AVAILABILITY AND UTILIZATION OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) ON STUDENTS ACHIEVEMENT IN MATHEMATICS: IMPLICATIONS FOR SUSTAINABLE EDUCATIONAL DEVELOPMENT

Olubukola Olutosin AKANNI

Department of Educational Foundations, (With Educational Psychology), University of Lagos, Akoka, Nigeria, E-mail:oakanni@unilag.edu.ng or drakanni.olubukola@yahoo.com

Abstract: *Information Communication Technology (ICT)) plays a major role in the education sector in improving the quality, effectiveness and efficiency of learning in order to boost adolescents' achievement. They make learning more interesting thereby contributing to in-depth way of learning. The use ICT can improve education quality, expand learning opportunities and make education accessible. However, the stage of ICT facilities in Nigerian secondary schools show that there is a slow wave of development. Hence, this study investigated the availability and utilization of Information Communication Technology on Mathematics achievement among adolescents in Education District IV of Lagos State. The descriptive research design was used and the populations for the study were all senior secondary school students' in Educational District IV of Lagos-state. Multi-stage sampling technique was used to select two hundred and forty-two (242) senior secondary school students and twenty-four (24) teachers. The instruments was a self-constructed questionnaire title Availability and Utilization of ICT questionnaire (AUICT) and a Mathematics Achievement Test (MAT).Three hypotheses were tested at 0.5 level of significance to guide the study. Findings from study revealed that the availability of ICT resources in secondary schools was not efficient in impacting academic achievement in Mathematics among adolescents; while adolescents' utilization of ICT resources (i.e. the culture of using these available ICT resources among the students) was also not efficient in boosting academic achievement in Mathematics and the joint effect of the availability and utilization of ICT resources was not significant on the adolescents' Mathematics achievement Based on the research findings, it was recommended that even though ICT resources are available, school owners and stakeholders should endeavor to match the availability of these ICT resources with the accessibility to use them for sustainable educational development.*

Keywords: *Availability, utilization, information communication technology, mathematics, achievement,*

INTRODUCTION

Mathematics is considered the queen of all sciences. For a long time, the role of mathematics was reduced to the purely academic domain. But at present, the role of mathematics is not limited to the purely academic domain. It has entered the field of technology and industry**.** The predominant means of instruction has traditionally been through verbal medium, either as verbal been words or written text. As more instructional resources of many different media types become available to students, through the internet, there is a need for educators to understand when these sources may be used effectively for instruction, as well as a need

for students to develop an additional set of literacy skills in order to learn from these sources.

The term Information Communication Technology (ICT) is among several terms that have associated with literacy to emphasize that literacy extends beyond reading and writing the alphabetic codes, and should include a variety of audio-visual forms of representation. Associating ICT with the literacy which highlights a belief among many scholars and educators that conceptions of literacy and how it is developed should not focus exclusively on printed materials but should include electronic media that have moved into the mainstream of communication

especially at the end of the twentieth century. Implicit in these views is that research and practice related to literacy must be transformed to accommodate new ways of accessing, processing and using information by students generally and those in Mathematics in particular. Information encompasses a wide range variety of things ranging from oral and printed words, figures, statements, files and documents to such intangible elements as sound signals, rays and waves. Whatever the form information takes, the essence of information is that it conveys messages.

In the era of globalization, educational organizations became more flexible, responsive and capable of adapting to change in order to ensure its survival. Organizational change is the movement of an organization away from its present state and toward some desired future state to increase its effectiveness (Lunenburg, 2010). Schools as social organizations where the future citizens are shaped and developed through the process of teaching and learning, showing a very strong demand in order to constantly change and adapt to existing organizational changes to become an effective learning environments. Schools are expected to help all students to develop their potentials to the fullest level. They also must improve their core business (teaching and learning process) that aims at helping and empowering all students to raise their broad outcomes required by the changing world through instructional improvement. To achieve these expected outcomes, governments needed to play a more important role in supporting teaching and learning process through integration of ICT in their schools. The use of ICT can improve education quality, expand learning opportunities and make education accessible.

The greatest achievement in the twentieth century was the development of ICT for the use of all facets of human endeavours. With the rapid growth of industrialization, came the need for handling the ever increasing volume of information concerning parts and people. This formed the basis for the development of the computer. At present, powerful computers are used to store large volumes of information. Information and communication technology is the major employer of computers so much that the two are thought to be synonymous.

ICT also refers to the more efficient and effective way of storing, accessing and updating information than processes involving paper.

The revolution implied by ICT is placing different demands of education on generation, science and mathematics in particular. These demands cannot be met through simple revision of the current curriculum or currently existing textbooks. This is because, ICT revolution has transformed available technologies, the means and methods of teaching and learning the sciences, especially in mathematics, and the very way we think about what science education could do and should do. The paradigm now is that not only should students be made to understand basic mathematical concepts, they must also understand how mathematics education and the (ICT) are related. With the internet, it is possible to access learning mathematical materials anywhere in the world. The opportunities available to science staff and the students on the internet are numerous and those making use of it are better off for it. Students who often apply the use of ICT in their educational career do better than those who do not.

As a matter of fact, there are several sites on the World Wide Web (www) which provides information on how the network is used for the teaching of various science or mathematics courses. The materials at the sites teach students to think laterally, longitudinally and across board. Results of the studies conducted on impact of computer used as aid to instruction on students' attitudes and achievement in science, particularly in mathematics related courses showed general improvement.

It is opined that in spite of the tremendous impact and widespread usage of ICT facilities in the teaching and learning of mathematics worldwide, it is pertinent to ask the question of how prepared are the Nigerian secondary ? Whether Federal or State owned schools are coping with the challenges posed by the ICT. The answer to this question is not far-fetched within the context of global competitiveness of the information age, the stage of ICT facilities in Nigerian secondary schools show that there is a slow wave of development. Yet the quality of instruction in colleges or secondary level of our education system must keep pace with the development of new trends in ICT

education, which are revolutionizing the lives of those who can afford to use it. In the modern culture of science and technology, the competence of science staff in educational attainment, is gauged by the training they acquired and their effective utilization of ICT facilities in students' assignments. Unfortunately, a vast majority of mathematics teachers in our secondary schools are deficient in these areas.

In the recent time, students have benefited from the use of ICT such as computer, television, telephone and the internet as veritable sources of information in their academic career or pursuit, especially in mathematics related disciplines. Adolescents use the information communication technology especially the internet to gather vital educational information's. The advent of ICT has made teaching and learning of mathematics simpler and easy for students. ICT has helped students in many ways such as collection of necessary information leading to effective studies. This has enabled many students to have high academic achievement in school. It is stated that ICT has created a remarkable balance and effectiveness in the daily activities of students who are in the habits of using the computer and the internets to carry out faster storage and retrieval of information in the academic environment or school.

Karim and Hassan (2016) noted the exponential growth in digital information, which changes the way students perceive studying/reading and in how printed materials are used to facilitate study. The education system all over the world has certainly been affected positively by the influence of ICT. According to Abdul-Salaam, *et al*(2011), ICT has the potentials to accelerate, enrich, and deepen skill; to motivate and engage students in learning; to help relate school experiences to work practices; to help to create economic viability for tomorrow's workers, contribute to radical changes in school; to strengthen teaching and to provide opportunities for connections between the school and the world. ICT can be used to assist students to get along with others, achieving self-reliance and educational success. It can also help students' to achieve professional success and to adhere to societal values and norms. With information technology, students achieve high academic laurels in schools, especially in mathematics. Mathematics is referred

to as the language of science and technology; queen of science; the science of counting, science of numbers, quantity and space, study of abstraction and their relationship..

Mathematics is a basic tool in the development of any science based knowledge such as technology, industry and even for sound analytical reasoning in daily living in a modern society such as ours (Babalola, 2011). Mathematics is one of the most powerful and adaptable tools that has aided man intelligence over the centuries (Usman, 2012). The extra rigour that mathematics gives to our thinking is unparalleled. Mathematics is also a subject that has a major influence on all aspects of human endeavours and it has been described as the life in the studies of various disciplines (Smith, 2002). In a developing country like Nigeria, one cannot over emphasize the need to help students, particularly those in high schools, to understand how wire they can use mathematical knowledge to investigate, interpret and make decisions in their daily activities.

In Nigeria, mathematics is a compulsory subject for all students at the secondary school level. Although, not all the students are expected to become mathematicians, yet, it is compulsory because of its application in everyday life (Oladele, 2014). For a person to be able to function very well within his immediate environment, the professional knowledge of rudimentary Mathematics is very necessary. The role of mathematics in the commercial, scientific and technological development of the civilized nations is always acknowledged.

The general objectives of school mathematics, irrespective of the level can be summarized as follows: Develop computational skills; develop ability to think deductively; produce the mathematical background needed in other school subjects; develop originality, creativity and curiosity in the students; develop and appreciate the aesthetic values of Mathematics; develop ability to solve mathematical problems and provide solid foundation for further studies in Mathematics.

Nigeria's quest for early technological development and advancement necessitates intensive training in the basic subjects. These

subjects are Science, Technology and Mathematics, all of which are otherwise referred to as the STM subjects. However, it is expedient that mathematics teachers know what concept to teach, when and why students are having difficulty, how to make concepts meaningful, when and how to practice skills and how to stimulate productive thinking. Hence, students need to be motivated and enrich to study effectively in order to achieve academically .

Kim and Chang (2010) stated that computer use in the teaching and learning of mathematics helps in reducing achievement gap among different diverse backgrounds. Using ICT as a tool, students spend productive time developing strategies for solving complex problems and develop a deep understanding of the various mathematics topics. Students can use ICT as a tool to perform calculations, draw graphs, and help solve problems in most areas of mathematics such as position value; order, and rounding; equations, formulae, and identities; sequences, functions, and graphs;;geometrical argumentation: lines, angles, and shapes; transformations; coordinates. – geometric; construction and loci; probability and statistical applications and so on.

 It is obvious that there might be many factors affecting students' science and mathematics performance. Research findings revealed that technology is one of these factors; that is why it is important to explore how we can assists our students' in science and mathematics achievements by looking at the availability, accessibility and utilization of computers and related technologies. Notten and Kraaykamp (2009) stated that science performance is positively affected if there is a positive reading climate and computer availability at home. They also mentioned that "the absence of a television set at home seems to narrow a child's worldview and knowledge of science.". Dumais (2009) also mentioned that using computers for fun was related to increasing mathematics achievement.

The introduction of these modern tools in our secondary school system can help to improve the teaching and learning of mathematics. The more effective these tools were used in teaching and learning of mathematics, the greater the

understanding of the students for the subject. ICT can help enhances students' performance in mathematics in our secondary schools in Nigeria. For instance, Mathematics students find the use of ICT relevant in recalling facts and figures and in doing quick calculations which enhances their achievement in schools. Schools today face ever-increasing demands in their attempt to ensure that students are well equipped to enter the workforce and navigate a complex world. Research indicates that computer technology can help support learning, and is useful in developing the higher order skills of critical thinking, analysis, and scientific inquiry. The integration of ICT into the mainstream of education will prepare the students for the global environment. The use of ICT will accelerate motivate ,enrich and deepen skills which will help the students to relate with the global word, hence, creating economic viability for the future. Hence, this study investigate the availability and utilization of Information Communication Technology on the achievement in Mathematics among adolescents in Education district IV of Lagos state.

Statement of the Problem
Information communication technology (ICT) as an effective means of storing, accessing, retrieving or collecting vital information is often times used by students to carry out their educational activities. With the advent of information technology, students access information that lead them to successful academic and professional achievement. Nevertheless, information communication technology seems to have corrupted students, especially, the adolescents in their formative ages that are in secondary school. For instance, students are often seen glued for hours to the television and the internet watching or viewing pornographic films or pictures that are capable of bending their minds and distorting their dispositions. Studies have shown that students who browse the internet's often are more corrupt than those who do not. Students who use the internet often or watch the television involved in sexual promiscuity, examination malpractices, stealing and other vices or indiscipline's that are always carried out in the school.

In recent times, many students have been caught using Global System Mobile Network (GSM)

phones to carry out or perpetrate examination malpractices; especially in calculation-based courses like Mathematics and other science related ones to connect friends and associates in crimes.Both adults and students are found to use the GSM phones to tell assorted kinds of lies and deceit in the larger society and this has made corruption to be well rooted in the society in which we live. The more advanced manner in which television programmes are aired are commendable, but many of the programmes show very bad and aggressive films and the children watch them after which they start acting what they have seen and this has affected the child's psyche negatively. No doubt, the emergence of information communication technology has made students in calculation-based courses like Mathematics to be lazy and more dependent on calculator. Most mathematics students can no longer do simple arithmetic without consulting the calculator and the internet etc.

The import of this on the candidates' future and the nation's manpower development should be a cause of concern for the country's leaders, parents, school administrator's stakeholders in the education industry, government at various levels and the nation as a whole. The invention of ICT as one of the foremost discovery of our time had not being patronized in educational sector for its usefulness and advantages. These deplorable states of performance in mathematics in our educational system in Nigeria were due to the inadequate use of modern teaching–learning facilities and infrastructures. Most libraries in Nigerian secondary schools do not possess required audio-visual learning materials and the ones that has, are hardly utilized as a result of incessant power shortages and sometimes lack of awareness on the part of the students. Main ICT challenges in Nigerian education system are that school culture and structure don't support specific uses of technology; most teachers lack confidence in technology as well as their technology skills; lack of qualified teachers to teach ICT in schools: lack of computers; lack of electricity; lack of electricity; burglary; lack of internet or slow connectivity; privacy factor; entertainment factor

Formerly, schools depended on the face-to-face classroom teaching and learning experience but the advent of the technology age has brought about

gadgets that can help improve such experiences. .Hence, various learning approaches are being put in place to compensate for the problems occasioned by this traditional learning paradigm. One of them has been the online instruction, which has the potential to provide opportunities for reflective and integrating learning outcomes. This approach when utilized provides the students with adaptive personalized ICT experiences because it is a practical approach which can be replicated by the students to improve learning outcomes. It involves the use of mobile technologies such as personal digital assistants , MP3/MP4 players, web-based teaching materials, computer rooms or web-sites, webinars, collaborative software and other technologies which can enable the students attend lectures without been physically present.Mavins Beacon application for students, e-mail, blogs, wikis, text chart, computer aided assistant, educational animation, simulation, games, learning management software et cetera are other collaborative packages available.

The diverse applications of mathematics abundantly establish that mathematics as a subject is fit for purpose, as mathematic continually drives the expansion of the frontiers of other subjects through their progressive formalization and symbolization of mathematical paradigms of real world system. It is against this backdrop that the study evaluates the availability and utilization of Information Communication Technology on the achievement in mathematics among students in secondary schools in Educational District IV of Lagos State

LITERATURE REVIEW
The review of related literature on the impact of availability and utilization of ICT on achievement in Mathematics among adolescents' in Education District IV of Lagos State.

- Concept of Information Communication Technology (ICT).
- ICT in Nigeria Educational System.
- The Need of Availability and Utilization of ICT Facilities in Teaching and Learning of Mathematics..
- How ICT can be used in the Classroom.

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- Roles of ICT in Students Achievement in Secondary Schools.
- ICT Skills Needed by 21ST Century Teacher.
- Sustainable Development

Concept of Information Communication Technology (ICT)

The ICT is made of computer and communication technology. The computer technology is the tool for storing and processing information in digital form while communication technology helps us to transfer and disseminate digital information.

ICT means a variety of technological applications in the process and communication of information. The word ICT is a combination of two words information, communication & technology. Information means knowledge and technology means the use of computer & communication. The term ICT can be defined as "the integration of computing, networking, and information processing technologies and their applications". Thus, ICT means a combination of computer applications' and communication technology for gathering, processing, storing and disseminating of Information. ICT is simply about sharing and having access to data with ease. It is regarded as the super highway through which information is transmitted and shared by people all over the world.

ICT is also defined as "the handling and processing of information (texts, images, graphs, instruction etc) for use by means of electronic and communication devices such as computers, cameras, telephone." Ofodu (2014) also refer to ICT as electronic or computerized devices, assisted by human and interactive materials that can be used for a wide range of teaching and learning as well as for personal use. Information and telecommunication technologies (ICT) as "any technology we use to facilitate processing, gathering, distribution and use of information." Bandele (2010) on the other hand, views ICT as, a revolution that involves the use of computers, internet and other telecommunication technology in every aspect of human endeavor. Ogunsola and Aboyade (2012) viewed ICT as a cluster of

associated technologies defined by their functional usage in information access and communication of which one embodiment is the internet. According to Marcelle (2013), ICT can be described as a complex varied set of goods, applications and services used for producing, distributing, processing, transforming information including telecoms, TV and radio broadcasting, hardware and software, computer services and electronic media. Rodriguez and Wilson (2011) defined ICT as a set of activities which facilitate by electronic means the processing, transmission and display of information. ICT as tools within the school environment include use for school administration and management, teaching and learning of ICT related skills for enhancing the presentation of classroom work, teaching/learning repetitive tasks, teaching/learning intellectual thinking and problem solving skills, stimulating creativity and imagination, for research by teachers and students and as communication tool by teachers and students. ICT as computer-based tools used by people to work with the information and communication processing needs of an organization. It encompasses the computer hardware and software, the network and several other devices (video, audio, photography camera, etc) that convert information (text), images, sound, motion and so on into common digital form.

ICT in the Nigeria Educational System

The role of Information and Communication Technologies (ICTs) in the 21st century education system has been described as vital to keeping abreast with rapidly changing technologies. The development of information and communication technology into the Nigerian educational system has come to stay; its importance has been translated into huge potentials in terms of positive outcomes, although investments in ICTs in Nigerian's education system have not yielded much when compared to similar investments made in communication (Atureta, 2011).

This will aid issue like good course organization, effective class management, content creation, self-assessment, self-study collaborative learning, task oriented activities, effective communication between the actors of teaching learning process and research activities will be enhanced by the use of ICT based technology (Ajayi, *et.al.,* 2018) ICT can

aid teachers take their students beyond traditional limits, ensure their adequate participation in teaching and learning process and create vital environments to experiment and explore. This new development is a strong indication that the era of teachers without ICT skills are skills are gone They are also added that, any classroom teacher with adequate and professional skills in ICT utilization will definitely have his students perform better in classroom learning

Stressing the importance of the use of ICT in schools, Olurunsola (2014) posited that, through ICT, educational needs have been met; it changes the needs of education as well as the potential processes. A great deal of research that has proven the benefits of ICT in improving quality of education, (AL-Ansari, 2016). ICT has made a very profound and remarkable impact on the quality and quantity of teaching, learning and research in the educational institutions. He has also indicated that, the pervasiveness of ICT has brought about rapid technological, social, political and economic transformation, which has eventuated in a network society organized around ICT. ICT is an indispensable part of educational administration as its application makes institutions more efficient and productive, thereby engendering a variety of tools to enhance and facilitate teachers' pedagogical activities. ICT in education encompasses a vast range of rapidly evolving technologies such as Desktop, NoteBook, and Handheld Computers, Digital Cameras, the Internet, Cloud Computing, the World Wide Web, Spread Sheets, Tutorials, Simulations, email, Local Area Networking, Bluetooth, Streaming, and DVDs; and applications such as word processors, Virtual Environment, Simulator, Digital libraries, Computer-Mediated Conferencing, videoconferencing, Emulator etc. ICT allows for the production of digital resources such as digital libraries, where students, teachers, and professionals can access study material and course material from anywhere at any time.

The Need of Availability and Utilization of ICT Facilities in Teaching and Learning of Mathematics

Teaching is the process of meeting the educational needs of society through the application of skills, knowledge and attributes desirable of the individuals in the society. To realize the goals of education choice of learning activities must be properly done so that the teacher who is at the centre stage would be properly guided in the implementation of the desired learning experiences. A competent teacher is a lover of knowledge and will always desire to have the development of his students as one of his priorities. According to Imonivwerha, Obiunu and Ogheneovo (2014), a quality teacher has to be knowledgeable and possess mastery of the topic of each lesson and have emotional and psychological competencies.

Mathematics teachers who are doing well have definite attributes that distinguish them. Mathematics is a subject that is generally dreaded by many students and for mathematics curriculum to be attained a mathematics teacher has to exhibit the necessary competence to help the learners who have phobia and traditionally struggle with the subject to gain confidence to solve mathematics problems correctly. In realizing this, the qualification and exposure of the teacher must be considered. Teachers who are highly qualified develop self confidence in teaching and become a source of inspiration to the students (Osaat, 2012). It is very true that poorly trained mathematics teachers make mathematics to suffer major setbacks that make it difficult for mathematics curriculum to be attained. Another factor that may impede curriculum implementation and attainment is the fact that most Nigerian teachers are overburdened with large classes which affects classroom management and effective face-to-face contact with the learners. The resultant effect could lead to confusion and frustration in the mind of the teacher thereby reducing his level of effectiveness, originality and creativity. In the present day reality, Information and Communication Technology (ICT) has provided an effective platform for achieving the implementation of Mathematics curriculum.

All the know-how used to manipulate telecommunications are referred to as Information and Communications Technology (ICT), they may include intelligent building management systems, broadcast media, network-based control and monitoring functions and audio-visual processing and transmission systems. The scope of ICT is

broad even though it is often regarded as an extended synonym for Information Technology (IT). Over the last twenty years, the utilization of ICT has become an essential theme in education. ICT utilization is, the presentation and distribution of instructional content through web environment (e-teaching) or systems offering an integrated range of tools (stand-alone computer instruction, CD ROM amongst others) to support learning and communication. Instructional service delivery has to do with teaching/learning activities that take place in the classrooms. Therefore, quality of instructional service delivery entails the extent of effectiveness to which the teachers carry their classroom teaching/learning process. Studies have revealed that ICT can improve teaching and learning outcomes in mathematics and science education, researchers have discovered that the utilization of ICT can enhance students' conceptual understanding, team working skills and problem solving (Culp, Honey &Mandinach, 2015). To this end, nearly every curriculum document highlights the significance of ICT and encourages teachers to make good use of them.

However, teachers must be specially trained so that they can integrate ICT effectively in their practice. Consequently, students, student teachers and teachers in practice must acquire training that could enable them to utilize various software packages and applications most efficiently. The variety of ICT facilities utilized in the teaching and learning process according to Bamidele (2016) include; radio, television, overhead projectors, computers, optical fibres, CD-Rom, fax machines, internet, digital multimedia, electronic notice board, slides, etc. The efficient use of the range of gadgets of ICT in teaching and learning rests on the availability of these gadgets and the competences of the teachers using them. It is sad to note that in classrooms in Nigeria, traditional ways of teaching and learning have not been enhanced. The need to brace up with the modern ways and systems of education through the acquisition and utilization of ICT in Nigeria secondary schools cannot be over emphasized. Nigeria is behind in embracing the usage of ICT in secondary schools.

There are several evidences that, ICT can be an effective tool in supporting teaching and learning process in the classroom. However, its introduction into schools does not by itself improve the quality of education or raise students attainment (Hennessy et.al, 2010). Effectively introducing technology into schools is also largely dependent upon the availability and accessibility of ICT resources (e.g. hardware, software and communications infrastructure).

It must however be stressed that the effective use of the various method of the ICT in teaching learning depends on the availability of these facilities and teachers' competence in using them. The availability and utilization ICT helps in developing critical and scientific thinking among the students and the teachers. This can be justify by the fact that:

i.   It motivates the learner to participate in learning activities at any time and from anywhere.

ii.   It helps in exchange and shares ideas among teachers for professional growth.

iii. ICT has also used to improve access and the quality of teacher training. ICT tools enhance teaching, and facilitate learning using multimodal courseware, Integrate ICT using pedagogical innovations to develop higher-order thinking skills among learners.

iv.   ICT tools such as radio, T.V., Internet, computer, laptop, tablets, and many other hardware and software applications can be appropriated in the teaching-learning process. These tools can give benefits in the areas of content, curriculum, instruction, and assessment.

How ICT can be used in the Classroom

The implementation of technological solutions need to ensure that, they are sustainable, context specific and adapted to local needs and conditions, for actual technologies by themselves have little development impact. It is only when potential users have a sound understanding of how they can use new ICTs effectively that they have real influence. Otherwise, ICT becomes just a drain on the organization or community (Unwin, 2015). According to UNESCO (2014), the **three main approaches** to use ICT by teachers in classroom:

1.   An Integrated approach: planning the use of ICT within the subject to enhance

particular concepts and skills and improve students' attainment.

2.   An Enhancement approach: planning the use of an ICT resource which will enhance the existing topic through some aspect of the lessons and tasks.

3.   A Complementary approach: using an ICT resource to empower the pupils' learning all three approaches can enhance attainment, but the effects may be different. In the integrated approach, students' learning is enhanced because they are confronted with challenges to their existing knowledge and given deeper insights into the subject being studied. The enhancement approach presents knowledge in new ways, encouraging learners to formulate their own explanations.

Finally, the complementary approach frees the learner to focus on more challenging and subject focused tasks. These different types of use require the teacher to have an extensive knowledge of ICT and to be able to fit its use either into their existing pedagogy or   to extend their pedagogical knowledge so they can accommodate ICT effectively in their teaching (UNESCO, 2014).

Roles of ICT in Students Achievement in Secondary Schools

Information Communication Technologies (ICT) has indispensable and positive impacts to transforming education systems all over the world. ICT plays important roles to enhance the quality of education all over the world. The benefits of ICT in education have been identified in terms of aspects, which have been stated as follows: teaching-learning processes ;quality and accessibility of education ;improving the learning environmental conditions; for innovative ways and methods of study; learning motivation; ICT helps to increase the critical thinking skills, analyzing skills, understanding and application skills of students; It is extra favorable for conceptualize mathematical thinking, self-learning by Internet and other audio visual instruments, professional development of teachers, to make effectiveness of classroom activities, motivate students towards learning, updates teachers and students with new technologies; improves students scholastic performance; saving time for **c**ommunication and collaboration

National Implementation Guidelines for ICT in Education

(i)   build and encourage the development, utilization and sustenance of the ICT manpower required to achieve an ICT-enhanced Education;

(ii)   establish and sustain a common ICT infrastructure platform for education at all levels;

(iii)   ensure and encourage Research and Development (R&D) in ICT generally and ICT in Education in particular;

ICT Skills Needed by 21ST Century Teacher

In order to become a confident user of ICT in the classroom, teachers need to take part in ongoing trainings. Teachers should understand the benefits of digital literacy. Training in ICT needs to be recognized as essential for teaching such skills, and as an enabler of other teaching and learning practices Teachers remain central to the learning process. As a skilled educator, you will have to aim for uncommon excellence and proficiency in this computer oriented era. Well here are some top eight (8) computer skills for every **21ST Century** teacher to master that can be regarded as been mandatory.

1. *Word Processing Skill***:** are certainly some of the most ancient applications all modern computers now feature. As a teacher, you will have to be skillful in utilizing the best word processors, which are currently available in the market. This will let you undertake and ultimately complete all your written communications with both your colleagues and students in a markedly time efficient manner. You will have to learn just how to check spelling, create tables, and even insert hyperlinks into your word documents. All in all, you will need to be in an excellent position of creating lengthy and well-formatted documents.

2. *Spreadsheet Skills***:** an excellent mastery of spreadsheets applications is also among the top ones in 21st century skills list for educators. Such an invaluable software will let you conduct some

of the most pertinent aspects of your teaching duties in a convenient and highly methodological way. Some of the most notable of these duties are compiling grades for your students and even masterfully charting any critical data you might wish to pass to them.

3. *Database Management Skills*: As a teacher, you will have to learn just how you can use databases. This includes been able to create database tables, storing, and retrieving data from those tables. While also knowing just how you can create the right queries for the information found in your institute's databases.

4. *Electronic Presentation Skills*: applications are, in essence, part and parcel of an educator's various teaching duties. As such, you will have to find a way to master the art of creating electronic presentations for your classes. While more to the point, just how you can showcase them to your students and even colleagues and superiors.

5. *Internet Navigation Skills*: As you might probably be aware the World Wide Web is a great repository of all manner of information, which can definitely make your life as a teacher much easier. Generally speaking, you will have to find a good way of been able to efficiently navigate the internet for the exact data or teaching resources you stand in need of. You will also have to be well conversant with the basics of advanced search, including the utilization of Boolean operators within your search engine queries.

6. *Email Management Skills*: the most preferred means of written communication for most of us, in both our professional and personal lives. As an educator, you will have to be highly skilled in sending and receiving email messages and the various applications you need to utilize. You will also be required to be conversant with the variety of features and functionalities that these computer applications boast of. This includes mass mailing, link insertions, and even the utilization of email attachments in your communications with both your colleagues and students.

7. *Networking Skills***:** Teachers who wish to remain relevant in their given fields must also find the necessary time to fully grasp the basics of

computer networking. If applicable, they should also try their level best to totally understand just how their institution's computer network functions and exactly how it can be of benefit to them in their professional duties.

8. *Touch Typing***:** is yet another essential computer skill, which all 21st century educators must take time to master. This particular skill lets you significantly improve typing speed as well as accuracy. This is brought about by simply relying on your motor reflexes as opposed to sight while typing. By mastering touch typing, you will find it infinitely easier to draft highly detailed and accurate texts in a quicker manner than you previously did. You will also learn how to integrate the right typing 'best practices' to prevent injuries and fatigue. This includes using the ideal typing posture and the right finger placement on your keyboard.

Sustainable Development

Sustainable development is a difficult concept to define; it is also persistently surfacing, which makes it difficult to define. According to United Nations decade of education for sustainable development (2005-2015), one of the original explanations of sustainable development is attributed to the Brundtland commission which state that: 'sustainable development is development   that meets the need of the present without compromising the ability of the future generations to meet their own needs''.

In the opinion of Okorosaye-Orubite (2017), sustainable development is generally thought to have three component: environment, society, and economy. This indicate that the well-being of this three areas is interconnected, not detach. For example, a healthy, wealthy society depends on a healthy environment to provide food and resources, safe drinking water, and clean air for it citizens.

To Ugoh (2008) sustainable development is a construct, which envision development as meeting the need of present generation without compromising the needs of the future generation. It implies that while education meets the need of the present it does not compromise the ability of the future generations to meet their own needs. Nevertheless, this ability to meet the needs is determined by human capital through education, technology and physical capital such as machine, tool among others. Ugoh (2008); Ikem and Reuben (2012) argue that continued sustainable development is only possible when it is agreed

and indeed concrete steps are taken to raise the level of literacy and numeracy in any society. Educational institution and their programs are therefore, the tools with which to achieve development and its sustainability.

Purpose of the Study

This study attempts to examine the availability and utilization of information communications technology (ICT) on the achievement of adolescents in Mathematics at the secondary school level in Lagos State. Specifically, the study seeks to examine the:

  I. Impact of the availability of ICT on achievement in mathematics among adolescents' in Education District IV of Lagos state.
  II. impact of the utilization of ICT on achievement in Mathematics among adolescent's in Education District IV of Lagos State
  III. Relationship between the availability and utilization of ICT on achievements in Mathematics among in Education District IV of Lagos State.

Research Hypotheses

The under-mentioned hypotheses would be tested in this study:

HO_1: There is no significant impact of the availability of ICT on academic achievement in Mathematics among adolescents' in Education District IV of Lagos State.

HO_2: There is no significant impact of the Utilization of ICT on achievement in Mathematics among adolescents' in Education District IV of Lagos State.

HO_3: There is no significant relationship between the availability and utilization of ICT on achievement in Mathematics among adolescents' in Education District IV of Lagos State.

METHODOLOGY

Research Design

The study adopted descriptive survey research design (which is correlational in nature). Descriptive research is a research method whose purpose is to produce an accurate representation of persons, events, or situations (Saunders, Lewis, &

Thornhill, 2012). Moreso, according to Best (2011), Descriptive survey research design is a research method which enables the researcher to obtain the opinions of a representative sample of a target population so as to infer the perception or view of the entire population.

Population of the Study

The target population for this study consisted of public senior secondary school students and their teachers within Educational District IV of Lagos State.

Sample and Sampling Technique

Multi-Stage sampling technique was considered because at first, there was a purposive selection of Educational District IV among all existing Educational Districts within Lagos State. In this Educational District IV, there were ready-made strata of selection (i.e. the three educational zones - Apapa, Surulere, and Lagos Mainland); in each of these three zones, there was a random selection of two (2) senior secondary schools among all the existing schools.

Disproportionate Stratified Sampling and Convenience sampling techniques were used to select

across the three educational zones, the adolescents' sample size for the study summed up to two hundred and forty-two (242) senior secondary school students, while there was a total of twenty-four (24) teachers involved in the research.

Research Instruments

Two research instruments (i.e. a self-constructed questionnaire and a mathematics achievement test) were used for this study. The questionnaire was structured and titled Availability and Utilization of ICT tools questionnaire (AUICT) The questionnaire (AUICT) is of two types; the students' questionnaire and the teachers' questionnaire. The Mathematics Achievement Test (MAT) was a twenty (20) item multi-choice objective test, compiled and prepared by the researcher from past mathematics question papers of WAEC/NECO for seven years (2013-2019) based on a prepared Table of specification . The research instrument was given to experts in the field of measurement and evaluation, University of Lagos to ensure its validation of face and content validity. The instruments have high stability co-efficient of 0.716 for availability; 0.784 for

utilizations and 0.882 for MAT when tested during

the pilot study at 0.05 level of significance.

RESULTS

Hypothesis 1: There is no significant impact of the availability of ICT resources on adolescents'

academic achievement in Mathematics within Education District IV of Lagos State.

Table 1: An "r" statistical table showing the impact of the Availability of ICT Resources on Adolescents' Academic Achievement in Mathematics

Variables	N	Mean	SD	df	r-cal.	Sig. Value (p)	Decision
Availability of ICT Resources	242	14.68	3.80				
				240	-0.030	0.647	Accept H$_o$
Adolescents' Academic Achievement in Mathematics	242	4.98	1.90				

p= 0.647 > 0.05

Table 1 reveals that the average (mean) availability of ICT resources in schools (14.68) was above the *expected mean value of 10.50* however, the average (mean) of adolescents' academic achievement in Mathematics (4.98) was below the *expected mean value of10.00*
Using Pearson Product Moment Correlation (PPMC) technique to compute the calculated "r" (r-cal. = -0.030) was with 240 degrees of freedom given that the obtained level of significance. (p-value) is 0.647>0.05 *(statistical benchmark).* By

implication, the null hypothesis is therefore accepted; hence, there is no significant impact between the availability of ICT resources and adolescents' academic achievement in Mathematics within Education District IV of Lagos State.

Hypothesis 2: There is no significant impact of utilization of ICT resources on adolescent academic achievement in Mathematics within Education District IV of Lagos State.

Table 2 : An "r" statistical table showing the impact of the Utilization of ICT Resources and Adolescents' Academic Achievement in Mathematics

Variables	N	Mean	SD	df	r-cal.	Sig. Value (p)	Decision
Utilization of ICT Resources	242	32.81	5.76				
				240	-0.048	0.456	**Accept H$_o$**
Adolescents' Academic Achievement in Mathematics	242	4.98	1.90				

p= 0.456 > 0.05

Table 2 reveals that the average (mean) utilization of ICT resources in schools (32.81) was above the *expected mean value of 22.50.* However, the average (mean) of adolescents' academic

achievement in Mathematics (4.98) was below the *expected mean value of10.00 .*
Using Pearson Product Moment Correlation (PPMC) technique to compute the calculated "r" (r-cal. = -0.048) was with 240 degrees of freedom

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given that the obtained level of significance (p-value) is 0.456 >0.05 *(statistical benchmark).* By implication, the null hypothesis is therefore accepted; hence, there is no significant impact between adolescents' utilization of ICT resources and their academic achievement in Mathematics within Education District IV of Lagos State.

Hypothesis 3: There is no significant relationship among availability, utilization of ICT resources and adolescents' Mathematics achievement within Education District IV of Lagos State.

Table 3: Multiple Regression Model of Availability, Utilization of ICT resources and Adolescents' Mathematics Achievement

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.050	0.002	-0.006	1.90109

Analysis of Variance

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Regression	2.150	2	1.075	0.297	0.743
Residual	863.784	239	3.614		
Total	865.934	241			

Table 3 indicates that coefficient of determination (Adjusted R^2) = 0.002, which gives proportion of variance/difference (Adjusted R^2 x 100) = 0.2%. This implies that the independent variables - *availability and utilization of ICT resources* accounted for 0.2% of the variance/difference in the dependent variable (*adolescents' Mathematics*

achievement). Hence, the joint effect of *the availability and utilization of ICT resources* is not significant on the *adolescents' Mathematics achievement* within Education District IV, Lagos State (F=0.297; df= (2; 239); significant value p = 0.743> 0.05).

Table 4:   Relative Contribution Availability, Utilization of ICT resources on the Adolescents' Mathematics Achievement)
Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t- values	Sig. (p) values
	B	Std. Error	Beta		
(Constant)	5.550	0.746		7.443	0.000
Availability of ICT resources	-0.007	0.035	-0.014	-0.198	0.844
Utilization of ICT resources	-0.014	0.023	-0.043	-0.621	0.535

Table 4 shows the individual contribution of the independent variables - *availability and utilization of ICT resources* on the dependent variable *(adolescents' Mathematics achievement)*. Observing the obtained result in table 4, it can be said that availability and utilization of ICT resources did not contributed significantly to the dependent variable .   This assertion can be

observed from the *t-values* and the *significant (p) values* of each of the independent variables [(Availability of ICT resources: *t-value = -0.198, p-value = 0.844);* (Utilization of ICT resources: *t-value = -0.621, p-value = 0.535*)], since none of the values was statistically significant.

DISCUSSION OF RESEARCH FINDINGS

Finding 1 revealed that there is no significant impact in the availability of ICT resources on adolescents' academic achievement in Mathematics within Education District IV of Lagos State. This implies that availability of ICT resources in secondary schools is not yet making the needed amount of impact on adolescents' academic achievement in Mathematics. This present finding was opposed by Noor-Ul-Amin (2013) who found that the availability of ICT resources increases the flexibility of learning activities and achievement of students. In the same vein of opposition, Guzeller& Akin (2012) discovered that the availability of ICT resources helps to boost mathematics achievement, attitude, anxiety, and self- efficiency.

Even though in this present research, it has been acclaimed that there is more a good extent of availability of ICT resources in the secondary schools, Obayi, Ukonu, &Wogu, (2012) seems to cast an element of doubt, when they noted that in Nigeria, the use of ICT resources is still at its infancy, and that Nigeria is among the countries trying to use ICT resources to leapfrog many stages of development.

Finding 2 revealed that there is no significant impact of adolescents' utilization of ICT resources on their academic achievement in Mathematics within Education District IV of Lagos State. This implies that utilization of ICT resources in secondary schools is not yet making the needed amount of impact on adolescents' academic achievement in Mathematics. This present findings was opposed by Noor-Ul-Amin (2013) who found that the utilization of ICT resources increases the flexibility of learning activities and achievement of students. In the same vein of opposition, Guzeller & Akin (2012) discovered that the use of ICT resources helps to boost mathematics achievement, attitude, anxiety, and self- efficiency .However, Obayi, Ukonu, & Wogu, (2012) seems to give support to the present research finding, when they noted that in Nigeria, the use of ICT resources is still at its infancy, and that Nigeria is among the countries trying to use ICT resources to leapfrog many stages of development.

Finding 3 revealed that the joint effect of *the availability and utilization of ICT resources* is not significant on the *adolescents' Mathematics achievement* within Education District.

The independent variables - *availability and utilization of ICT resources* accounted for 0.2% of the variance/difference in the dependent variable (*adolescents' Mathematics achievement*). Hence, the joint effect of *the availability and utilization of ICT resources* is not significant on the *adolescents' Mathematics achievement* within Education District IV, Lagos State (F=0.297; d.f. = (2; 239); significant value p = 0.743 > 0.05). Respectively, the availability and utilization of ICT resources did not contributed significantly to the dependent variable *(adolescents' Mathematics achievement)*. This assertion can be observed from the *t-values* and the *significant (p) values* of each of the independent variables [(Availability of ICT resources: *t-value = -0.198, p-value = 0.844);* (Utilization of ICT resources: *t-value = -0.621, p-value = 0.535)*], since none of the values was statistically significant. The present research finding was opposed by Earl (2012), in her research report where it was identified that, ICT gave both teachers and students the opportunity to increase their communication and interaction with others whether in a school district or outside it, and also that the students' knowledge improved relationships when they were working around a computer. More opposition was given by Mdlongwa (2012) explored some benefits of using the ICT in teaching and learning as learners can connect to experts and have access to global resources, learners have access to quality learning material, learners can improve owns knowledge and standard of work, makes communication easier and faster, and easily get information's from the Internet.

CONCLUSIONS

Based on the research findings, it could be inferred that the availability of ICT resources in secondary schools was not efficacious in boosting academic achievement in Mathematics among adolescents. While,, adolescents' utilization of ICT resources (i.e. the culture of using these available ICT resources among the students) was also not efficacious in boosting academic achievement in Mathematics; however, the joint effect of *the availability and utilization of ICT resources* was

not significant on the *adolescents' Mathematics achievement;*

Recommendations

Based on the findings and conclusion in this study, it would be appropriate to recommend that:

1. Federal and State governments should provide the information and communication technology (ICT) facilities needed in the secondary school to enhanced effective teaching and learning for national development.
2. Teachers and ICT experts should be employed by the federal and state governments, and deployed to our secondary schools for effective utilization of the ICT facilities available.
3. Electricity distribution companies in Nigeria should as a matter of urgency connect every secondary school with electricity. Besides, standby generators with adequate fuel storage and security should be provided in every school to ensure uninterrupted power supply.
4. Teachers should be adequately trained on the use of ICT facilities for teaching and learning to enhance national development.
5. School owners and major stakeholders (i.e. the Nigerian Government) in the education sector should make much emphasis on everyday use of the available ICT resources in secondary schools. Taking it to a greater dimension, they should encourage the idea of bringing laptops to schools so that each student can have easy access to online learning resources in time.
6. School Teachers should ensure that they update their knowledge bank with cutting edge teaching techniques on how to utilize these available ICT resources maximally.
7. Students should cultivate the habit of exploring depths of knowledge on how best to utilize these available ICT resources maximally beyond the limit of what their school teachers can reveal to them. .
8. The Nigerian Government/Ministry of Education should organize technology-related trainings and seminars which will help them to imbibe the ethics of planning their day-to-day lessons with tech practices in view.
9. Parents should make every worthwhile effort to give their children get laptops for their children to that they can extend their practices of offline and online ICT resources at home.

Implications for Sustainable Educational Development

Based on the findings and conclusion on the present research, it has been established that:

- Availability of ICT resources is sine qua non (i.e. absolutely necessary) for the realization of any worthwhile academic achievement in Mathematics and sustainable educational development among adolescents. Okorosaye-Orubite (2017
- Utilization of the ICT resources can never be possible without the availability of these ICT resources (offline and online) both in the school and at home for sustainable educational development among adolescents.

- Accessibility to these ICT resources is a driver of any possible utilization of the ICT resources (offline and online) both in the school and at home sustainable educational development among adolescents.

- There is the need for Nigerian students to develop positive attitude toward mathematics as a subject because every –one no matter the profession needs rudimentary knowledge of mathematics in day to day activities for sustainable and educational development.

Hence, the availability and utilization of ICT towards attaining good achievement in mathematics" needs to be given both longitudinal and cross-sectional reviews. This will go a long way to bring out the real determinants of the construct and sustainable educational development among   adolescents.

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