
Availability and Utilization of Adequate ICT as Correlates of Effective Learning of Basic Science

Essien Edem UDO, *Ph.D*
Science Education Department,
University of Uyo, Uyo;

Patricia Nneka OBI

AND

Florence Ijeoma IWUJI, *Ph.D*
Department of Curriculum and Instruction
Alvan Ikoku Federal College of Education,
Owerri, Imo State

ABSTRACT

This text provides an introduction to the concept of information and communication technology (ICT) and its application in education, particularly in the teaching and learning of basic science. It discusses the broad definition of ICT and its various components, such as hardware and software, emphasizing their role in enhancing institutional administration and promoting students' learning. The text explores the concept of effective learning, highlighting the importance of metacognitive processes in successful learning. It also defines basic science as the methodical investigation of nature and its significance in supporting knowledge progress. The availability and utilization of adequate ICT in education are discussed, emphasizing how ICT can enhance teaching and learning experiences, provide access to knowledge and experiences beyond students' immediate surroundings, and contribute to the development of a technologically skilled workforce. The text concludes by emphasizing the need for teachers to embrace ICT and improve their understanding and attitude towards its use in the classroom. One of the recommendations was that the government, collaborating entities, and good-spirited people invest in education by supplying the schools with power supply generators and footing the electricity payments. This would help solve the problem of inadequate power supply to schools. For the efficient use of ICTs in teaching and learning, instructors need to be skilled enough to use ICT-based resources.

KEYWORDS: Availability, Utilization, ICT, Effective Learning and Basic Science

Introduction

The broad definition of ICT encompasses all forms of communication technology, including video conferencing and distant learning, as well as radio, television, cell phones, computer and network hardware, satellite systems, and more. The need for higher education institutions that equip teachers to create answers to the issues that arise in classrooms is expanding as the globe becomes more interconnected. This is especially true considering how easily available information is on a global scale because of technology like telecommunications, computers, and other electronics, also referred to as "information and communication technology" (ICT). It has been demonstrated that educational programs need to be restructured because of the potential of ICT and its application in enhancing institutional administration, promoting students' learning, and enhancing the literature. The increasing belief that teaching and learning can successfully take place through the deployment of electronic communication

facilities between teachers and students has given rise to hope that many more learners can be reached at a more comfortable pace than had previously been achievable.

The functions that information and communication technologies (ICTs) perform define them. Any instrument or program used to access, manage, integrate, assess, develop, or distribute knowledge qualifies as an ICT, according to Pernia in Abubakar (2016). They include communication devices, including computers, the internet, telephones, television, radio, and audiovisual equipment, that are used to produce, manage, and distribute information. ICTs can be divided into two categories: hardware and software. Students who are familiar with ICTs in the classroom can enhance their daily lives, acquire skills for pursuing professional or vocational goals, and serve as an effective teaching and learning medium as they enhance the teaching and learning process. ICT has substantially changed the field of library and information science and is one of the many wonderful gifts of modern science and technology. The use of information and communication technology (ICT) in library and information work has changed the traditional perception of libraries as "storehouses of books to "intellectual information centers," connoting the idea of an electronic library. It has opened up a new chapter in library communication and made knowledge accessible to everyone, regardless of regional boundaries. The phrase "basic science" can be used to describe both information obtained by observation and fact-testing and knowledge based on facts that can be demonstrated, such as through experiments, regarding the structure and behavior of the natural physical universe. Inquiring methodically about both live and inanimate elements in our environment is another aspect of it.

Concept of ICT

Information and communication technology, sometimes known as ICT, is described as "the integration of computing, networking, and information processing technologies and their applications." ICT is described as the use of computer applications and communication technologies for the gathering, processing, storing, and distribution of information (Lisbdnetwork, 2023). Information and communication technology is referred to as ICT. These procedures include gathering, processing, storing, and presenting data, to name a few. Teamwork and communication are increasingly necessary for these activities. ICT, often known as information and communication technology, has thus taken on the role of the word IT. The term "ICT" (information and communication technologies) was first used in the middle of the 1980s, and it was defined as "all kinds of electronic systems used for broadcasting telecommunications and mediated communications," with examples including personal computers, video games, cell phones, the internet, electronic payment systems, computer software, etc. ICT is made up of computer and communication technology. Computer technology is used to store and process digital information, and communication technology is used to convey and broadcast it. Information, communication, and technology, or ICT, is a combination of two other words. Information is defined as knowledge, whereas technology is the use of computers and communication.

Information and communications technology (ICT) is defined by Margaret Rouse (2023) as the application of computing and telecommunication technologies, systems, and tools to ease the creation, collection, processing, transmission, and storage of information. It encompasses wired and wireless communication technologies that enable telephones, the Internet, the Internet of Things (IoT), and the metaverse, in addition to computing technologies like servers, laptop computers, and software applications. ICT aims to facilitate human-to-human, human-to-machine, and machine-to-machine (M2M) communication by making it simpler and more effective. Information means knowledge, and technology means

the use of computers and communication. Information and communications technology (ICT) is defined by Margaret Rouse (2023) as the application of computing and telecommunication technologies, systems, and tools to ease the creation, collection, processing, transmission, and storage of information. It comprises computerized systems; including servers, laptops, and software programs this includes wired and wireless communication technologies that support telephones, the Internet, the Internet of Things (IoT), and the metaverse. ICT aims to facilitate human-to-human, human-to-machine, and machine-to-machine (M2M) communication by making it simpler and more effective. Additionally, ICT, or information and communications technology (or technologies), refers to the components and infrastructure that make contemporary computing possible. Although there is no single, universal definition of ICT, the term is generally accepted to mean all devices, networking components, applications, and systems that together allow people and organizations (i.e., businesses, nonprofit agencies, governments, and criminal enterprises) to interact in the digital world.

According to Mary K. Pratt (2023) Information and Communication Technologies (ICTs) is a broader term for Information Technology (IT), which refers to all communication technologies, including the internet, wireless networks, cell phones, computers, software, middleware, video-conferencing, social networking, and other media applications and services enabling users to access, retrieve, store, transmit, and manipulate information in a digital form. A unified system of cabling (including signal distribution and management) or link system is used to connect media technology, such as audio-visual and telephone networks, with computer networks. This is referred to as the convergence of ICTs. However, as the ideas, practices, and technologies associated with ICTs are continuously growing nearly on a daily basis, there isn't a single definition of ICTs that is widely acknowledged (FAO, 2023). The term "information and communications technology" (ICT) is an extension of the term "information technology" (IT) and emphasizes the importance of unified communications and the integration of computers and telecommunications (phone lines and wireless signals), as well as the essential enterprise software, middleware, storage, and audiovisual, that allow users to access, store, transmit, understand, and manipulate information (Murray James, 2011).

Information and communication technology (ICT) has been successful in creating a global village and is a useful instrument for teaching and learning. ICT can be a resource for effective teaching in basic science classrooms, which is in line with this research. Like other technologies, information and communication technology (ICT) can be utilized in a variety of ways, depending on the user and the situation. Therefore, the purpose of this essay was to simply clarify the concepts of ICT and instructional resource. The paper also explored the application of ICT in the teaching of fundamental science in Nigerian schools and the difficulties encountered in making the best use of ICT in Nigeria. The study then attempted to describe the status of ICT in Nigerian Schools. The use of ICT as an effective teaching resource in basic science is highlighted. The paper finally suggested that the use of Information Communication Technology (ICT) must be encouraged by teachers and various government agencies through the provision of teaching and learning materials like computers and the like. Non-Governmental Organizations (NGOs) and Parent Teachers Associations (PTA) and other stake holders in education should provide adequate funding for the purchase of ICT facilities. Information Communication Technology refers to any electronic means of capturing, processing, storing, and dissemination of Information. It is a combination of Information Technology (IT) and Communication Technology (CT). In contrast to communication technology (CT), which involves the interaction, exchange, and linking of information and databases amongst users through networking, Hamza (2007) defined information technology (IT) as the packaging and processing of information.

ICT was also described by Hamza (2006) as the fusion of computers with all types of electronic communication tools to facilitate faster access to and transmission of information. The development of information and communication technology has created exciting possibilities for major reforms in education. With the use of multimedia presentations, it is possible to create an engaging, playful, and interactive learning environment that can assist knowledge distribution, engagement, or cognitive control. According to Suwaid (2013), children who learn informally using technology appear to perform well in school because they provide more context to the objects they come into contact with and show greater interest in complex toys and other equipment with keypads and buttons. The use of contemporary information and communication technology in teaching and learning is crucial. For instance, the use of computers, television, radio, the internet, etc., makes knowledge easily accessible and increases flexibility and interest in learning. Information and communication technology has an impact on many areas, including the office, the home, schools, manufacturing industries, banking and commerce, military and security, and training.

Concept of Effective Learning

When the intended learning objectives are accomplished through the teaching-learning process, learning is considered successful. It is the process of learning new information, attitudes, actions, abilities, beliefs, and preferences. Testbook Edu Solutions Pvt. Ltd. (2023). Effective learning benefits the learner as well as the business, but it also has to benefit your company. No learning initiative will be successful if it does not reflect the principles, culture, and reputation of your business, Litmos (2023). Despite its widespread use, the word "effective" only has meaning when context and aims are clear. These crucial aspects of the modern environment are present:

- The knowledge base in society is increasing rapidly and now doubles every 373 days. Teaching knowledge is an anachronism.
- A wider range of the population processes and generates knowledge. Information is not in the possession of a few "experts".
- Employment prospects relate more to the ability to enhance and transfer learning. The accumulation of qualifications is not enough.
- The landscape of learning is much wider and richer, involving multiple contexts, modes, and sources. Learning is no longer the province of special institutions; it is a way of being.

In this situation, less emphasis should be placed on information acquisition by individuals and more on knowledge creation with others. Effective learners have learned about the social and personal processes needed to be successful learners. This includes monitoring and assessing learning to see whether tactics are working as well as learning specific strategies. Both "meta learning" and "learning how to learn" have been used to explain this. According to Chris Watkins, Eileen Carnell, Caroline Lodge, Patsy Wagner, and Caroline Whalley (2023), effective learning includes an additional essential component "which actively involves the student in metacognitive processes of planning, monitoring, and reflecting".

Concept of Basic Science

It is the methodical investigation of nature. It is a topic that makes the sciences accessible to people (Spidalworks Digital, 2022). It is also a fundamental science in the study of medicine, along with anatomy, physiology, bacteriology, pathology, and biochemistry. The fields of science known as arithmetic, physics, chemistry, and biology Because they offer

fundamental knowledge of natural events and the methods by which natural resources are converted, they are referred to as basic sciences (International Science Programme (ISP) 2023).

Others, like applied science, help basic science, which is crucial for knowledge progress. Humanity would not develop in this way without its capacity to produce information that can be generalized. However, its research component, which is pure research, presupposes the theoretical foundation of others, like experimental research. It thus has no particular utility by itself, yet without it, none of the others would exist. Therefore, its significance may be seen in what it adds to the other parts. The success or failure of the investigation of many phenomena would primarily depend on chance in the absence of a strong theory to support it. Both are required, even if the experience is by no means insignificant (Define Business Terms, 2023). Regardless of the possible uses of such information, the American Psychological Association (2023) defines scientific study or theory that is concerned with understanding fundamental phenomena and the principles that govern them as being "pure science" or "basic science."

Availability of Adequate ICT and Effective Learning of Basic Science

Information and communication technologies (ICTs) have been applied to the teaching and learning of science as part of a succession of advancements in this area. Its dynamic, interactive, and engaging content has had an influence on the quality and quantity of teaching and learning, and it can offer genuine chances for personalized instruction due to the availability of suitable ICT (Egomo, Enyi, and Tah, 2012). The use of ICTs in the education of the expanding population in the academic sector is important at this age of wild knowledge growth.

The period of conventional "chalk and talk" methods of instruction is rapidly giving way to student-centered methods, including the use of result-oriented ICTs. According to Ajayi (2008), teaching and learning have progressed beyond the days when a teacher would only stand in front of a class of students and lecture them without including them in the learning process. Teachers may also push students beyond their conventional boundaries with the use of ICTs, ensuring their active engagement in the teaching and learning process and creating environments that are suitable for experimentation and exploration. ICTs (information and communication technologies) offer excellent training programs that aid in the development of skills. It may be used to stimulate learning, develop models, and adjust interactively, and its use extends beyond language and the sciences to a number of other professional courses (Osakwe, 2013).

Information and communication technologies (ICTs) help pupils develop their abilities and expose them to experiences outside of their immediate area. Additionally, it makes the learning and teaching environment more engaging by letting the student's progress at their own rate while the teacher supervises them. According to Ugwu and Oboegbulem (2011), efficient ICT use in schools ensures greater access to knowledge and experience in this age of globalization. The introduction and availability of ICT in the educational environment have a significant influence on advancing teaching and learning as well as helping to reach educational objectives, aims, and goals. The growth of ICT is one technical advancement that has a very high potential for development in education and may enhance educational quality, increase learning possibilities, and make education more accessible. Information and communication technology (ICT) has the potential to produce greater interactive potential for users to develop their own intellectual and creative abilities, which suggests that integrating ICTs into secondary education will undoubtedly improve the Nigerian educational system and give students a better education that will enable them to compete favorably with the outcomes of other educational

systems around the world. This will result in the development of a technologically sophisticated labor force with the potential to advance military technology, telecommunications, and media communication, and skilled ICT professionals who will be prepared to address ICT-related issues wherever they may arise. Without the help and influence of the instructors who are able to take advantage of the opportunities presented by ICT in the teaching and learning process, the introduction and availability of ICTs in our educational institutions will not be sufficient to change the outcomes of the students. This suggests that instructors should enhance their understanding of and cultivate a favorable attitude toward the use of ICT in teaching and learning, according to Bright Nwoke (2016).

Utilization of Adequate ICT and Effective Learning of Basic Science

Information and communications technology is being used more and more often in Nigeria and other African nations overall. ICT has become an increasingly important component of all levels of schools and the overall educational system over the past few years. The use of ICT in the process of teaching and learning in secondary schools in Nigeria has been the subject of a wide range of research studies. In this study, scientific students, teachers, and administrators were asked to evaluate how ICT is used in teaching and learning in Nigerian public secondary schools, particularly those in the Northeastern States. The goal of this study is to determine the extent to which ICT resources are used in teaching and learning procedures based on the three main research topics. Data from science students, teachers, and administrators in the investigated states was gathered through questionnaires and interviews in this study, which employed a mixed-methods approach to data collection.

The major objective is to employ and improve the ability to make informed and reasoned judgments for the public welfare as citizens of a culturally varied, democratic society in an interconnected world (National Council of the Basic Sciences, 1994). The great architects of American public education, such as Thomas Jefferson, Horace Mann, and John Dewey, felt that every student must be thoroughly acquainted with his nation's history, the ideals and practices that underlay citizenship, and the institutions that characterize our government. Understanding trade and geography was crucial to their ideas as well. In essence, Jefferson, Mann, and Dewey saw the study of basic science as vital to the goal of public schools. Indeed, they would praise the inclusion of "responsible and involved citizens" in the guiding principles as well as fundamental science as one of eight curriculum areas in the learning results. A successful fundamental scientific education depends on a comprehensive grasp of its associated subjects. Without an understanding of the geography and economics of prior periods, history is simply a list of people, events, and dates. Without an understanding of history, the institutions of American government and the dynamics of today's global economy are impossible to grasp. Although basic science curricula vary in their breadth and complexity, the Basic Science Standards indicate a concentration on government, history, geography, and economics as the foundations of the material, with other disciplines within the social sciences judged relevant but not necessary. The world at large is advancing towards globalization through information and communication technology (ICT). Information and communication technology (ICT) comprises the complete modern electronic equipment employed in numerous areas of our economy. It cuts across all fields of human activity, such as education, industry, medicine, and financial organizations.

Conclusion

The paper has explained that information and communication technology (ICT) can serve as a very good teaching resource that can be employed in the teaching and learning of basic science in Nigerian schools, as it will help to visualize and organize learning in general,

and the study concludes that full integration of ICTs can help revitalize teachers and students. This will go a long way toward increasing the quality of education by providing curricular assistance in the disciplines of fundamental science and technology. With the use of ICTs, instructors may simply browse through e-books utilizing a mobile phone-internet interface and have access to mentors, experts, and researchers. ICTs can increase the quality of education by raising learners' motivation and aiding the acquisition of fundamental skills. It has an influence not just on what students learn but also on how they should learn. This view of science learning and teaching builds on a long legacy of change in science education that has highlighted the need for all students to understand fundamental disciplinary core ideas, paired with scientific and engineering methods that are part of inquiry. In addition, the vision highlights the necessity of integrating knowledge through cross-cutting ideas. To teach science in these ways, teachers will need to move away from traditional models of instruction that emphasize memorizing facts and covering a large number of discrete topics, focusing instead on core ideas studied in depth through active student engagement in investigations and opportunities to reflect on and build scientific explanations for phenomena.

Recommendations

1. The research consequently suggests that the government, collaborating entities, and good-spirited people invest in education by supplying the schools with power supply generators and footing the electricity payments. This would help solve the problem of inadequate power supply to schools. For the efficient use of ICTs in teaching and learning, instructors need to be skilled enough to use ICT-based resources.
2. The schools, through the ministry of education, should seek technical partnership and collaborative funding with international and national organizations to provide and maintain more ICT facilities such as computers (hardware and software consoles), internet facilities, laptops, projectors, interactive boards, and printing accessories in secondary schools, and ensure these facilities are gainfully utilized by setting up monitoring teams to pay unscheduled visits to schools.
3. The use of ICT in learning helps to visualize scientific information; consequently, ICT must be integrated into the science curriculum and other relevant courses.

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