to properly incorporate ICT into the curriculum.

4.3. Effective Use of ICT in Primary School Education
The researcher in [22] gave seven requirements for the effective use of ICT in education:
1. Suiting technology to education goals and standards.
2. Having a vision for the use of technology to support curriculum.
3. Providing for both in-service and pre-service training.
4. Ensure access to appropriate technology
5. Provide administrative support for technology use
6. Providing time for teachers to plan and learn how to integrate technology
7. Providing ongoing technique support for technology use in general, these requirements fall into three areas of impact:
   - Providing the infrastructure of hardware and software,
   - Providing curriculum and technical support for teachers,
   - School organization, design, policies and practices, schooling, and management support.

4.4. ICT Integration Challenges
This study's main result is that many instructors in African schools, both public and private, have a difficult time utilizing 21st-century teaching resources. The main issue is that teachers generally lack computer literacy. This makes it difficult for them to utilize the teaching and learning potential of ICT technologies.

The study emphasizes the critical role that information and communication technologies (ICT) play in education. It is crucial for instructors to be knowledgeable about digital ideas and the incorporation of ICT tools into the curriculum at a time when computer-oriented learning predominates.

Computers, interactive whiteboards and projectors, Learning Management Systems (LMS), educational apps and software, online collaboration tools, televisions, and online assessment tools are just a few of the essential ICT tools mentioned in the paper for efficient teaching and learning. Numerous chances to improve the educational process are provided by these instruments.

Benefits of ICT Tools There are several benefits to using ICT technologies in teaching. It encourages students' imagination and creativity, which improves their academic achievement. It raises students' interest in learning while also improving motivation, accountability, and autonomy. Additionally, it promotes cooperation and allows for direct communication between students and teachers.

ICT tools have several downsides, despite the fact that they have numerous advantages. Distractions and diminished focus, excessive technology use that causes social and health problems, exposure to misleading information, the possibility of identity theft, less human interaction, and the escalation of cyberbullying are a few of these.

Specific issues in the Nigerian educational system in relation to ICT integration are revealed by the study. There are several of these problems, including low teledensity, unpredictable power supplies, insufficient funding for ICT infrastructure, and a lack of a thorough ICT Curriculum.

5. Conclusion

This research emphasizes how important ICT is to contemporary education and how important it is for instructors to adjust to the evolving nature of classroom instruction. By using ICT technologies, teaching and learning may be transformed to become more interesting, efficient, and inclusive. To fully utilize the potential of ICT in education, it is evident that there are substantial hurdles, notably in the Nigerian educational system. Comprehensive teacher training, better infrastructure, and the creation of an ICT curriculum are all required to address these issues. Furthermore, steps must be taken to address the drawbacks of ICT resources, such as reducing distractions and shielding pupils from cyberbullying. Finally, a comprehensive strategy that includes instructors, infrastructure, curriculum, and administrative support is needed for the effective integration of ICT in education. ICT technologies, when used effectively, may improve the educational process, give students more agency, and get them ready for the 21st century's digital requirements.

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