



# Application of Information and Communication Technology (ICT) in teaching Geography in Secondary Schools in Obio/Akpor, Rivers state, Nigeria

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## Abstract

This study—“Application of Information and Communication Technology (ICT) in teaching Geography in Secondary Schools in Obio/Akpor, Rivers state, Nigeria” is aimed at portraying Information and Communication Technology (ICT) as a key resource in the effectual teaching of Geography in Secondary Schools. In doing this, the researchers employed a descriptive survey research design. The study was guided by four (4) research questions. The population of the study comprised 240 Geography teachers drawn from all the public and private Senior Secondary Schools in Obio/Akpor, Rivers State. It was later sampled to 60 Geography teachers using proportionate stratified random/probability sampling technique. The researchers in the course of the study employed the use of a sixty (60) item questionnaire as the instrument for data collection. The instrument was validated, having a reliability index of 0.83. It was then administered and the data collected analyzed using mean and percentage. At the end of the analysis, it was revealed that Information and Communication Technology (ICT) can be best applied in teaching virtually all areas in Geography; that Information and Communication Technology (ICT) applied in teaching Geography in secondary schools has enormous and positive effects; that its application is not without a challenge, but that the challenges can be resolved with some measures, among which are inclusion of Information and Communication Technology (ICT) in Geography curriculum and more especially, Geography teachers’ education curriculum; training and retraining of Geography teachers on the application of Information and Communication Technology (ICT) in Geography education; engagement of only trained, certified and qualified Geography teachers in teaching Geography; provision of enough fund for the procurement and maintenance of Information and Communication Technological (ICT) tools and facilities; motivation of teachers through prompt remuneration, allowances, incentives, aids and grants; etc.

**Keywords:** Application, ICT, Teaching, Geography, Secondary Schools, Obio/Akpor, Rivers state, Nigeria.

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## INTRODUCTION

The world is rapidly growing into a global village with the emergence of Information and Communication Technology (ICT). Information and Communication Technology popularly known by its acronym 'ICT', is a universal concept. This is so because it is seen to be in operation in most fields of study and organizations across the globe. It is a system derived from the intermingling of Information Technology (IT) and Communication Technology (CT). It is defined as the application of electronic media [Computers, telecommunication gadgets, digital media, mobile devices, Personal Digital Assistants (PDAs), etc.] in the acquisition, processing, storage, retrieving, and dissemination of Information. It consists of those software and hardware technologies that support the purposeful communication of Information.

Geography is one of the subjects taught at the senior secondary level of Nigerian education. It has a broad syllabus which deals with virtually every phenomenon within the earth crust. Hence, it is said that everything that can be located on the surface of the earth (i.e. geo-referenced) can be studied in Geography. The word Geography is derived from two Greek words – 'Geo' meaning 'Earth' and 'Graphe' meaning 'to describe'. Etymologically, it is defined as the description of the earth. It was however first used by scholars at the Museum in Alexandria, Egypt in about 300BC, although its study as a distinct discipline in tertiary institutions started in the 15<sup>th</sup> century. Many scholars and practitioners of Geography have overtime come up with diverse definitions of Geography. This is because of the dynamic scope of Geography. Emphasizing on the broad and ever-changing scope of Geography, Wizer (2017) stated in his unpublished lecture module on Contemporary Philosophy and Methodology of Geography that "the ever-changing nature of the field of Geography, its scope, content and methodological approach has made a static definition of Geography irrelevant". As such, different scholars have overtime given their own definitions of Geography as it relates to time (i.e. temporal) and space (i.e. spatial). Adeyemo (2002:4) gave one of such definitions as a "discipline which is primarily concerned with the observation and analysis of spatial patterns of virtually all phenomena on the earth's surface; the processes involved, the underlying factors, as well as the possible effects of the spatial processes and patterns". A more contemporary definition is however given as, the study of Man, his environment (Cultural–Sociofact, Mentifact and Artifact–and Physical – Biotic and Abiotic), and the relationship (interaction, interconnection and interdependency) that exist between them.

The internal logic of Geographic study has tended to split the subject into Physical and Human geography. The physical geography tends to study the natural features of the earth's crust. It studies the spatial processes and patterns in the natural environment. On the other hand, the human geography studies the activities of Man on earth. It focuses on how man's activities on earth are been influenced by his environment, and how the activities in turn affect the environment. Geography as been studied in the senior secondary level of Nigeria's education system is of the following importance to the students:

- It provides the platform for the students to study the way of life of other people.
- It provides the students with the knowledge of the physical environment around them.
- It provides the students with diverse opportunities of professional careers to choose from.
- It is a platform for the students to study the social environment around them.
- It creates the platform for better understanding of related concepts in other subjects.

- The knowledge and skills gotten from Geography can help the students in international relationship (Iwena, 2012).

Due to the broad nature of Geography and its relevance to the society, it is imperative that Geography teachers adopt and apply the best possible methodologies in teaching the subject. This is to arouse the students' interest, facilitate their learning and reduce to the barest minimum the boredom that the students may encounter as a result of the broad scope of the subject. They need to update and acquaint themselves with the recent developments and trends of development (inventions and innovations) in the discipline. One of such developments is the application of Information and Communication Technology (ICT) in teaching Geography.

The 21<sup>st</sup> century education emphasizes a technological-based education that is problem-solving. Its curriculum is intended to develop in the students a higher order thinking skill, an effective communication skill, and the knowledge of technology that they will need for 21<sup>st</sup> century careers and the increased globalized environment. The 21<sup>st</sup> century Geography teachers are expected to be tech-savvy, computer literate, and at the cutting edge of Geography education. They should operate learner-centred classrooms and personalized instructions, learn and apply new technologies, go global and digital, be smart with the use of technology, collaborate and connect with the world, be innovative, and keep learning thereby changing the role of Geography teachers from repertoires of knowledge to facilitators of knowledge. More so, the 21<sup>st</sup> century Geography education has a number of modern technologies that are geared toward enhancing teaching and learning of Geography of which, Information and Communication Technology (ICT) is one of them. Hence the 21<sup>st</sup> century Geography teachers are expected to adequately and appropriately utilize the technologies in their classroom interactions for effective teaching. It is in this vein that this study tends to orient Geography teachers on the gains of the application of Information and Communication Technology (ICT) in teaching Geography in secondary schools, with the aim of portraying Information and Communication Technology (ICT) as a key resource in the effectual teaching of Geography in secondary schools. The objectives include: to identify the areas (concepts/topics) in Geography that Information and Communication Technology (ICT) can be best applied in teaching Geography in secondary schools in Obio/Akpor, Rivers state; to determine the effects of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers state; to analyse the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers state; and to proffer solutions to the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers state.

### **Educational Technology**

The concept of Information and Communication Technology (ICT) in teaching Geography can be best understood when we look at it from the aspect of Educational Technology. It is from the concept of Educational Technology that Information and Communication Technology (ICT) in Education derived its root. Educational Technology is born out of three different perceptions: the Product view/Media technology of Educational Technology, the Process view/Instructional technology of Educational Technology, and the System's Approach view. The Product view perceives educational technology to be synonymous to teaching aids, audio-visual materials, or instructional materials – an adjunct to the teacher to be used at will (Achuonye, 2004). Here,

Educational Technology is perceived as a catalogue of educational tools, equipments, gadgets, etc, that is to say, perceiving Educational Technology from the hardware approach. The Process view perceives Educational Technology as the application of learning theories to instruction thus, perceiving it from the software approach. The both approaches/views mentioned above are aspects of Educational Technology. The contemporary definition of Educational Technology is all encompassing hence, the System's approach. The System's approach view Educational Technology as the combination of the product and process views. It is a more holistic, goal-oriented and pragmatic perception of Educational Technology. Therefore System's approach perceives Educational Technology as the systematic application of both product and process in order to achieve efficient and effective learning.

Based on the foregoing, Educational Technology was defined as the “systematic process of organizing and managing both human and non-human resources and their environment in identifying and solving educational problems” (Achuonye, 2004:5). It is the application of science – technology – in making learning more efficient. The Association for Educational Communications and Technology (AECT) defined it as “a complex integrated process involving people, procedures, ideas, devices and organizations, for analyzing problems and devising, implementing, evaluating, and managing solutions to the problems, involved in all aspects of human learning” (AECT, 1977 in Ike, Chimezie, Iwu & Anulobi, 2012). To Ogunranti (1982) in Achuonye (2004), it is “a principle and method which brings together men and resources in a systematic bid to effectively resolve educational problems”. It is therefore “a process by which techniques and materials, both human and non-human, are used relatively to support and complement one another to make learning more effective and efficient” (Achuonye, 2004:6). Alessi and Trollop (2001) in Vikoo (2015:228) gave their own definition as “the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources”. However, a more contemporary definition is given by Olele and Abraham in Williams and Avwiri (2016) as the facilitation of learning and improving of students' performance through the use of technological tools and processes. For this they said, to be achieved, teachers need to understand how to create, use, and manage appropriate digital resources and activities, and also their affordances.

Information and Communication Technology (ICT) is an example of such technological tools or digital resources that can be applied in Education especially Geography education, to facilitate learning and improve students' performance. However, three essential types of knowledge are necessary for its effective application in teaching: Content knowledge (CK), Pedagogical knowledge (PK) and Technological knowledge (TK). They are incorporated into a single whole in the TPACK framework for technology integration in Education. TPACK focuses on the understanding of what is involved in teaching with technology thereby, forming the basis of effective teaching with technology. It emphasizes that the most effective uses of technology require a deep understanding of content and related pedagogical strategies. Therefore for effective application of Information and Communication Technology (ICT) in teaching Geography, the TPACK framework must be duly considered.

### **Information and Communication Technology (ICT) in Geography Education**

The internet and computer stand at the core of Information and Communication Technology (ICT). Computer however, is not the only Information and Communication Technological (ICT) tool, as erroneously perceived by many. According to Achuonye (2004) in Vikoo (2015),

Information and Communication Technology (ICT) is not one but many different complementary technologies that are all digital. They include, but not limited to: Fibre-optics, Laser-disc, Packet switching, Direct Broadcasting Satellite (DBS), Digital Satellite System (DSS), Multimedia technologies, etc. Hence, Vikoo (2015) defined it as the convergence of computer networking and telecommunications to process, store, retrieve and send information of all kinds. It is the intermingling of Information Technology (IT) and Communication Technology (CT). Information Technology (IT) as stated in United States of America (USA) report of 1997, cited in Achuonye (2004) is the collection, storage, processing, dissemination and use of information. It is the acquisition, processing, storing and dissemination of vocal, pictorial, textual and numeric information by a micro-electronic based combination of computers and Telecommunication (Achuonye, 2004). To Nwanji, Nweke and Waribo (2007), it defines those instruments which permit purposeful acquisition and application of information. Therefore, Information Technology (IT) can be seen as the use of electronic devices in acquiring, processing, storing and disseminating of information. Communication Technology (CT) on the other hand, defines the use of hardwares and softwares to send (share and transfer) information from one place to another; recording, storing, or retrieving it, as well as ensuring its security (Achuonye, 2004). It defines the use of telecommunication gadgets to disseminate and share messages, information, ideas, knowledge from one point (source) to the other (destination). Achuonye (2004) asserted that it consists of various channels through which messages, information, ideas and knowledge could be passed from a sender to the receiver. Information and Communication Technology (ICT) therefore brings Information Technology (IT) and Communication Technology (CT) into a single framework.

Chukwuebuka (2015) in Oledibe (2016) defined it as the application of various softwares and hardwares which support activities involving information. Oledibe (2016) gave her own definition as the various means by which information is communicated using technology. Olele and Abraham in Williams and Avwiri (2016) also defined it as different types of digital tools and resources which are used for storing, managing, and for communication. To Ndioho in Williams and Avwiri (2016), it is a complex system involving gathering of information and transmitting same to the global community. It covers a wide range of complementary contemporary technology derived from the handling and processing of information by means of electronic gadgets and communication devices such as Computer, Camera, Telephone, Flat screen television, Scanning machine, etc (Dike & Arokoyu, in Williams & Avwiri, 2016). It emphasizes the integration of telecommunications, computers as well as necessary enterprising software, which allows users to access, store, transmit and manipulate all relevant information (Obafemi & Avwiri, in Williams & Avwiri, 2016). Hence, from the above definitions, it can be deduced that Information and Communication Technology (ICT) involves those hardware and software technologies that permit the purposeful acquisition, management, application and communication of information.

Information and Communication Technology (ICT) represents the building block of modern society, as it cuts across every facet of human endeavours, which include teaching and learning. It is an essential tool in transmitting a country into a knowledge-based society. As such, the emergence of Information and Communication Technology (ICT) in Education reflects a paradigm shift in the teaching profession. The infusion of Information and Communication Technology (ICT) in Education has redefined the society's expectations about what it means to be an educated person. Thus, one basic requirement of present day Education is to prepare learners for participation in a networked, information society in which knowledge will be the

most critical resource for social and economic development. The application of Information and Communication Technology (ICT) in teaching and learning is a viable tool for uplifting the standard of Education in any nation including Nigeria. No wonder many countries are already keying into it especially those of the developed world. It is therefore defined as the use of Information and Communication Technological (ICT) tools in a brand new way to teach students digital literacy, and how to share content with the world. It emphasizes the whole range of facilities or technologies involved in information processing and dissemination, so as to achieve educational potentials (Nworgu, 2008 in Oledibe, 2016).

It is also seen as a modernized procedure by which a teacher prepares, delivers and evaluates his/her instruction using some Information and Communication Technological (ICT) tools. It provides the students with the 21<sup>st</sup> century skills needed to be relevant in the labour market. It is therefore a necessity as it has replaced the limiting walls of the classroom by introducing long distance learning, and other computer-based learning patterns. It enables teachers and indeed Geography teachers, to improve their instruction to students and update their knowledge, skills and aptitudes, for effective teaching. It digitizes the curriculum and teaching profession, especially as it concerns Geography education. It is therefore imperative and pertinent that Geography teachers apply Information and Communication Technology (ICT) in their instructional processes and classroom interactions. This is because the 21<sup>st</sup> century students are regarded as digital natives because they are born into technology, whereas the teachers are seen as digital immigrants because they were not born but rather, came into technology.

Angwin (2013) and Norwich, Dudley, Ylonen and Annaman (2014) in Dambudzo (2014) asserted that the interest generated by Information and Communication Technology (ICT) in teaching has reduced truancy and absenteeism by learners significantly. A review of literatures according to Dambudzo (2014) has shown that the use of Information and Communication Technology (ICT) especially Geographic Information System (GIS) in teaching Geography enhanced learners' engagement and motivation to learn Geography. This is as shown in the diagram below:

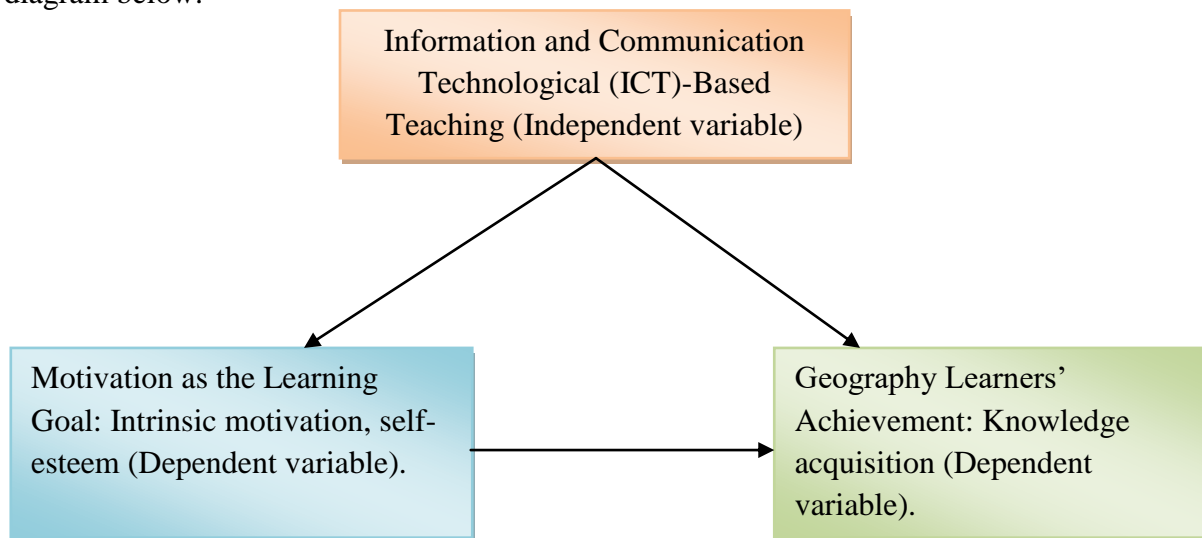


Figure 1: Conceptual framework for assessing the impact of Information and Communication Technology (ICT) on Motivation and Achievement (Adapted from Singh and Penny Van Bergen, 2013 in Dambudzo, 2014).

Bada, Adewole and Olalekan (2009) outlined the importance of Computer - Information and Communication Technology (ICT) – in teaching and learning to include:

- Helping students to learn at their own pace.
- Promoting individualised instructions through personalised responses to learners' action to yield a high rate of reinforcement.
- Putting more information in the hands of teachers.
- Providing a more positive affective climate especially for slow learners.
- Allowing students' control over the rate and sequence of their learning.
- Giving appropriate feedback.
- Producing significant time saving over conventional classroom instruction.

Thus, application of Information and Communication Technology (ICT) in teaching Geography should be an integral part of Geography education. However, Information and Communication Technology (ICT) in teaching will only be effective as the teacher using it, which in this case is the Geography teacher. This is because the effective use of Information and Communication Technology (ICT) requires careful planning from the teacher, especially in terms of lesson objectives, lesson contents, learning resources, learning environments, and learning experiences. Conducive learning environments are very much needed for effective application of Information and Communication Technology (ICT) in the classroom.

The teacher (Geography teacher) must also be acquainted with the affordances of the various Information and Communication Technological (ICT) tools for appropriate, suitable and effective utilization hence, the dire need for the inclusion of Information and Communication Technology (ICT) in Teacher's education (Geography teacher's education), to equip prospective teachers with the relevant skills and knowledge needed to effectively apply Information and Communication Technology (ICT) in teaching. Rue (2014) in Dambudzo (2014) asserted that teachers needed a sound understanding of the tools available and their utilization for pedagogy which to him, without such an understanding, the learning and teaching tools such as Computers may become part of the problem rather than part of the solution to improve learning. This however erases the fear of teachers that technology will someday replace their role in the classroom thereby displacing them from their most cherished job.

Kersh (1995) cited in Bada, et al (2009) reacting to this, asserted that the classroom teachers will never be replaced by programme of self-instruction but will rather be freed to guide the learning of their students in ways that only a human being can. Still emphasizing on that, Benmaman (1992) and Wynn (1999) all in Bada et al (2009) posited that teachers cannot be removed from effective instructional positions they occupy irrespective of the level of technology because of the paramount role they play in teaching and learning processes. It is to remove this fear from teachers and to curb the perceived challenges the fear will pose to Education through the resistance of technological changes by teachers that Bada, et al (2009) recommended that the government and employers of labour should employ only applicants with Educational degrees as teachers.

## **Modes of applying Information and Communication Technology (ICT) in teaching Geography in Secondary Schools**

Teaching is a pedagogical process. It is an art of instructing learners. Iloabuchi, Abraham and Afangideh (2016) posited that a teaching staff (teacher) is one who guides others in gaining knowledge, skills and abilities that are necessary for possible adjustments in the society for future development. They further defined a teacher as a trained person employed to facilitate learning in classroom situation in order to achieve set educational goals. Therefore a teacher must be trained and certified in the art of teaching for him/her to be qualified to practice as a teacher. Madumere-obike, Nwabueze and Ukala (2013) in Iloabuchi et al. (2016) gave their own definition of a teacher as one who facilitates the acquisition of desirable knowledge and skills, and inculcates societally acceptable attitudes into the learners for present and future development. Therefore teaching as an art defines the facilitation of knowledge and development of skills in learners, for the present and future development of themselves and the society. Clark and Starr (1970, p. 4) in Awotua-Efebo (1999) in defining teaching posited that, it is “an attempt to help people acquire some skills, attitudes, knowledge, ideas or appreciation”. Therefore teaching Geography entails an attempt to help Geography students acquire geographic skills, attitudes, ideas, and knowledge. It explains facilitating geographic knowledge and developing geographic skills in Geography students. It is the pedagogy of Geography.

Igwe (2013, p. 1) asserted that “the teacher is indeed an indispensable element in curriculum development ...”. Therefore Geography teachers remain indispensable elements in the planning, developing, implementation and evaluation of Geography curriculum. This is because the subject (Geography) maintains a broad curriculum, which for its effectual implementation at the senior secondary level of Nigerian education, the application of Information and Communication Technology (ICT) in its pedagogy is very pertinent. Its broad course (lesson) content is seen in its various definitions postulated over time by different scholars and practitioners, as relating to time (temporal) and space (spatial). Some of such definitions is given by Ackerman (1963) in Adeyemo (2002) describing Geography as “... an understanding of the vast interacting system comprising all humanity and their natural environment on the surface of the earth”. Harvey (1973), Abler et al (1977), Onyemelukwe and Filani (1983) all in Adeyemo (2002:3) also gave theirs as concerning ‘the what’, ‘the where’, ‘the how’, and ‘the why’ of phenomena on the earth’s surface. Hence, to effectively transmit geographic knowledge and skills and achieve the goals of Geography education, Geography teachers must acquaint themselves with the knowledge and skills of Information and Communication Technology (ICT), and apply same in their instructional processes. This can be applied through the following modes:

**As an Instructional Tool:** Information and Communication Technology (ICT) can be used in the instructional process to enhance teaching, professionalise the teacher and the teaching profession, and improve the students’ performance. It can be used in planning, developing and presenting the lesson, as well as managing the learning experiences and evaluating the instruction. These can be done using Information and Communication Technological (ICT) tools like Slides, Projectors, Televisions, Electronic/Interactive White boards, Computerized Blackboards, Computer systems, Routers, Modems, Smart phones, Remote Chalk boards, Personal Digital Assistants (PDAs), Digital maps, Presentation softwares, Spreadsheets, Word processors, Social networking apps, Desktop publisher, Virtual classrooms/E-classrooms, Virtual



fieldtrips and laboratories, Computer-Based Instruction (CBI), Computer-Managed Instruction (CMI), Computer-Assisted Teaching (CAT), Computer-Assisted Instruction (CAI), Computer-Based Testing (CBT), Geographic Information System (GIS), Remote sensing, Computerized Cartography, Graphic softwares, E-Tutorials, Games and Simulation softwares, Models, etc.

**As a Communication tool:** There can't be teaching without communication. Therefore communication is key to teaching. The communication process must be clear, devoid of noise, and free from other barriers of communication for teaching to be effective. The communication channel must be such that will integrate the teacher and students in the process, through a democratic framework. Information and Communication Technologies (ICTs) like Smart phones, Computer systems, Projectors, Televisions, Tablets, Interactive White boards, Slides (Screens), Public Address systems (PA systems), Ipads, Personal Digital Assistants (PDAs), Router, Modem, Web 2.0, Video conferencing, Teleconferencing, E-mails, Skype, Social networking apps, etc, can be applied to enhance communication, bridge the communication gap, overcome the barriers of communication, break the limiting walls of face-to-face communication, and promote long distance communication.

**As a Research tool:** Research is an investigation into a particular problem with the aim of finding solution(s) to the problem. It is a platform for teachers to update themselves and professionalise their career. An effective research requires data acquisition and analysis, and information presentation. The use of Information and Communication Technologies (ICTs) like Computer systems, Smart phones, Tablets, Ipads, Router, Modem, Digital cameras, Circuit Camera Televisions (CCTVs), Photogram, Search engines (Google, Bing, etc.), Browsers (Firefox mozilla, Opera, Microsoft internet explorer, UC browser, CM browser, Google Chrome, etc.), Plug-ins (pdf reader, Adobe reader, WPS, VLC media player, etc.), E-books, Virtual fieldtrips and laboratories, Virtual libraries, GPS reader, Surfing softwares, Problem-solving softwares, Google Earth, Geographic Positioning System (GPS), etc, can help acquire and analyse data, as well as present information needed for research and problem-solving purposes.

**As a Storage tool:** Instructional designs, communicated messages, research reports, evaluation reports, etc, cannot just be discarded after first usage. They must be kept and stored for future reference purposes, in order to grow and develop skills continually. Such files (information) can be stored in Information and Communication Technologies (ICTs) like Flash drives, CD Roms, External Hard disks, Mini storage device (SD) cards, Micro storage device (SD) cards, Smart phones, Tablets, iPhones, Ipads, Computer systems, Word processors, Database Managements (DBMs), Spreadsheets, Graphic software's, etc.

### **Requirements for the application of Information and Communication Technology (ICT) in teaching Geography in Secondary Schools**

The affordances of Information and Communication Technology (ICT) are enormous that if not properly and carefully harnessed, can be misleading. It must be mentioned here that not all the affordances of Information and Communication Technology (ICT) are academically wholesome. As such, care must be taken to select the best possible affordances and effectively harness the powers of Information and Communication Technology (ICT). To do this, Abraham (2017) in

her unpublished lecture note on Computer in Education, outlined three (3) conditions that must be met as follows:

- Teachers and students must have unlimited access to digital technologies and the internet in their classrooms, schools and Teacher's education institutions.
- High quality, meaningful and culturally responsive digital content must be available for teachers and learners.
- Teachers must have the knowledge and skills to use the new digital tools and resources to help all students achieve high academic standard.

The above conditions have implications for students, teachers, and even school administrators. Vikoo (2015) highlighted some of the implications for the teachers to include:

- The teacher should choose technology with an eye towards how it can help students actively explore, construct, and restructure information.
- The teacher should look for collaborative and real-world learning.
- The teacher should choose technology that presents positive models for students.
- The teacher's teaching skills are critical, regardless of the technology used.
- The teacher should continue to learn about technology and increase his/her technological competencies.

The International Society for Technology in Education (ISTE) (2008) posited the following standards for teachers using technology in Education:

- Teachers should facilitate and inspire students' learning and creativity.
- Teachers should design and develop digital age learning experiences and assessments.
- Teachers should model digital age work and learning.
- Teachers should promote and model digital citizenship and responsibility.
- Teachers should engage in professional growth and leadership.

### **Statement of the Problem**

The teaching profession has overtime experienced drastic changes. These changes are been reflected on the role of the teachers, the classroom activity and communication process, and the teaching methodologies. Today, the role of teachers has changed from repertoires to facilitators of knowledge. The classroom activity has now taken the form of interaction between the teacher and students rather than mere instruction as it used to be, with the communication process incorporating both the teacher and the students. The teaching methodology has not also been left-out in the trend of changes. The philosophical (conventional) methods of teaching have been fortified with psychological (innovative) methods that are more contemporary. These contemporary psychological methods emphasize the use of technology of which, Information and Communication Technology (ICT) is a part of. As such, they focus on delivering to the students the four Cs of learning (Communication, Collaboration, Critical thinking, and Creativity) even as been reflected in Geography teaching.

Application of Information and Communication Technology (ICT) in teaching Geography in secondary schools is a contemporary methodology in the pedagogy of Geography.

It reflects a paradigm shift in Geography education. It means using technology in a brand new way to teach Geography students digital literacy, and fortifying them with the skills needed in the 21<sup>st</sup> century technological-based labour market. It however has its effects and challenges which it poses to Geography education and educators alike. It is in vein of these, that this study is saddled with the problem of discovering those areas (concepts/topics) in Geography that Information and Communication Technology (ICT) can be best applied, unraveling those effects and challenges of applying it in teaching Geography in secondary schools, and then proffering possible solutions to the challenges.

### **Research Questions**

To duly and effectively investigate the problem of this study, the following research questions were formulated:

- Which areas (concepts/topics) in Geography can Information and Communication Technology (ICT) be best applied in teaching Geography in secondary schools in Obio/Akpor, Rivers state?
- What are the effects of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers state?
- What are the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers state?
- What are the possible solutions to the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers state?

### **METHODOLOGY**

The researchers adopted a descriptive survey research design for this study with the aim of describing the effects and challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers state, using a sample of both public and private senior secondary Geography teachers' population in Obio/Akpor, Rivers state. The population consists of Geography teachers in all public and private senior secondary schools in Obio/Akpor, Rivers state which is 240 (20 public senior secondary school Geography teachers and, 220 private senior secondary school Geography teachers).

The population is sampled to 60 Geography teachers using Proportionate Stratified Random/Probability Sampling technique. The sampled population represents  $\frac{1}{4}$  or 25% of the population. The population was first divided into public and private senior secondary school Geography teachers using Stratified Random/Probability Sampling technique with the public having 20 Geography teachers, and the private having 220 Geography teachers. The researchers then used Proportionate Stratified Random/Probability Sampling technique to proportionately sample  $\frac{1}{4}$  or 25% of the public and private senior secondary school Geography teachers. The sampling arrived at 5 Geography teachers for public senior secondary schools, and 55 Geography teachers for private senior secondary schools, making the sample 60 Geography teachers. However, in selecting the actual respondents, who happen to be the sampled Geography teachers, from the list of the population, the researchers employed Convenience Non-Random/Non-Probability Sampling technique to pick the 60 Geography teachers at their convenience.

The instrument employed by the researchers to collect data for this study is questionnaire. The questionnaire is titled ‘Questionnaire on application of Information and Communication Technology (ICT) in teaching Geography in secondary schools’ (QAICTTGSS). It is divided into two (2) sections. The first section – Section A – focused on gathering information about the respondents, while the second section – Section B – which contains sixty (60) items focused on gathering the respondents’ responses to the research questions. The responses in Section B are weighed on a modified Likert 4-point rating scale, having Strongly Agree (SA) with 4points, Agree (A) with 3points, Disagree (D) with 2points, and Strongly Disagree (SD) with 1point. The instrument was subjected to a validity test by some test experts. It is based on the professional comments, corrections and modifications of the test experts that the instrument was adjudged valid. The test-retest method of reliability was employed to test the reliability of the instrument.

To do this, 5 copies of the instrument for data collection were administered to a different set of respondents, outside the sample. Within two (2) weeks interval, the instrument was again re-administered to the same set of respondents. The responses of the first administration of the instrument and that of the second administration were correlated using Pearson Product Moment Correlation Coefficient to obtain the Coefficient of Stability of the responses of both administrations. The Coefficient of Stability, after computations, was 0.83, meaning that the instrument for data collection has a high reliability index, and as such is highly reliable.

The data collected for this study through the use of the questionnaire were organised, analysed, and presented in tables. The questionnaire’s items have a mean rating scale of 2.50, which is used as the Criterion mean to analyse the responses of the respondents to the items. Thus, any item on the questionnaire with a Weighted mean ( $W\bar{x}$ ) above the Criterion mean ( $C\bar{x}$ ) of 2.50 is agreed with, while those with Weighted mean ( $W\bar{x}$ ) below 2.50 are disagreed with. The Criterion mean ( $C\bar{x}$ ) is illustrated below:

$$\text{Criterion mean } (C\bar{x}) = \frac{SA+A+D+SD}{4} = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.50$$

More so, to authenticate the Mean rating scale, the researcher also used Percentage analysis to obtain the Percentage Agreed (%a) and Disagreed (%d). The total Weighted mean ( $W\bar{x}$ ) on the questionnaire was also computed to obtain the Aggregate Weighted mean ( $A\bar{x}\bar{x}$ ), while the Percentage Agreed (%a) and Disagreed (%d) were also computed to obtain the Aggregate Percentage Agreed (A%a) and Disagreed (A%d).

## RESULTS

The researchers employed mean rating scale and percentage statistics in analysing the data collected for this study. Out of the 60 Geography teachers sampled for this study, only 51 of them were administered questionnaire. Among the 51 copies of the questionnaire administered, only 44 copies were retrieved.

### Research Question 1

Which areas (concepts/topics) in Geography can Information and Communication Technology (ICT) be best applied in teaching Geography in secondary schools in Obio/Akpor, Rivers State?

Table 1: Mean rating scale and percentage analysis of respondents' responses to research question one (1) - which areas (concepts/topics) in Geography can Information and Communication Technology (ICT) be best applied in teaching Geography in secondary schools in Obio/Akpor, Rivers State

S/N	ITEMS	SA	A	%	D	SD	%d	$\bar{w}\bar{x}$	REMARK
1	Concepts in Physical geography like Rocks, Landforms, Soil, Vegetation, Weather and Climate, Drainage, etc can best be taught using ICT tools like Digital maps, Computerized models, GIS, etc.	22	19	93.2%	3	-	6.8%	3.43	Agreed
2	Concepts in Human geography like Population, Settlement, Transportation, Trade, Industrialization, Urbanization, etc can best be taught using ICT tools like Computerized models, Digital maps, GIS, Remote Sensing, etc.	19	20	88.6%	5	-	11.4%	3.32	Agreed
3	Concept of Regional geography can best be taught using ICT tools like Digital Maps, GPS, Google Earth, Remote Sensing, etc.	29	14	100%	-	-	-	3.68	Agreed
4	Concepts of Mapping and Surveying can best be taught using ICT tools like Digital Maps, Computerized Cartography, Remote Sensing, GPS, Google Earth, GIS, etc.	27	13	95.2%	1	1	4.8%	3.57	Agreed
	<b>Aggregates</b>			<b>94.3%</b>			<b>5.7%</b>	<b>3.5</b>	<b>Agreed</b>

From the above table, it is clear that Information and Communication Technology (ICT) can be best applied in teaching virtually all areas (concepts/topics) in Geography. This can be seen in the weighed mean and percentage agreed and percentage disagreed of the questionnaire's items which show that the questionnaire's items are been agreed with. It can also be seen in the aggregate weighed mean of 3.5, aggregate percentage agreed of 94.3% and aggregate percentage disagreed of 5.7% which all show an aggregate agreement that Information and Communication Technology (ICT) can be best applied in teaching virtually all areas (concepts/topics) in Geography.

## Research Question 2

What are the effects of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers State?

Table 2: Mean rating scale and percentage analysis of respondents' responses to research question two (2) - what are the effects of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers State

S/N	ITEMS	SA	A	%a	D	SD	%d	$w\bar{x}$	REMARK
5	Application of ICT in teaching Geography in secondary schools will arouse students' interest in the subject.	27	15	97.7%	1	-	2.3%	3.60	Agreed
6	Application of ICT in teaching Geography in secondary schools will facilitate students' learning.	26	18	100%	-	-	-	3.60	Agreed
7	Application of ICT in teaching Geography in secondary schools will digitalize the lesson.	13	21	79.1%	8	1	20.9%	3.07	Agreed
8	Application of ICT in teaching Geography in secondary schools will break the limiting walls of the classroom.	17	18	79.5%	7	2	20.5%	3.14	Agreed
9	Application of ICT in teaching Geography in secondary schools will make the students active in classroom interaction.	23	18	93.2%	3	-	6.8%	3.45	Agreed
10	Application of ICT in teaching Geography in secondary schools will effectively develop the students' cognition.	17	22	90.7%	4	-	9.3%	3.30	Agreed
11	Application of ICT in teaching Geography in secondary schools will make the students creative.	17	20	86%	4	2	14%	3.21	Agreed
12	Application of ICT in teaching Geography in secondary schools will make the lesson lifelong.	13	24	88.1%	2	3	11.9%	3.12	Agreed
13	Application of ICT in teaching Geography in secondary schools will make the transfer of learning in students very productive.	20	23	100%	-	-	-	3.47	Agreed
14	Application of ICT in teaching Geography in secondary schools will make the students to collaborate effectively with one another.	12	28	90.9%	3	1	9.1%	3.16	Agreed
15	Application of ICT in teaching Geography in secondary schools will professionalise the teaching profession.	13	21	79.1%	8	1	20.9%	3.07	Agreed
16	Application of ICT in teaching Geography in secondary schools will enhance the teacher's teaching skill.	28	14	97.7%	-	1	2.3%	3.60	Agreed
17	Application of ICT in teaching Geography in secondary schools will minimize students' boredom in the subject.	18	23	93.2%	3	-	6.8%	3.34	Agreed
18	Application of ICT in teaching Geography in secondary schools will increase students' motivation in studying the subject.	21	20	93.2%	3	-	6.8%	3.41	Agreed
19	Application of ICT in teaching Geography in secondary schools will make learning more effective.	18	23	93.2%	2	1	6.8%	3.32	Agreed
20	Application of ICT in teaching Geography in secondary schools will take learning out of the teacher-managed classroom.	18	16	77.3%	7	3	22.7%	3.11	Agreed
21	Application of ICT in teaching Geography in secondary schools will promote open distance	17	24	93.2%	1	2	6.8%	3.27	Agreed

	learning.								
22.	Application of ICT in teaching Geography in secondary schools will make information sharing and transfer effective and easy.	23	20	97.7%	1	-	2.3%	3.50	Agreed
23	Application of ICT in teaching Geography in secondary schools will imbibe in the students problem-solving skills.	15	22	86%	5	1	14%	3.19	Agreed
24	Application of ICT in teaching Geography in secondary schools will improve classroom communication.	13	24	88.1%	5	-	11.9%	3.19	Agreed
25	Application of ICT in teaching Geography in secondary schools will stimulate discovery learning in the students.	20	21	97.6%	-	1	2.4%	3.43	Agreed
26	Application of ICT in teaching Geography in secondary schools will concretise and internalise the subject in the students.	16	24	90.9%	4	-	9.1%	3.27	Agreed
27	Application of ICT in teaching Geography in secondary schools will improve the teacher's instructional competence and proficiency.	31	12	97.7%	1	-	2.3%	3.69	Agreed
28	Application of ICT in teaching Geography in secondary schools will make both the teacher and students to be technologically-oriented.	28	14	95.5%	2	-	4.5%	3.60	Agreed
29	Application of ICT in teaching Geography in secondary schools will make abstract concepts in Geography to look real and easy to comprehend.	22	18	90.9%	4	-	9.1%	3.41	Agreed
30	Application of ICT in teaching Geography in secondary schools will bring the world closer to the students for their better understanding.	28	12	93%	2	1	7%	3.56	Agreed
31	Application of ICT in teaching Geography in secondary schools will enhance the high level cognitive domain in the students.	18	18	83.7%	6	1	16.3%	3.23	Agreed
32	Application of ICT in teaching Geography in secondary schools will provide the platform for the teacher to incorporate the Cognitive, Affective and Psychomotor domains in the lessons.	20	21	93.2%	3	-	6.8%	3.39	Agreed
33	Application of ICT in teaching Geography in secondary schools will make the subject to be interesting to teach and to learn.	23	19	97.7%	1	-	2.3%	3.51	Agreed
34	Application of ICT in teaching Geography in secondary schools will make the Geography teacher to stand out amongst his/her counterparts from other subjects.	21	15	85.7%	6	-	14.3%	3.36	Agreed
	<b>Aggregates</b>			<b>91%</b>			<b>9%</b>	<b>3.35</b>	<b>Agreed</b>

The table above shows that the effects of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools are enormous and positive. This is seen in the weighted mean, percentage agreed and percentage disagreed of the questionnaire items which agree with all the items. The aggregate weighted mean of 3.35, aggregate percentage agreed of 91% and aggregate percentage disagreed of 9% show an overall agreement to the items, meaning that Information and Communication Technology (ICT) has enormous and positive effects when applied in teaching Geography in secondary schools especially in Obio/Akpor, Rivers state.

### Research Question 3

What are the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers State?

Table 3: Mean rating scale and percentage analysis of respondents' responses to research question three (3) - what are the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers State.

S/N	ITEMS	SA	A	%a	D	SD	%d	$\bar{w}\bar{x}$	REMARK
35	Inadequate technological infrastructures is a challenge to applying ICT in teaching Geography in secondary schools.	28	15	97.7%	1	-	2.3%	3.61	Agreed
36	Unavailability of ICT facilities in schools is a challenge to applying ICT in teaching Geography in secondary schools.	30	13	97.7%	1	-	2.3%	3.66	Agreed
37	Uneasy access to internet facilities is a challenge to applying ICT in teaching Geography in secondary schools.	25	14	88.6%	5	-	11.4%	3.45	Agreed
38	Lack of fund for procuring ICT facilities is a challenge to applying ICT in teaching Geography in secondary schools.	20	22	95.5%	1	1	4.5%	3.39	Agreed
39	High cost of procuring ICT facilities is a challenge to applying ICT in teaching Geography in secondary schools.	17	25	95.5%	2	-	4.5%	3.34	Agreed
40	Lack of skilled manpower is a challenge to applying ICT in teaching Geography in secondary schools.	18	18	81.8%	6	2	18.2%	3.18	Agreed
41	Use of Untrained, Uncertified and Unqualified Geography teachers in teaching Geography is a challenge to applying ICT in teaching Geography in secondary schools.	16	16	72.7%	6	6	27.3%	2.95	Agreed
42	Poor teachers' motivation is a challenge to applying ICT in teaching Geography in secondary schools.	13	22	81.4%	7	1	18.6%	3.09	Agreed
43	Delayed teachers' salaries is a challenge to applying ICT in teaching Geography in secondary schools.	14	10	54.5%	14	6	45.5%	2.73	Agreed
44	Insufficient professional teachers is a challenge to applying ICT in teaching Geography in secondary schools.	12	19	72.1%	10	2	27.9%	2.95	Agreed
45	Unstable power supply is a challenge to applying ICT in teaching Geography in secondary schools.	24	17	93.2%	2	1	6.8%	3.45	Agreed
46	Students' technological background is a challenge to applying ICT in teaching Geography in secondary schools.	11	16	62.8%	15	1	37.2%	2.86	Agreed



47	Ethical implications of ICT in Education with regards to teenagers, is a challenge to applying ICT in teaching Geography in secondary schools.	9	8	38.6%	23	4	61.4%	2.50	Disagreed
	<b>Aggregates</b>			<b>79.4%</b>			<b>20.6%</b>	<b>3.17</b>	<b>Agreed</b>

It has become obvious, looking at the table that the application of Information and Communication Technology (ICT) in teaching Geography in secondary schools is not without challenges. These challenges impede and hinder the effectual, successful and plausible application of Information and Communication Technology (ICT) in teaching Geography in secondary schools. The respondents therefore agreed to all the items on the questionnaire as shown in the table above. The aggregate weighted mean of 3.17, aggregate percentage agreed of 79.4% and aggregate percentage disagreed of 20.6% all emphasize that there're challenges to the application of Information and Communication Technology (ICT) in teaching Geography in secondary schools especially in Obio/Akpor, Rivers state.

However, let it also be known that the challenge of ethical implications of Information and Communication Technology (ICT) in Education with regard to teenagers was disagreed with, meaning that it does not constitute a challenge to Information and Communication Technology (ICT) application in teaching Geography in secondary schools.

#### Research Question 4

What are the possible solutions to the challenges of applying ICT in teaching Geography in secondary schools in Obio/Akpor, Rivers State?

Table 4: Mean rating scale and percentage analysis of respondents' responses to research question four (4) – what are the possible solutions to the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools in Obio/Akpor, Rivers State.

S/N	ITEMS	SA	A	%a	D	SD	%d	$\bar{w}\bar{x}$	REMARK
48	Provision of technological infrastructures such as Computerized laboratories, Computerized Libraries, Electronic Resource and Research centres, ICT tools and facilities, etc is a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	31	13	100%	-	-	-	3.70	Agreed
49	Availability and accessibility of ICT tools and facilities to teachers and students is a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	28	16	100%	-	-	-	3.64	Agreed
50	Provision of internet facilities and creation of easy access to such facilities is a possible solution to the	28	16	100%	-	-	-	3.64	Agreed

	challenge of applying ICT in teaching Geography in secondary schools.								
51	Enough fund should be channeled to procuring ICT facilities as a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	28	15	97.7%	1	-	2.3%	3.61	Agreed
52	The cost of procuring ICT facilities should be subsidized by government agencies and corporate bodies as a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	27	16	97.7%	1	-	2.3%	3.59	Agreed
53	ICT should be included in Geography teachers' Education curriculum to trained pre-service teachers, while in-service teachers should undergo special training and retraining on ICT as a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	32	12	100%	-	-	-	3.73	Agreed
54	Only trained, certified and qualified Geography teachers should be employed to teach Geography as a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	22	15	90.2%	4	-	9.8%	3.44	Agreed
55	Motivation of teachers is a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	18	17	83.3%	7	-	16.7%	3.26	Agreed
56	Early payment of teachers' salaries is a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	14	17	72.1%	9	3	27.9%	2.98	Agreed
57	Teaching profession should be made lucrative to attract more professional teachers as a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	22	21	100%	-	-	-	3.51	Agreed
58	Standby power supply should be made available to schools as a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	25	18	97.7%	1	-	2.3%	3.55	Agreed
59	Students should be exposed to ICT right from their homes as a possible solution to the challenge of applying ICT in teaching Geography in secondary schools.	23	17	90.9%	4	-	9.1%	3.43	Agreed
60	Students especially teenagers, should be properly guided to the productive use of ICT as a possible solution to the challenge of applying ICT in teaching Geography in secondary	22	19	93.2%	3	-	6.8%	3.43	Agreed

	schools.								
	<b>Aggregates</b>			<b>94.1%</b>			<b>5.9%</b>	<b>3.50</b>	<b>Agreed</b>

The challenges of Information and Communication Technology (ICT) application in teaching Geography in secondary schools can however be remedied. This is as shown in the table above, which agrees to the solutions proffered by the researcher. The weighted mean, percentage agreed and percentage disagreed of the questionnaire items show that the respondents agreed to the possible solutions proffered by the researcher. This cumulated to the aggregate weighed mean of 3.50, aggregate percentage agreed of 94.1% and aggregate percentage disagreed of 5.9% showing the respondents' agreement to the possible solutions proffered by the researcher as regards the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools.

## DISCUSSION

It was found out after the research that Information and Communication Technology (ICT) can be best applied in teaching virtually all aspects of Geography. It was also found that there're Information and Communication Technological (ICT) tools that are already established to aid teaching and learning of Geography. To this end, Osodo, Indoshi and Ongati (2010) who carried out a study on application of computer based resources in Geography education in secondary schools, asserted that over the years, there has been a rapid growth in the range and sophistication of new Information and Communication Technologies (ICTs) in teaching and learning Geography. In support of this, Becta ICT Research (2004) and Dambudzo (2014) found from their separate researches on Information and Communication Technology (ICT) in the teaching and learning of Geography, that Information and Communication Technologies (ICTs) like Geographic Information System (GIS), simulation, computerized models, digital photography, internet, e-mail, virtual realities, etc. are already been used in teaching and learning Geography. It therefore implies that Geography teachers should intensify efforts in making use of Information and Communication Technological (ICT) tools and facilities in their classroom interactions. Nevertheless, there's still need for the production of more sophisticated and improved Information and Communication Technological (ICT) tools and facilities in teaching Geography. Hence, it behooves on Information and Communication Technology (ICT) practitioners and Geography educators to go into research in the production of more efficient, effective, reliable, and sophisticated Information and Communication Technological (ICT) tools and facilities for teaching and learning Geography, as well as publishing literatures on Information and Communication Technology (ICT) in Geography education.

It was also found out that Information and Communication Technology (ICT) application in teaching Geography has enormous and positive effects. These effects are reflected on the teacher; his profession, skill, competence and proficiency, the student; his learning, attitude and activities, the lesson; its curriculum, content and structure, and the general teaching and learning process. It was found from the study that application of Information and Communication Technology (ICT) in teaching Geography will facilitate learning, improve performance, enhance increased productivity and professionalise the Geography teaching profession. It is based on the effects of Information and Communication Technology (ICT) in Education that Gonlhi (2003) in Oledibe (2016) posited that Information and Communication Technology (ICT) is an effective instructional tool to engage students on a daily basis in the teaching/learning process. The finding corresponds to that of Karriah (2015) who found out, after researching on the effect of

the application of Mobile technologies in teaching and learning (a case study of Delta state University, Abraka), that there are benefits derived from the use of Mobile technologies [which also are Information and Communication Technologies (ICTs)], in teaching and learning. More so, the study of Nwanji, Nweke and Waribo (2007) on the relevance of Computer education in tertiary institutions in Rivers state (a case study of Rivers state University of Science and Technology, Faculty of Technical and Science Education, Port Harcourt) supports the finding, as it was revealed from their study that students who use computers to learn behave better and increase their motivation. The implication therefore is that, with the continuous and increased application of Information and Communication Technology (ICT) in teaching Geography, it will through its enormous effects go a long way to enhance and improve the standard of education especially as it relates to Nigerian education. It will also make the graduates from schools to be more technologically oriented and suitable for the labour market, thereby increasing the transition rate from the schools to the labour market and, reducing the gap and disparities that exist between the products of the schools and the materials for the labour market.

Another revelation from this study is that there are challenges which are constraints to the effectual, successful and plausible application of Information and Communication Technology (ICT) in teaching Geography. This finding is in line with the positions of Shavinina (2001), and Anumu (2008), all in Oledibe (2016) that cost, weak infrastructure, lack of skills, lack of relevant software, limited access to the internet and non-availability of Information and Communication Technological (ICT) resources in schools are challenges that impede and hinder the successful and actual utilization of Information and Communication Technology (ICT) in schools. These challenges as they also stated hinder, limit, impede and mitigate the application of Information and Communication Technology (ICT) in teaching Geography and as such, should be looked into. This was also the stance of Oledibe (2016) who studied the role of Information and Communication Technology (ICT) in teaching and learning in Community Secondary School, Okoro nu Odo, Obio/Akpor, Rivers state, Nigeria. Her study revealed that the problems encountered by the students and teachers in utilizing Information and Communication Technological (ICT) facilities in learning and teaching respectively are cost of Information and Communication Technological (ICT) facilities, lack of internet connectivity, poor funding of schools, lack of professional skilled manpower and inadequate infrastructure. By implication therefore, Geography educators, the government, relevant individuals and agencies should devise measures to tackle the challenges so that Information and Communication Technology (ICT) can be freely, effectively and successfully applied in teaching Geography without any hurdle.

More so, it was revealed that if certain measures are put in place, the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools will be a thing of the past. This is because there're possible solutions to the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools. These solutions have to do with: Staffing, which Abraham (2003) opined that the right person should be put in the right place in line with the ELP (Expertise, Location and Position) principle he proposed. Igwe (2013:1) also asserted that "no educational system can rise above the quality of the teachers"; Finance, which the Federal Republic of Nigeria (1981:44) in Abraham (2003) clearly stated that for any educational system to succeed, there must be proper planning based on reliable statistical data, effective administration and above all adequate financing; Motivation and Remuneration (prompt and early payment of teachers' salaries), which Abraham (2003) asserted that it's geared towards increasing people's efforts and performance, even as Igwe (2013:9) posited that "it is also

important for teachers to be highly motivated as this has a positive correlation on learner's achievement"; and many other measures that were found to be possible solutions to the challenges. The implication of this finding is that no matter how mighty the challenges of applying Information and Communication Technology (ICT) in teaching Geography in secondary schools may be, there're possible solutions to curtailing and possibly curbing the challenges, for an effectual, successful and plausible application of Information and Communication Technology (ICT) in teaching Geography in secondary schools especially in Obio/Akpor, Rivers state.

In a nutshell, Geography teachers/educators should apply Information and Communication Technology (ICT) in every pedagogy of Geography, at all times because of its enormous and positive effects on teaching and learning, not minding the challenges that it poses to them, having in mind that those challenges can however be solved by putting some measures in place.

## **CONCLUSION**

Based on the findings, as connected to the results of the analysed questionnaire's responses, it was concluded that Information and Communication Technology (ICT) can be best applied in teaching virtually all areas in Geography; that Information and Communication Technology (ICT) applied in teaching Geography in secondary schools has enormous and positive effects; that its application is not without a challenge, but that the challenges can be resolved with some measures been put in place. Some of these measures have been succinctly found to include staffing, financing, motivation, remuneration, etc.

## **Recommendations**

From the findings of this study, the researchers therefore recommend that:

- Information and Communication Technology (ICT) should be applied by every Geography teacher in their classroom interaction, to facilitate learning, improve performance, enhance increased productivity, and professionalise the Geography teaching profession.
- More effectual and sophisticated Information and Communication Technological (ICT) tools and facilities should be produced to tackle the perceived deficiencies in the available ones.
- Literatures on Information and Communication Technology (ICT) in Geography education and Geography pedagogy should be published to bridge the gap in literature.
- Information and Communication Technology (ICT) should be part of the Geography education and Geography teachers' education curriculum to train both Geography students and teachers alike on Information and Communication Technology (ICT) in Geography education.
- Trained, certified and qualified Geography teachers (i.e. professional Geography teachers) should be employed to teach Geography in line with the Teachers Registration Council of Nigeria (TRCN) Act.
- Information and Communication Technological (ICT) tools and facilities should be made available to schools, teachers and students.

- Adequate finance should be appropriated and allocated to schools for procurement and maintenance of Information and Communication Technological (ICT) tools and facilities.
- Standby power supply and internet facilities should be available in schools.
- Children and indeed students should be exposed to Information and Communication Technology (ICT) right from their homes.
- Teachers should be motivated especially in terms of prompt remunerations.
- Geography teachers/educators should form associations separate from the Association of Nigerian Geographers (ANG) and the Nigerian Union Teachers (NUT), just like the National Council of Geographic Education (NCGE) in the United States of America (USA) and the Science Teachers' Association of Nigeria (STAN), to always converge and carry out researches and other academic and professional activities.

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