AVAILABILITY AND UTILIZATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FOR EFFECTIVE TEACHING IN SECONDARY SCHOOLS IN RIVERS STATE: IMPLICATION FOR EDUCATIONAL PLANNING AND MANAGEMENT

BY

MICHAEL BEN
PG/EDU/220030

A DISSERTATION WRITTEN IN THE DEPARTMENT OF EDUCATION FACULTY OF ARTS AND EDUCATION AND SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF EDUCATION (M.ED) OF BENSON IDAHOSA UNIVERSITY BENIN CITY, EDO STATE, NIGERIA

MAY, 2023.

DECLARATION

I, **MICHAEL BEN**, do hereby declare that this dissertation is entirely my work and composition. The work embodied in this dissertation has not been submitted in candidature for any degree and is not concurrently being submitted for any other degree. All references are made to works of other persons have been duly acknowledged.

_____ _____

MICHAEL BEN **Date**

CERTIFICATION

We certify that this work is adequate in scope and content for the award of Master Education (M.Ed) Degree in Educational Administration and Planning in the Department of Education, Faculty of Arts and Education, Benson Idahosa University, Benin City, Edo State Nigeria.

_____ _____

PROF. Norah OMOREGIE **Date**
Project Supervisor

_____ _____

Dr. (Mrs) Chukujindu. Joyce OKAFOR **Date**
Head of Department

DEDICATION

This research work is dedicated to my lovely Mother.

ACKNOWLEDGEMENTS

The researcher is grateful to his project Supervisor, Prof. (Mrs.) Norah Omoregie for her efforts in the development and completion of this project work. The researcher is also grateful to the Head of Department of Education Dr (Mrs.) Chukujindu Joyce Okafor for her immense contribution to the success of this project work. The researcher also like to to appreciate all the wonderful and amiable lecturers in the Department of Education for their contributions to input towards the success of his academic work. Prof. M .U. Agbonkpolo, Prof. (Mrs.) Margaret I. Abikwi, Prof. (Mrs.) C. O. Duze, Mr. J. E. Edokpolor, Dr. J. Agboola, Dr. (Mrs.) A. Imafidon and Dr. C. Eruanga.

The researcher is also grateful to his lovely and caring mother , Hon. Grace Ekine for her supports and prayers and my Lovely Wife Ruth Loveday. the researcher also appreciates his children Peace Michael, Victory Michael. The researcher also appreciates his Pastor Rev. James Inetimi, and his uncle Col. Milland Dixon Former Presidential Amnesty Coordinator for making to be part of this scholarship program.

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ABSTRACT

This research examined the availability and utilization of information and communication technology (ICT) for effective teaching in secondary schools in Rivers West Senatorial District of Rivers State. Four (4) research questions were raised and two (2) hypotheses were formulated for the study. A correlational research design was adopted for this study. Data was collected through the use of questionnaire. The population of the study consists of 3000 teachers from the Senatorial District. 300 teachers which constitute 10% of the population was used as the sample for the study. Instrument used was a Questionnaire and using the Cronbach Alpha method for reliability procedure, the instrument yielded a coefficient of 0.83. The descriptive statistics was used to answer the research questions while the Pearson Product Moment Correlation statistics was used to test the hypotheses at 0.05 Alpha Level of Significance. The findings of the study included that the availability of ICT infrastructure was significantly related to effective teaching, the extent of utilization of these infrastructures was low and this not significant, there were many challenges limiting the use of ICT in teaching for teachers and learning process and appropriate solutions were proffered. The study recommended that the government and other organization should support schools in provision of ICT infrastructures and organizing training session for teachers. The study also recommended the provision of ICT programs in teachers training curriculum, school curriculum among many others. Further studies on the perception of students on the use of ICT for pedagogy and comparative study of the use of ICT in public and private schools were suggested.

CHAPTER ONE

INTRODUCTION

Background to the Study

Nigeria like other developing countries is still in the initial stages of integrating ICT in teaching and learning process in the education sector. Though it is limited by a number of barriers, there are many factors influencing the use of ICT to make teaching and learning effective in schools of learning in Nigeria. ICT is an electronic means of capturing, processing, storing, communicating information. The use of ICT in the classroom teaching and learning is very important for it provides opportunities for teachers and students to operate, store, manipulate, and retrieve information, encourage independent and active learning, and self-responsibility for learning such as distance learning, motivate teachers and students to continue using learning outside school hours, plan and prepare lessons and design materials such as course content delivery and facilitate sharing of resources, expertise and advice. This versatile instrument has the capability not only of engaging students in instructional activities to increase their learning, but of helping them to solve complex problems to enhance their cognitive skills.

Effective teaching consistently emerges as a fundamental driver of school improvement. As the commonly held belief goes, the quality of a school hinges on the competence of its educators. Effective teaching strategies play a pivotal role in enabling students to reach their personal and academic aspirations. Proficient teachers often serve as influential figures in the lives of many young individuals, offering them much-needed reassurance and confidence. Children who experience a sense of security, value, and engagement within the school community tend to excel academically and contribute positively to the school's culture by fostering favorable attitudes and behaviors.

Effective teaching is the knowledge, strategies, processes and behaviours which lead to good student outcomes. Effective teachers have a positive impact on their students and use their expertise to

improve learning. These good outcomes are often those that can be measured easily, usually through summative assessment.

However, it's also important to remember that not all aspects of effective teaching are immediately visible or measurable. Effective teachers cultivate excellent working relationships with their students within safe and respectful environments. Effective teaching is much more than end-of-year data: it is an ongoing, reflective practice that needs to be refined and amended to suit learners' needs.

Effective teachers nurture effective learners who are actively involved in their own learning and personal development. They can manage a classroom to remove or reduce instances of behaviour that challenges, introduce new information in an engaging and accessible way, and provoke curiosity in the subject matter to promote higher-order thinking. Effective teachers also love their subject and use their experience and pedagogical knowledge in order to create high-quality learning.

Effective teaching is constantly recognised as one of the key drivers in school improvement. As the popular saying goes, a school is only ever as good as its teachers.

Effective teaching helps students to achieve their goals both personal and academic. We know that effective teachers can be hugely influential figures to many young people, providing them with both certainty and assurance when they need it the most. Children who feel safe, valued and engaged within the school community will learn better and help to contribute to an improved culture by promoting positive attitude and behaviour.

Effective teaching can also have a monumental impact on student achievement. Improved relationships with students generate more personalised learning opportunities and greater quality targeted assessment. Being able to capture an accurate snapshot of student understanding helps to boost progress as both teachers and pupils know how to improve learning outcomes.

ICT plays a vital role in effective teaching and learning because it serves as a potentially powerful tool for extending educational opportunities, both formal and non-formal, to previously

underserved constituencies scattered and rural populations, groups traditionally excluded from education due to cultural or social reasons such as ethnic minorities, girls and women, persons with disabilities, and the elderly, as well as all others who for reasons of cost or because of time constraints are unable to enroll on campus. The ICT plays significant roles in Nigerian Educational Institutions.

Information communication technologies (ICTs) are currently affecting every aspect of human life. They are playing a major role in work places, business, education and entertainment. Furthermore, changes in working conditions, handling and exchanging information, teaching methods, learning approaches, access to scientific research and information communication technologies have led many to consider ICT as a catalyst for change. In this digital age, the use of ICT in the classroom is of utmost importance to give students opportunities to learn and apply essential skills of the 21st century. ICT improves the teaching and learning process and increases its importance for teachers to play the role of creators of the educational environment. ICT enables a teacher to present his teaching in an attractive manner and enable learners to learn at any stage of educational programmes. Today teaching training programs in India are becoming useful and engaging with the term ICT. Information and communication technology (ICT), exemplified by the Internet and interactive multimedia, is clearly an important focus of future education and needs to be effectively integrated into formal teaching and learning particularly in a teacher education institution becomes even more important.

Information and Communication Technology (ICT) involves the use of electronic infrastructures such as computers and computer software to create, store, process, protect, transmit and retrieve information. formation and communications technology or technologies is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such

as videoconferencing and distance learning. It is often spoken of in a particular context, such as ICTs in education, health care, or libraries.

There are two main approaches to the use of ICT in Education; there is ICT for Education and ICT in Education. ICT for education involves the deployment of information communication technology for general educational purposes; this involves the use of ICT for administrative purposes as it concerns students, staff and the institution in general, while ICT in education involves the use of ICT tools and gadgets practically in teaching and learning processes.

Yusuf (2005) explored that the education field has been affected by ICTs which has undoubtedly affected teaching, learning and research. Findings revealed that ICT has the potential to accelerate, sharpen, deepen and enrich skills to motivate and engage students, to help relate school experience to work practices, create economic viability for the workers of tomorrow as well as strengthening teaching and helping schools change. ICT is helpful to teachers in many aspects. It helps teachers in performing their duties effectively. Use of ICT in classrooms will enhance the quality of teaching learning process and results in better academic achievement

What is ICT in education? Kim (2009) provides a sensible definition that captures the essence of ICT in education. He defines ICT in education as a "Comprehensive approach to innovate education systems, methods, and management through Information Communications Technology" Put simply, ICT is thought of as a reliable vehicle for education, a platform for communication, and a powerful tool for economic growth. ICT is virtually being used today in all sectors of life; ICT is employed in solving a wide variety of problems. Educationally, ICT is a major driving force as it is being employed in the dissemination of information and knowledge in our learning institutions. The impact of ICT in knowledge dissemination is mostly based on the use of digital media such as computer and the internet to enhance teaching

and learning. Teachers are now being challenged to equip and acquaint themselves with technological skills to accommodate changes that have been brought about by technology.

Technology can help teachers a lot in keeping pace with the fast changing knowledge. In order to use these tools effectively and efficiently, teachers need some sort of training regarding these technologies, only then the teachers will be well informed and more confident in the use of new technologies

The use of ICT in education has provided many options for teaching and learning. Teachers now have access to multitude of equipment such as whiteboards, tablets personal Computers, internet resources, apps, virtual reality devices and other tools that have the potential of enabling them to reach their students anytime. Information and communication technology has broken the limitations placed by distance. It is now possible for a teacher to have several students all over the world through virtual classrooms. With the aid of smart phones, Skype and other related devices, teachers and students can now readily connect and achieve the educational goals of learning. Information and communication technology is now considered as a major force that is driving quality. It is no longer possible to talk about quality in education without giving credence to the place of ICT.

Today, ICT is seen as the engine for growth and also a tool for empowerment. It has profound impact on education, social and economic development, ICT foster the dissemination of information and knowledge by separating content from its physical location. Today, the place of ICT in education and in the world in general cannot be undermined. The field of education has greatly been affected and penetrated by the influence of ICT worldwide particularly in developing country like Nigeria and other African nations.

Jones (2003) opined that effective learning is dependent on the will and competencies of the teacher in instructional delivery of lessons. This implies that teachers must undergo capacity building in ICT resources at the NCE and university level of education to enable them

utilize maximally its benefit in instructional delivery. Furthermore, ICT resources are instructional delivery tools used to explore, investigate, solve problems, interact, reflect, reason and learn concepts in the classroom. This innovation permits alternative types of educational patterns for facilitating the teaching/learning process.

ICT resources can be conceptualized as the e-learning which is most commonly associated with higher education and corporate training that uses an information network through the internet, an intranet (LAN) or extranet (WAN). Electronic learning (e-learning) is used both in informal and formal educational setting for facilitation, instruction, interaction and for instructional delivery. Web-based learning is also a subset of e-learning. Another type of ICT resources is the virtual teaching which entails instructional delivery through teleconferencing the video conferencing technique. Web based instruction uses internet and the World Wide Web (WWW) as the major component of learning materials and instructional resources for effective instructional delivery. Audio media (instructional slides and tutorials) are teaching/learning aids made and written into compact disks, graphics and texts. Through the power point, instructional delivery is impactful to slow and fast learners.

Effective Teaching is the way to impart knowledge/skills to students. It is a profession of a person who teaches. In short, it is described as an activity or the act of educating or instructing that impart knowledge and skills. Effective teaching engages the students, tackling their problems and as a result, learning becomes an active, meaningful and understandable experience. Effective teaching results in effective learning by the students. Effective teaching is the knowledge, strategies, processes and behaviours which lead to good student outcomes. Effective teachers have a positive impact on their students and use their expertise to improve learning. These good outcomes are often those that can be measured easily, usually through summative assessment.

However, it's also important to remember that not all aspects of effective teaching are immediately visible or measurable. Effective teachers cultivate excellent working relationships with their students within safe and respectful environments. Effective teaching is much more than end-of-year data: it is an ongoing, reflective practice that needs to be refined and amended to suit learners' needs.

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The use of ICT can effectively enhance learning were traditional methods have failed. The pace of technological revolution and emergence of a knowledge and information society

have changed the traditional role of the teachers and the students. Traditionally, the teacher used to be the whole and sole source of knowledge for the students. The main source of knowledge remains limited to the text-book. The development of ICT changed the center of knowledge.

Many schools have limited resources for buying latest books and relevant materials which are required for conducive teaching-learning. Their lesson plans are most often outdated or irrelevant. These jeopardize the available quality of education. ICT enabled education to a great extent, can combat this problem. Because the present day learning is ICT-enabled, most of the programmes include computer and Internet training to facilitate the use of essential technology. The acquisition of ICT skills among teachers helps students in knowledge sharing, thereby multiplying educational opportunities. They must be given opportunities for acquisition and exploration of a new knowledge. This can begin by promoting computer training programmes for teachers.

ICT provides both learners and instructors with more educational affordances and possibilities. More specific benefits of using ICT in education are described below. A model known as Technological Pedagogic and Content Knowledge (TRACK) was introduced by Mishra and Koelher (2006), the model also known as the Total Package was meant to equip the 21st century teachers with all necessary skills and tools needed to function effectively in the dissemination of knowledge in their classrooms. ICT is argued to be a powerful driver for educational change if used properly. It helps to create a less stressful environment for both teachers and students. Education has been identified as a viable platform for equipping the nation with ICT skills, it is believed that successful introduction and the use of ICT in education and in training institutions will play a major role in disseminating skills to the wider society and thus create positive impacts on the economy. Many schools have adopted the setting up of ICT infrastructures consist of making available physical elements such as desktop

computers, laptops, software, projectors, data servers, networks telecommunication links as well as human resources to move them. The adoption of ICT as a tool for teaching and learning by educational institutions is a strong force needed to contribute to educational change, better prepares students for the information age, equipped with survival skills for the information driven society. A lot of researches have been carried out in connection with the use of ICT in several ways including its effectiveness in improving teaching and learning. The Information and Communication Technology (ICT) policy (Federal Republic of Nigeria, 2012) placed as its objective, a knowledge based and a globally competitive society with a mission to integrate completely, information and communication technologies into the socio-economic development of Nigeria, thereby transforming Nigeria into a knowledge based economy. It is for this reason that effective ICT-based teaching and learning would help the Nation fulfill this great vision. information accessed through digital technologies can promote innovation, increase productivity and enrich the quality of lives. Information and knowledge changes rapidly, teaching and learning process can only change in order to meet up with these changes. ICT has been figured to be a driver of this change and potentially improve education quality and expand learning opportunities. In today's age of digitalization, the ability to effectively use technology is of high priority to teachers at all levels of education. Teachers should have the knowledge of technology as well as able to give instructions using ICT. Evidence abound to the effect that if used appropriately, ICT can be an effective tool in improving teaching and learning.

Statement of the Problem

ICT has become within a short time, one of the basic building blocks of modern society. For this reason, many developing nations are integrating ICT in their education system with the intents to enhance teaching and learning. The study of the use of ICT in education has attracted quite a good number of researches in the recent past, outside the

immediate environment of the researcher. Such researches observed that ICT has impacted greatly on educational systems. These researches also pointed out factors militating against the success of ICT for effective teaching by teachers. These factors ranged from lack of strong support from government at national and state levels, lack of support by school management, lack of technical skill by teachers, inadequate ICT gadgets to attitudes of students.

It is also glaring that, the traditional educational practices by teachers can no longer provide the necessary skills needed by students to compete favorably in today's challenging and competitive workplace. Despite this realization, it appears the use of ICT for effective teaching by teachers is one area that has been given very little attention by researchers and school administrators in the researcher's immediate environment. Against this backdrop it has become imperative to investigate the availability and utilization of ICT in the researcher's immediate environment. The fundamental question for this study is: What is the level of availability and utilization of ICT in Rivers West Senatorial Districts of Rivers State?

Purpose of the Study

The purpose of this study was to examine the availability and utilization of Information and communication technology for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State. Specifically, the study seeks:

1. To determine the level of availability of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State.
2. To determine the extent of utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State
3. To determine the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

4. To know the suggested solutions on the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

Research Questions

The follow research questions were raised to guide the study.

1. What is the level of availability of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?
2. To what extent is ICT infrastructures utilized for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?
3. What are the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?
4. What are the suggested solutions on the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?

Hypotheses

The following null hypotheses were tested for the study at 0.05 level of significant

1. There is no significant influence of the level of availability of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State.
2. There is no significant influence of the extent of utilization of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

Significance of the study

The results of this findings will be of immense benefits to relevant stakeholders in the educational sectors which include government, administrators and proprietors of schools, principals, teachers, students and future researchers.

This study will be beneficial to government as the result of this study will enable the government to appreciate the benefits of Information Communication Technology in secondary education in Nigeria, and the extent at which ICT can improve quality secondary education in Nigeria. It will also equip these stakeholders on the importance to procure, manage and effectively utilize ICT resources in secondary schools. This study is also intended to call attention of government to current challenges, faced by secondary schools as regards adoption of ICT infrastructure and proffer likely solutions

Also, the findings of this study will be beneficial to administrators and proprietors of schools as the results are of good essence to administrators of secondary schools in finding out the impact of ICT on the provision of quality teaching and learning and also find out the problems that could militate against effective ICT usage in secondary schools.

The study will be of immense benefits to principals and teachers as it will encourage them to seek technological trainings and develop adequate skills in ICT so as to deliver quality teaching services to students as this will facilitate learning and thereby improve quality education in secondary schools. It will also bring to their consciousness that ICT can be used to enhance the teaching and learning process.

The study will create awareness to secondary school students as they will understand the impact which ICT could have in facilitating adequate and contemporary learning, and thereby facilitating quality education.

Finally, it will provide relevant materials for future researchers undertaking similar research. The study will help researchers with more information on the subject matter.

Scope of Study

The study focuses on the availability and utilization of information and communication technology (ICT) infrastructures for effective teaching in Secondary schools in Rivers West senatorial district of Rivers State. Also all private secondary schools in Rivers West senatorial district of Rivers State was used.

Definition of Terms

The following variables were technically defined as they were used in the study.

Computer: A computer in this study refers to hardwares and softwares used to facilitates teaching and learning process in secondary school.

Effective teaching: Effective teaching in this study refers to the way teachers use ICT facilities in enhancing teaching and learning process.

Information and Communication Technology (ICT): ICT in this Study refers to the computer and Internet connection used to handle and communicate information for learning purposes. It also refers to the various aspects of computes, networks (including the Internet), software and other environments that act as a tool for teachers and students by supporting learning and instruction.

ICT infrastructures: Includes hardware (mainly physical servers), software, networks, data centers, facilities, and related equipment, which is used to develop, test, operate, monitor, manage, and support ICT services.

Utilization: Utilization in this study refers to how teachers uses ICT facilities for the teaching and learning process in secondary schools

Www: Means world wide web. It also refers to all the public websites or pages that teachers and learners can access on their local computers and other devices through the internet.

CHAPTER TWO

LITERATURE REVIEW

The reviewed of relevant literature was handled here under the following Sub-headings, Conceptual Framework; Theoretical Framework; Review of the Empirical Studies; Summary of Review of Literature.

Conceptual Framework

The conceptual framework in this study as depicted in figure 1 captures the independent variable, information and communication technology, and the dependent variables which is effective teaching.

INDEPENDENT VARIABLE **DEPENDENT VARIABLE**

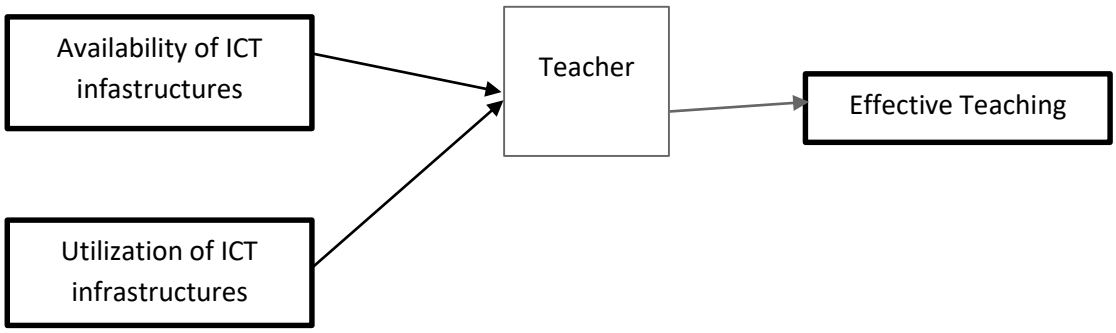


Fig: 1.1: Conceptual Framework of ICT effective dissemination of knowledge
Source: Developed by the Researcher.

Concept of Information Communication Technology (ICT)

Information Communication Technology (ICT) is an umbrella term that includes all technologies for the communication of information. It encompasses any medium to record information and also technology for broadcasting information. According to Anikweze and Kanu (2018), ICT, refers to all forms of technologies that are used to store, share, create or transmit and exchange information. This broad definition of ICT include these technologies such as radio, television, DVD, telephone (both fixed-line and mobile phones), satellite

systems, computer and network hardware and software, as well as the equipment and services associated with these technologies, such as video conferencing and electronic mail. However, the selected definition for the current study focuses on the tools utilized by educational institutions to enhance teaching and learning which consists of software, networks and media for collection, storage, processing, transmission and presentation of information (voice, data, text, images). It refers to technologies that provide access to information through telecommunications and focuses on communication technologies. These include the internet, wireless networks, mobile phones and other means of communication. (Anikweze and Kanu, 2018). Berge, (2016) stated that the use of ICT can effectively enhance learning were traditional methods have failed. The pace of technological revolution and emergence of a knowledge and information society have changed the traditional role of the teachers and the students. Traditionally, the teacher used to be the whole and sole source of knowledge for the students. The main source of knowledge remains limited to the text-book. The development of ICT changed the center of knowledge.

Information and Communication Technology is a field that has a wide coverage. It extensively deals with communication technology and how it impacts on other fields of human endeavor. It is the fastest growing academic field of study and a viable source of livelihood. It is the convergence of telephone and computer networking through a single cabling system with ease of data storage, manipulation, management, and retrieval. It is concerned with database management, computer programming, and software development. Web designing, mobile application development, project management, security, networking analysis, media equipment, computer engineering, computer studies, the internet, intranet, internet protocol (IP), system software, application software, signal technology, base station management etc (Anikweze, 2013).

Perraton and Creed (2001) stated that technology can help teachers a lot in keeping pace with the fast changing knowledge. In order to use these tools effectively and efficiently, teachers need some sort of training regarding these technologies, only then the teachers will be well informed and more confident in the use of new technologies. Ertmer and Otternbreit-Leftwich (2010) reviewed the existing literature on the necessary elements to enable pre-service and in-service teachers to apply ICT as a meaningful pedagogical tool. Since learners are actively involved in the learning processes in ICT classrooms, they are authorized by the teachers to make decisions, plans, and so forth.

Information and communication technologies consists of hardware, software, network and media for collecting, storing, processing, transmitting and presenting information (voice, data, text, and image) as well as related services. ICT can be divided into two components: Information and Communication Infrastructure (ICI) and Information Technology (IT). The former refers to physical telecommunications systems and networks (cellular, voice, mail, radio, and television), while the later refers to hardware and software of information collection, storage, processing and presentation (Sarkar, 2012). According to UNESCO (2002), ICT now permeates the education environments and underpins the very success of 21st century education. ICT also adds value to the process of teaching and the organization and management of teaching institutions. Technologies are a driving force behind much of the development and innovation in both developed and developing countries. ICT is considered mainstream in higher education. ICTs are being used in many areas such as developing course materials, delivering content and sharing content, communication between learners, teachers and the outside world; creation and delivery of presentations and lectures; academic research, administrative support, and student enrolment (Mandal & Mete, (2012). When applying ICT in higher education, teaching is no longer confined to schedules and timetables (Hattangdi & Ghosh, 2008).

Information technology inclusion in most high schools curriculum is has gained prominence as some institutions have made it a compulsory subject. This is as a result of the understanding that it cut across every facet of human endeavor most especially the education sector. More so, it is the fastest growing industry in the 21st century (Udemy, 2014). It is commonplace to hear e-learning, e-commerce, e-banking etc. It is, therefore incumbent on education curriculum developers to place ICT as a hub around which other disciplines revolve at least for the fact that it is a platform on which modern learning takes place. Needless to say that there is a paradigm shift with respect to popular opinion on how knowledge is acquired and dispensed (Udemy, 2014). Those who were hitherto conservative in this regard in the past seem to be winning the race ahead of those who merely believe and talk about it but with no evidence of commitment especially in the education sector. It is expected that in no distance future, textbooks may to a high extent be faced out in schools to be replaced with a soft copy accessible globally. This is not a news to the developed World as they are already far ahead. So been ICT compliant is a necessary tool for any meaningful learning in this dispensation. Gonzalez (2010) stated that information accessed through digital technologies can promote innovation, increase productivity and enrich the quality of lives. Information and knowledge changes rapidly, teaching and learning process can only change in order to meet up with these changes.

Concept of ICT in Teaching and Learning

The use of ICT in teaching is no longer as complex as it used to be. Most secondary schools now can afford the most basic ICT facilities. However they are still so many schools that lack the ICT resources needed for ICT to be used as a tool in teaching and learning hence a barrier to the successful adoption of ICTs in the teaching and learning process (Schoepp, 2015). These barriers have been classified as either individual, school system barriers, extrinsic or intrinsic.

The use of information and technology ICT is fast becoming an integral part of education in the world today; ICT has without doubt gradually found its way into the educational system of Nigeria

Concept of ICT in Education

The use of information and technology in education has indeed provided teachers and students with so many options for classroom learning. The introduction of the modern library and the pencil in the mid-1600s actually marked the beginning of the use of technology in education.

In the 1700s schools had technologies such as Jacquards loom while in the 1800s there were slated and chalk, blackboard, the calculating engines and the typewriter. In 1900s technologies such as the stereoscopes, the film projectors, radios, overhead projectors were available.

In the 1950s, technologies like headphone, the slide ruler, the videotapes and the photocopiers were used. In the 1960s, we had the microfilm viewer and the liquid paper. In the 1970s came in the calculator, the Scantron, the Public Broadcasting System (PBS) and the very first computers were integrated into schools. By the 1980s schools had the personal computer created by IBM, the CD-ROM and in the 1990s the internet interactive whiteboards were invented.

Classroom Technology in the 21st Century

In the 21st century, many classroom and educational institutions in developed nations became more connected. In 2004, You-Tube was discovered to be an effective tool for classroom learning. With the aid of these tools, instructional video could be easily shared. The 1- Clicker also become a popular classroom tool for teachers during this period. The 1- Clicker allowed teachers to easily poll students during a lesson and receive the result the result in real time. Also during this time, the use of laptops by teachers and students become popular.

Between 2007 and 2010, Smart phones become very popular and were being used by teachers and students although they were not accepted as classroom learning devices. However, the inception of the IPad in 2010 which came along with Wifi catapulted these mobile phones to the forefront of being learning tools, even in classroom. In 2015, interactive mobile Apps for all types of devices and operating system took centre place in classroom learning. Teachers were empowered to provide better learning opportunity as a result of the wide availability of these Apps.

Virtual Reality

More recently, in 2016 and 2017, virtual or augmented reality is being used by educators to enhance classroom learning experiences. Modern devices such as Google's, cardboard VR allow students to study location and object in 3D and in addition to exploring world current events.

Teachers and ICT

Teachers can now access multitude of equipment such as Whiteboards, tablets, PCs, internet resources, apps, virtual reality devices and other apps that allow them to reach every student regardless of learning styles. Without mincing words, teachers are the major instruments needed for the national development of any nation (Omoregie, 2017).

The Federal republic of Nigeria FRN, 2014) states the five national goals of Nigeria as necessary foundation for the national policy in Education as follows:

a. A free and democratic society

b. A just and egalitarian society

c. A united strong and self-reliant nation

d. A great and dynamic economy

e. A land full of bright opportunity for all citizens

For these laudable goals to be achieved, teachers are indispensable.

Technology has greatly changed the role of the teacher. Twenty years ago, a teacher basically provides lesson notes, lectures, using limited variety of multimedia to make learning fun and interesting. Today, a teacher's role has changed from being just a tutor to a facilitator and supporter as student collaborate and use apps that suit their learning styles. This enables teachers to be more proactive, providing individual help where necessary without having to worry about affecting other students in the classroom who may be faster in the learning process. The successful use of ICT in teaching and learning in learning institution is largely dependent on the support and attitudes of teachers. Onchwari, (2008) views teachers' perception about technology as a major factor in ICT adoption in the teaching and learning process. The beliefs and skills of teachers are very crucial with regard to the question of whether or not to use ICT in classroom. Teachers want to be sure that their efforts at teaching are not wasted. They want their students to learn and if technology will help to achieve this goal, teachers are more likely to invest their time and energy to learn to use it in teaching (Onchwari, 2008). Research revealed that teachers' attitudes towards technology influence the use of ICT in teaching and learning (Huang and Liaw, 2005). In a research conducted in EU involving six country, a number of participant agreed that the use of net books had positive impact on their learning; they believed it promoted individualized learning and helped to lengthen study beyond school days.

Teachers Skill and Willingness to Use ICT in Teaching

Skills and Willingness of teachers refers to skilled teachers who are ready and willing to use ICT in teaching and learning. To achieve a comprehensive teaching by using ICT, teachers need to be convinced of the benefits of using ICT in teaching and learning (Osman and Amed, 2003). It is of utmost importance that teachers should be given adequate training to enable them use ICT tools effectively and efficiently.

The use of ICT in teaching and learning allowed students to be active in finding information and build knowledge from information obtained by the chance to cross-link between knowledge of subject without being restricted by time and distance (Lim, 2005). ICT can enhance students learning in science from early age (Ong, Fro and Lee, 2010).

ICT Policies in Nigeria

Nigeria started implementing ICT policy in April 2001 after the Federal Executive Council approved it by establishing the National Information Technology Development Agency (NITDA), the implementing body.

The policy empowers NITDA to enter into strategic alliance and joint ventures and to work with the private sector to realize the country's vision of making Nigeria an IT capable country in Africa and a key player in the information world by the year 2015. To use IT as an engine for sustainable development, more than ten years passed and this vision was yet to be fulfilled.

Below are stated some of the objectives of Nigeria's ICT policy:

1. To ensure that ICT resources are readily available to promote efficient national development.
2. To empower Nigerians to participate in software and ICT development.
3. To establish and develop ICT infrastructure and maximize its use nationwide.
4. To integrate ICT into the mainstream of education and training.
5. To empower youth with ICT skills and prepare them for global competitiveness.
6. To create ICT awareness and ensure universal access in promoting ICT diffusion in all sectors of national life.
7. To encourage government and private sector joint venture collaboration.
8. To develop human capital with emphasis on creating and supporting a knowledge-based society.

9. To create an enabling environment and facilitate private sector (national and multinational investment in the ICT sector.
10. To guarantee that the country benefits maximally and contributes meaningfully, by providing the global solutions to the challenges of information age.
11. To build a mass pool of ICT literate manpower using the NYSC, NDE and other platforms as a train-the-trainer scheme for capacity building.

ICT in Secondary-Level Education

A non-profit organization known as School Net was created to address the use of ICT in Nigeria secondary schools with the support of government ministries. School Net Nigeria is a public sector initiative geared at mobilizing Nigeria human and financial resources for the purpose of using ICTs in education.

School Net created learning communities of educators and learners to use ICTs to enhance education by:

1. Implementing, supporting and co-ordinating ICT development project in education.
2. Providing and supporting lower-cost scalable technology solutions and internet for schools.
3. Providing support mechanism for schools for technical infrastructure and connectivity.

In collaboration with the mobile phone operator MTN, School Net established ICT laboratories for schools in four states in each of a four phase project using local ISPs. In the same way, School Net collaborated with the computer company Busy Net to set up ICT laboratories in four schools in 12 states.

Zinox computer a private computer company in collaboration with Microsoft also set out to revolutionize ICT usage in education. Zinox's strategy was targeted at students, lecturers and the institutions themselves. Zinox provided computers at highly discounted prices and hoped that government would support it to achieve 75% ICT applications in Nigeria

schools by 2010. First Bank of Nigeria was to sponsor the projects. The strategy required ICT Labs to be set up for schools that would repay in two or three years. Lecturers were to repay the cost of their laptops in one year.

Other banks such as Zenith also supported the ICT revolution in secondary schools. Over 100 schools have benefited from the Zenith Bank's ICT for Youth Empowerment Scheme. Each school received a minimum of 10 computers. To encourage the use of ICT, the bank organized an annual ICT empowerment forum for youth that attracted more than 2000 secondary and tertiary level students. The bank distributed 100 Personal Digital Assistant (PDAs) to the first 100 students to arrive at the venue in 2006.

The use of information and communication technology (ICT) is fast becoming an integral part of education in many parts of the globe (Ijert Vol. 1, 2010). Nigeria is fast catching up with this brand as ICT has gradually found its way into the education sector notwithstanding chronic setbacks brought about by social and economic disadvantages.

Education is a process which seeks to change (Gbamanja, 1989). Education is the process by which society deliberately transmits its cultural heritage through school, colleges, universities and other institutions (Gbamanja, 1989). ICT is one tool that is arguably one of the best that could help achieve these educational purposed. Several researchers have also carried out researches on the implication of ICT for teaching.

Pedagogical Practices using ICT

It is not enough to learn ICT skill but using ICT to improve teaching and learning is the key to success in effective dissemination of knowledge by teachers. Consider a young teacher who just learnt to use ICT for his daily teaching. With the aid of word process or the teacher can prepare lesson plans, and compile lesson material for the classroom lecture. The teacher can also use spread sheets to create class list to record performance and carry out statistical analysis. While delivering the lecture, an ICT compliant teacher can also make use

of presentation software like Power Point to draw diagram, play video, etc. all of these multimedia applications can actually ensure a motivating, interactive, interesting and productive and of course quality delivery of classroom instruction.

Also with the aid of multimedia courseware an ICT compliant teacher can create interactive, multimedia based instructional material where leaners are given control to review the topic at their own pace and in accordance to their individual preference, interest, needs and cognitive processes.

Multimedia courseware is also able to support drill and practice to master basic skill, simulate situations, and produce individualized instruction. It is now very feasible and possible to implement open and flexible learning strategies using ICT as tools.

Distributed learning is achieved where there is flexible access to content and learning resources through network across conventional classrooms, homes and community centre. The availability of online tools has now made it possible to create content websites online education to support and assist the traditional face-to-face instruction in an innovative way. The ability to develop online and offline learning resources using various learning management system software/tools should become one of the key competencies of modern day teachers.

Benefits of ICT to Learning and Teaching Practices

Basically, ICT tools used by teachers in teaching and learning help to open opportunities for learning by enabling four major key processes in transforming teaching and learning. These processes are:

Access: This entails providing of access to ideas and information from diverse sources through searching, locating and selecting material in a wide range of multimedia forms.

Extend: ICT extends idea and information by processing, manipulating, analyzing and publishing materials in different multimedia forms.

Transform: ICT helps to transform ideas and information into new or different forms through synthesizing, modeling, simulating and creating material in many multimedia design and formats.

Share: With aid of ICT, ideas and information across local, national and international networks can be shared through interacting electronically with others in real and/or delay time. The processes can be applied in all area of learning and in all levels of education.

The integration of ICT into teaching and learning has brought about the following key benefits:

1. Greater problem solving and critical skills
2. Communicate effectively about complex processes
3. Become socially aware and more confident
4. Increase motivation
5. Explore and represent information dynamically and in many form
6. Develop better understanding of processes and systems.

Emerging Trends in ICT for Education

Shymal, (2006) studied emerging trends in ICT for education and training. He stated that the development of new broadband communication services and convergence of telecommunication with computers have created numerous possibilities to use a variety of new technological tools for teaching and learning system. According to him, the integration of computers and communication offers unprecedented opportunities to the education system. ICT is opening new opportunities for learning because it enables learners to access, extend, transform and share ideas and information in multi modal communication styles and format. ICT is also improving teaching by enabling teachers to perform their role of creator of pedagogical environment.

For us to fully appreciate the integration of ICT in teaching, we need to understand some of the paradigm shift in education in recent years.

Paradigm Shifts

Under the cover of ICT enabled learning environment, education around the globe is witnessing major paradigm shifts in educational practices. In earlier days, learning was basically through facts, drills and practices, rules and procedures. Whereas in our present times, learning is more through, project and problems, inquiry and design, discovery and invention, action and reflection, creativity and diversity. Indeed the changes in educational environment has been phenomenal. The mode of learning has changed from traditional instruction to virtual learning environment.

Changes in Teaching/Learning Environment

Model	Focus	Role of Learner	Technology
Traditional	Teacher	Passive	Chalk & Talk
Information	Learner	Active	PC
Knowledge	Group	Adaptive	PC + Network

Using ICT, the new role of teachers demands new ways of thinking and understanding the new vision of the learning process. The major shift is described below;

Changes in Teacher Role

From	**To**
Transmitter of knowledge	Guide and facilitator of knowledge
Controller of Learning	Creator of learning environment
Always expert	Collaborator and co-learner
Learning to use ICT	Using ICT to enhance learning
Deductive Expository	Interactive/Experimental and Exploratory

Changes in Leaner's Role

From	**To**
Passive learner	Active learner

Reproducer of knowledge	Producer of knowledge
Dependent learners	Autonomous learner
Solitary leaner	Collaboration leaner

Changes in curricula and communication delivery

From	**To**
Memorizing facts	Inquiry based
Artificial Teaching Exercise	Authentic Learning
Rigid Delivery (Fixed Time & Space)	Open & flexible delivery (Anytime & Anywhere)
Sample Path Progression	Multi Path Progression

Emerging Topics in ICT Integration

Multimedia

Multimedia courseware development process involved the systematic approach to the analysis, design, development implementation and evaluation of learning materials. Instructional design ensure a learner centered approach to instruction rather than the traditional teacher centered approach. However, the major challenge in designing instruction through multimedia is the choice of media and their application for optimizing human learning with respect to attaining the learning objectives. Multimedia courseware offers the following advantages over traditional teaching method.

The learner obtains more individualized learning assistance, learners receive more information on their own, learners are more likely to obtain situational appropriate learning experience, learners secure real time assessment of feedback. Learners are able to exercise more effective and efficient control over their own learning.

e-Learning

This is a process whereby teachers and students are linked up on an electronic media/computer network. In e-learning, the focus of pedagogy is on learning. E-learning is learning about, with and through all electronic media (ICT) across the learning program to support student learning.

Blogs

A blog is a web page made up of usually short frequently updated posts that are arranged chronologically. The contents and the purpose of blogs vary from links, commentaries about other websites to stories or news about a company, person, idea, photos, poetry, mini essay, project updates, even fictions. Most times, blogs link to other websites or other blogs. Blogs or classroom web blogs are becoming popular with teachers. Many experts have predicted the dominance of blogs over websites as a successful teaching tool. The use of blogs in instructional purpose can only be limited by one's own imagination; teacher can use blog to teach in so many ways. Some of these ways are content related blog, networking, personal knowledge sharing, instructional tips from learners course announcements and readings annotated links, management of knowledge, etc. learners can also take advantage of blogs by effective writing, assignment submission, collaborative work. Blogs are beautiful for teacher because it needs little effort to maintain. Teachers can build a blog or start some new topic on an existing blog by simply typing text into a box and clicking buttons.

Shulman Pedagogic Content Knowledge (PCK)

Shulman (1986) stated that teachers must possess knowledge about the content area of their discipline. He further stated that teachers needed a firm grasp of the analogies and also the frameworks that can be used to explain these facts and concepts, this he called the Content Knowledge (CK). He explains that teachers needed knowledge about how to teach known as Pedagogical Knowledge (PK). Pedagogical knowledge includes planning of course work,

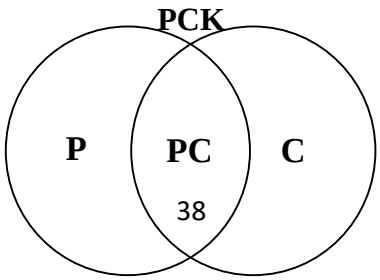
implementing grouping students to promote learning, using disciplined techniques and other teaching strategies to promote learning in the classroom environment. Shulman (1986) further argued that teaching will be ineffective in a case where the teacher lack knowledge related to teaching strategies which include the strategies for teaching and the ability for classroom management.

Shulman presented a model showing that when a teacher is able to connect the Content Knowledge with the Pedagogical Knowledge, the result is Pedagogical Content Knowledge (PCK). This he said represent the original domain of the teacher's knowledge. Hence the PCK informs the teacher's decision about the best method to use for teaching specific content standards to their students.

TPACK Model (Technological and Pedagogical Content Knowledge)

Mishra& Koehler (2006) developed Shulman PCK model by infusing technology into it. This brought changes to the way some specific subjects are taught and also the content knowledge itself was not left out.

The integration of technology into learning added complexity to the fundamental knowledge of what constitute the teacher's professional knowledge base. (Mishra& Koehler, 2006). The technology knowledge (TK), consists of having an understanding of the standard technologies such as books, and chalk and then more advanced technologies such as the internet and software (Agyei & Voogt, 2012: Graham 2011, Mishra & Koehler 2006). According to Mishra& Koehler (2006), effective pedagogical use of ICT is greatly influenced by the content domain to which they are situated. They describe technological and content knowledge as technological content knowledge (TCK).



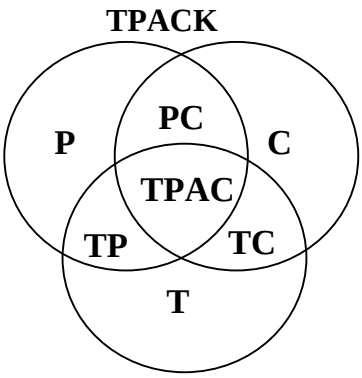


Fig. 2.1: Relationship between PCK and TPACK Model

Effective teaching is therefore influence by the way teachers use ICT tools in the teaching and learning process and not only knowing how tools function (Mishra& Koehler, 2006). Graham (2011) asserted that TPK knowledge begins to work when the teacher starts to understand the dynamic relationship between the content and the pedagogical knowledge. Also Tondeur, Van Braak, Sang Voogt, Fisser and Ottenbreet-Leftwich (2012) stated that teachers TPK remains the most critical area for novice and pre-service teachers because they have not participated in many learning experience that were enhanced by technology.

Aguel and Vorgt (2012) also assert that teachers needs knowledge of how lessons have been planned or designed in order to be able to integrate ICT into their classroom activities. Mishra & Koehler, (2006) stated that setting up ICT gadgets correctly influence how the teacher uses ICT tools in the teaching and learning process. A teacher's ability to blend the selection of appropriate tools (TCK) with the appropriate strategies and activities to teach ICT enhanced lesson (TPK) result to the technology pedagogical content knowledge (TPACT).

Angele and Valonedes (2013) went on to state that TRACK also represents the idea that what teachers know about effective teaching, their subject matter and educational technology must come together for them to be successful in classroom environment.

According to Shymal (2006) in his studies, pedagogy cannot exist in isolation to contents. Pedagogy intertwines into what is described as pedagogical content knowledge (PCK). The basic principles of PCK are to make teaching and learning;

i. Engaging and motivating

ii. Interaction

iii. Contextual

iv. Reducing cognitive load

v. Scaffolding

vi. Collaborative

ICT proffers better ways and opportunities to make the above principles more realistic learning experience. ICT encourages utilization of active learning, interaction, collaborative culture, introduction of feedback in proper context. ICT is capable of bringing abstract concept to life by bringing into the teaching and learning process the real world experiences through stimulation, modeling and capturing.

Harmon & Jones (1999) carried out study "Factors to consider in planning online course", four levels of web use in education were identified. These levels represent continuum bases occasional use to advance continual use. They are;

1. Informational

2. Supplementary

3. Complementary

4. Hybrid

5. Total

Level 1: Information Web Use

Information web use consorts solely of providing relatively stable information to the student which the student may access from time to time. The information contained here may be administrative in nature and may not contain direct course content.

Level 2: Supplementary Web Use

This is more useful that information Web Use. The Supplemented information web use differs from the information web use as it actually provide course content information for the learner this level consent of the instructor placing course notes and other handout on the web.

Level 3: Complementary Web Use

This level is also known as the essential level of web use. At this level, the student obtains most, if not all of the course content information from the web. We may actually think of the web instead of textbook in the course.

Level 4: Hybrid Web Use

This level is also known as communal level of web use. At this level, classess meet face-to-face and online course content are provided online or in the traditional classroom. Other online tools such as internet chart, bulletin boards, etc are also required for this level of web use.

Level 5: Total Web Use

This level is seen as a supplicated, constructivist virtual learning community. At this level virtually all the course content and course interaction occur online. It is most often comprised of learner centered, constructivist pedagogues. This level require that both the instructor and student have a high level of technical learning techniques.

It was observed by Wittelt (2000) in his study "Education multimedia and teachers need for new competence to use educational multimedia" that to use educational multimedia, that several prominent theories such as constructivism, socio cultural concept, situated

cognition, problem based learning, distributed cognition, multiple intelligence, etc all play important role in designing learner centered environment. Every one of these theories is based on the same foundational assumption that learners are active agents purposefully seeking and contributing collaborative knowledge within a meaningful context, these theories can be implemented to create rich and engaging learning environment with the tool of ICT.

Shulman (2006) asserted that the key to distinguishing the knowledge base of teaching lies at the intersection of content and pedagogy.

Contextual factors that can affect teachers' use of ICT for teaching

According to (Bullock, 2004; Dexter and riedele, 2003; Grove Studler& Odell, 2004), the use of ICT to teach by teachers is affected by general contextual factors such as access to ICT support and guidance from administration or school culture.

Bullock, (2004) stated that teachers who believe they are not adequately rewarded may see the use of ICT as an unfair additional challenge if the expectation for the ICT use by the schools, the school leadership is not clearly established.

Insufficient access to ICT is another factor. Access levels vary much across institution and levels. A classroom can have one or several computers, a portable laptop or access to the computer lab in the school. Dexter and Reidel (2003) noted that teachers with only one computer in the classroom increase in development of personal productivity skills such as lesson planning, delivering of presentation and keeping of grade books, but few had few chances of developing how to facilitate lesson that involved teachers use of technology with content area topics. On the contrary, teachers with more than one computer noted higher frequencies of student making use of technology (Grove *et al*, 2004).

Availability of technical support is another crucial factor that affects the use of ICT teaching mode by the teachers in schools.

Bullock, (2004) stated that for teachers who may not be too familiar with new ICT tools or different software, the provision of technical and instructional support is a key factor for successful integration of technology. Technical support can be provided by cooperating teachers, technical experts, on site resource person, etc. technical and instructional support is a significant determinant of whether or not teachers will use technology (Dexter & Riedel, 2003).

Teachers Professional Development in ICT and Competency

Agyei and Voogt, (2012) carried out a research to examine the effect of in-service training programmes in Ghanaian secondary schools. The study involved the training of mathematics teachers using a collaborative design approach to develop their TPACK for effective teaching. The teachers were trained on how they can use spread sheet supporting learning (SSL) in solving mathematical problems. Result for this research showed that after the training program, teachers were able to use TCK and TPK in their lesson. This led to increase to instructional knowledge to teach mathematics using ICT.

Agyei &Voogt (2012) further stated that collaborative design approach which allowed the teachers to share ideas and knowledge had an impact on their TPACK as it improves communication on the relevant information on best methods of teaching mathematics using ICT. It was also discovered that one major challenge faced by teachers integrating ICT in their teaching was the time allotted for various lesson.

Although the TPACK framework has been judged as the best for effective teaching using ICT, Graham (2011) criticize this model on the platform that it does not take into consideration the teachers' belief and values about teaching. Carlson and Gaido (2002) argued that the process of investing on ICT tools and resources without commensurate financing of teacher professional development will lead to a waste, as teachers will not be able to use these instrument as they were planned. According to them, ICT is not and will never be

transformational on its own as it requires teachers who can put it into use, the curriculum to improve their teaching and learning. Carlson and Gaido (2002) further review traditional on-time teacher training workshops which was basically training on the basic operating system of the computer and basic programmes such as word processing. This type of training has been replaced by a more sophisticated three dimensional approach. These dimensions are:

1. Initial pre-service training for teachers to equip them with fundamental technological knowledge, TCK and TPK.
2. Organizing seminaries, in-service training that trains teachers on acquiring technological skills in the use of ICT in the teaching and learning process.
3. Active on-going and technical support for teachers as they take up their daily tasks on the pedagogic use of ICT.

In concluding, Carlson and Gaido (2002) stated that ICT and teacher professional development is the best address in a context where the educational reform is evolving in a paradigm shift from a teacher-centered lecture based instruction towards interactive, student-centered and constructivist learning.

Collaborative use of ICT in the Pedagogy

A collaborative school culture will likely increase the willingness of incorporating ICT into the classroom (Graham 2011, Voogt 2010). Robertson Webb &Fluck (2007) assessed that for ICT to be used effectively in the learning process, the ICT tools have to be seen as a shared resource, leading to collaborative activities, hence increasing the knowledge of the teacher, thereby improving the teaching and learning process.

Webb & Fluck (2007) stated major successful collaboration practice for effective usage of ICT in a school.

1. Classifying shared purpose and related practices
2. Improving access to resources

3. Enhancing the teacher working knowledge available through in-service training with ICT tools.
4. Using shared experience to develop and refine teaching and learning process.

Integration of ICT use into classroom activities increases as a collaborative school culture increases. Students accept collaborative practices and common shared purpose becomes the norm resulting in better informed students. (Graham, 2011; Tonde&Voogt, 2015).

Fluck and Robertson (2007) also concluded that teachers and students need to collaborate with one another for their schools to successfully incorporate the use of ICT. Schools need to network with other schools, colleagues, families and even communities to enable the development of new practices.

As seen in the conceptual framework, there are different context that influence the process by which an institution adopts and implements ICT as a tool to aid teaching and learning. The school curriculum use of ICT teaching modes by teachers is also strongly influences flexibility and the demand for ICT methodologies in teaching (Zaman*et al*, 2011) stated that the effective implementation of ICT in school is a multifaceted complex process that does not only involves providing the technology to school, but also involves teachers competences, school readiness, long term financing and curricula approaches basically remains the same in practice (Dzidonu, 2010). From indication, it appears emphasis is placed more on students ICT capabilities rather than on the application of ICT knowledge to other subject across the curriculum. Keengwe and Onchwari (2001) noted that most teachers are not keen on adopting and using ICT tools for teaching as it appears that their skills and attitudes towards ICT constitute a challenge for them to adopt and use ICT in the classroom. This is despite the rapid growth in their access to ICT aid substantially enhanced school ICT infrastructure with connections to internets, availability of ICT labs and educational software.

Personal Characteristics of teachers

The teacher's educational level, age, gender and attitude towards ICTs could be of major influence on the teacher's adoption of ICT teaching modes, teacher's preparedness to adopt ICT into teaching determines the effectiveness of the technology and not by its sheer existence in the classroom (John, 2001). Teachers attitude towards technology greatly influence the adoption real implementation of ICT driven methodology anxiety, lack of confidence competence and fear usually makes ICT to be left behind conventional teaching mechanism. This make an understanding of the personal characteristic of teachers, which affect the ICT teaching modes to be of importance. Sandholtz & Reilly (2004) noted that teachers technological skills are strong determinants of ICT adoption in the classroom, there are training programs that concentrate on ICT pedagogical training and not just on technical issues. Effective technical support helps teachers adopt ICT as a tool to improve teaching and learning.

School Administrators as Technological Leaders

School administrators all over the world are now laden with a new responsibility as technological leaders, Flanagan and Jacobsen (2003). These leaders are required to develop the ability to handle effectively this new responsibility. The effect of the school's principal's leadership on the pedagogic use of ICT is one major challenge being experienced by many educational systems in the world today. Fullan, (20006 in a study carried out by Wang, (2010) on the role played by principals in promoting the use of ICT in Taiwanese Schools , the findings shows the lack of high school leadership as a major hindrance to effective use of ICT in teaching and learning process. Flanagen and Jacobsen (2003) urged school principals to provide responsive and flexible professional development opportunities to teachers, which focus on equipping teachers with TPK rather than TC and TCK.

Five common aims for the school principal as technological leaders to enhance the use of ICT in the school were given. These responsibilities include:

1. A leader of capacity building who is an agent of change working with the teachers, acting as a mentor to them and monitoring the development of a vision for the effective pedagogical use of ICT.
2. A leader of resource Management who takes responsibility for managing the resources available for successful pedagogical use of ICT in the school.
3. A leader of learners who demonstrates thorough understanding of ICT programmes by communicating, inquiring, involve in decision making and problem solving.
4. A leader of the community who involves the community including parents, non-governmental organizations, and other stakeholders in order to achieve the goal of effective pedagogic use of ICT in the school.
5. A leader of student entitlement, who sees to it that significant issue of equity and access to technology by students and teachers are promptly addressed.

Salleh and Laxman (2014) also carried out a study in Brunei (Australia) to investigate strategies adopted by the school leaders to promote the use of ICT in pedagogy. From their findings, it was noted that principal uses strategic planning and ICT goals as key policy blueprints in incorporating ICT in the teaching and learning process. These principals confirmed the use of ICT in the teaching process as a requirement for all teachers in their schools. Consequently the teachers were actively using ICT in schools.

Salleh and Laximan (2014) suggested that principals can

1. Give moral support to sustain teacher's use of ICT in teaching
2. Act as motivators who encourage teachers to use ICT
3. Facilitate teachers use of ICT in teaching thereby acting as enforcer.

Wang (2010) asserted that no matter how dedicated and convinced teachers may be about the benefits of the use of ICT in pedagogy, they will not achieve much if they do not receive both financial and moral support from their principals. McGan and Kearney (2009) gave their view in regarding principals as key pedagogic leaders and as such their views and thoughts about ICT present a significant bearing on the extent to which ICT will be fully integrated in pedagogy. However Nkwenti (2010) insisted that majority of the school principals are faced with more leadership difficulties due in the fact that they themselves hardly undergo professional ICT training needed to lead schools where ICT facilities are available. This poses a challenge to the integration of ICT in pedagogy as there is no access to professional training for school principal. After close examination of the integration of ICT in United Kingdom school, the British Educational communication and Technology. Agency research (Beeta, 2007) gave a recommendation that principals should be encourage to attend courses on strategic leadership in ICT in order to enhance the pedagogical use of ICT in Schools.

Parental Support for ICT in Education

Parents can be a great support to the integration of ICT in pedagogy, Beeta (2007) asserted that parents engagement in their children education has a significant and positive impact on learning. Tondeaou *et al,* (2012) argued that one of the ways schools become learning communities is when trained parents in the use of ICT become monitors in school computer labs, this they said will encourage school community relations, providing a platform for students and parent to share skills and knowledge. According to Kozma, McGhee, Quellmalz and Zalles (2004). Parents are supporting the implementation and sustainability of ICT tools through fund raising events organize by schools. Home access through ICT to information from the school bring parents into better and close contact with the school, leaving them feeling better knowing that they also have a role to play in their children education

(Becta, 2003). According to Wllintom (2004), this also leads to close relationship with other parents.

Kerawalla and Crook (2002) also from their studies asserted that the main reasons the majority of household are interested in owning a home computer are due to the need of their children educational purposes. However students spend more time in non-academic use of ICT tools to play games, chat, play music etc. rather than using them for educational purposes. In a study carried out by Kenawalla and Crook (2004), suggestions were made that parental engagement should involve them being attentive to their children computing activities. Still form their findings, they discovered that ICT use at here by students are poorly embedded as parents are scared that their children are more prone to use ICT activities that have little or nothing to do with their academic work. They further stated that even though parents are now encouraged to invest much in their children education, through the provision of ICT facilities at home, not much evidence showed that these children are actually using them at home for academic purposes. Becta (2007) advised parent to monitor and disciple their children to use the ICT gadgets for educational purposes whenever they make provision for ICT tools at home. Hollinworht, Monsrney, Allen and Rose (2011) stated that for proper pedagogical enhancement of ICT by parents, they should restrict children misuse of these gadgets by providing a form of restriction and password locks in home computers so that student can only access parental allowed sites.

Theoretical Framework

For the purpose of this study, two theories were adopted as the theoretical frameworks for this study. These theories are:

1. Social constructivism theory (Vygotsky,1968)

2. Theory of Action (Argyris and Schon, 1974)

Social Constructivism Theory

The theoretical framework of this study is based on the Social constructivism theory, developed by Lev Vygotsky (1968). This theory was developed from the constructivist theory which was first propounded by Jean Piaget in 1896 also known as the father of the constructivist view learning. Vygotsky propounded the Social constructivism theory and he believed that children learn through social interaction and by learning to solve problems with others. He called this process scaffolding. Thanasoulas (2008) stated that learning is a process that occurs through social interactions, and students generate new knowledge by building onto what they already know. The student selects information, constructs hypotheses, and make decisions, with the aim of integrating new experiences into his existing mental constructs. It is cognitive structures that provide meaning and organization to experiences and allow learners to transcend the boundaries of the information given. For him, learner independence, fostered through encouraging students to discover new principles of their own accord lies at the heart of effective education.

Constructivism is a view of learning based on the belief that knowledge is not a thing that can be simply given by the teacher at the front of the classroom to students. Rather, knowledge is constructed by learners through an active, mental process of development; learners are the builders and creators of meaning and knowledge (Gray, 1995). Social constructivism theory advocates student-centered, discovery learning where students us information they already know to acquire more knowledge. He also argued that students learn through participation in project-based learning where they make connections between different ideas and areas of knowledge facilitated by the teacher through coaching rather than using lectures or step-by-step guidance.

In relation to this study, on the availability and utilization of information and communication technology (ICT) for effective teaching by the teachers should help to construct knowledge and reflect the information on their academic performance in different subjects. The teacher should know and use the learning potential of students to build up his/her teaching. The theory also holds that learning can happen most effectively when people are active in making tangible objects in the real world. In this study the teachers are supposed to use the relevant teaching and learning resources like ICT resources to achieve effective teaching and learning. Seymour (1980) emphasized the way in which knowledge is structured using computers and how the student's own perception of their prior experiences leads to the knowledge structure. In the context of this study, the theory clarified the duty of teachers on checking on the prior knowledge of their students and attitudes they held towards ICT which may influence their learning process.

Theory of Action

This research is guided by theoretical framework of Argyris and Schon (1974) theory of action in which contrasting theories namely espoused theories and the theories-in-use are used to examine professional practice. Espoused theories are those theories an individual claim to follow or the world views and values people believe that behaviour is based on. Theories-in-use are those that can be inferred from action. It refers to the worlds view and values implied by their behaviour, stating that people have mental maps about their action and that these maps guide their actions rather than the theories they explicitly espoused. Theories-in-use therefore refers to implicit, informal and incidental information/knowledge which guides and assists the design of action within an ongoing and dynamic situation.

This theory state that all action (conscious and unconscious) is purposeful because it attempts to fulfill a function and/or achieve an objective. A professional such as a teacher engaging in complex action can be held to design his/her action in purposeful manner and this

include the utilization of available ICT infrastructures in an attempt to achieve a given end or objective.

Empirical Review

Availability of ICT Infrastructures

Olokoba (2015) studied the impact of information communication technology (ICT) on the management and performance of secondary school teachers in Kwara State, Nigeria. Three (3) research questions and three (3) hypotheses guided the study. Three hundred (300) teachers were sampled from three senatorial zones in the state. The instrument used was the researchers design structured 27 items questionnaire and mean scores were used to test the hypothesis. The findings showed that many schools do not have ICT infrastructures and teachers do not use the ICT tools in their instruction activities. The study recommended that government should partner with private organizations to provide ICT tools, for secondary schools in the state.

Amesi and yellow (2018) conducted a study to investigate the extent of the use of ICT in education management in public schools in Rivers State. The study examine the extent of teachers of ICT teaching modes in secondary schools in Rivers State. A descriptive survey design was adopted and the population comprised of 237 teachers and 9,945 students giving a total population of 10.182. The sample was drawn from the study and analysis was done with 168 teachers and 232 students who returned their instruments. The test re-test method was used for the reliability test which yielded a coefficient of 0.90. Mean and standard deviation was used to analyse the research questions while Z-test was used to test the hypothesis. Finding from the study revealed that teachers awareness of information and communication technology teaching modes in secondary in Rivers State as there were no significant differences in the responses of the respondents on the extent of the teachers in Rivers State. Base on the findings, conclusion where drawn and recommendations made

amongst others include that government and NGOs including stakeholders should endeavour to make teachers to be aware of ICT teaching mode for effective teaching in secondary school.

Alharbi (2015) of Cardiff school of education, Cardiff metropolitan university carried out a study to examine how ICT is applied in the classrooms in Kuwait Schools from the perspective of students, teachers and decision-makers. Base on four fundamental research questions. The study aimed among other things to analyze the level and impact of ICT on teachers' pedagogy, students', perceptions of ICT use in classroom. The sample size is 200 teachers. The research adopted a mixed methods approach to data gathering, using questionnaire and semi-structured interviews to gather data from students, teachers and policy makers. The result of the study showed a sporadic use of ICT on Kuwait schools and stated that there remain a significant gap between possessing ICT and applying then in the school setting.

Asimwi and Levi (2017) in their study examined the influence of information and communication technology (ICT) on learning among secondary schools in Ghana developing countries in Africa, both qualitative and quantitative methods were used. Purposive sampling was used and sample sizes of 45 respondents were picked who comprised of 30 students, 10 ICT teachers and 5 heads of teachers. They stated that despite the massive advocacy of ICT aided teaching and learning investment and donation of ICT equipment to secondary schools by different organization, school still faces the challenges of how to transform students learning process. They went on to propose that assessment on how the usage ICT devices in learning among secondary school students will influence its outcome if it will be given attention.

Ohiwerei and Onimawo (2016) carried out a study titled "the utilization of information and Communication Technology between Older and Younger Lecturers in Business Education in Nigerian Universities in the South-South Geo-Political Zone". This study was

conducted to ascertain the level of utilization of information and communication technology equipment in the teaching of Business Education courses in the Department of Business Education in Nigerian Universities in the South-South Geo-Political Zone". This study was conducted to ascertain the level of utilization of Information and Communication Technology equipment in the teaching of Business Education courses in the Department of Business Education in Universities in the South-South geo-political zone of Nigeria. A population 117 business education lecturers in seven federal and state universities of the south-south geo-political zone of Nigeria was used. The instrument for data collection was a four-point scale questionnaire.

Three research questions were answered using mean(X) and standard deviation. Hypotheses 1-3 were tested using ANOVA statistics. All the hypotheses were tested at a 0.05 level of significance. Results from the analyzed data showed that the null hypothesis is accepted because the critical p-value is less than P<.05. The null hypothesis is accepted because the critical p-value is less than P<.0.5 This is because lecturers with fewer years of experience have a higher proportion of utilization of ICT equipment more than those lecturers with long years of experience. The null hypothesis was accepted because the calculated p-value is less than p<.05. This is because Lecturers with lower qualifications. Conclusion and recommendations were made such as University authorities should provide incentives to encourage the older Lecturers to encourage them in ICT training. Government and university authorities should provide electricity as well as solar generating sets for all the universities. Government and university authorities should connect all the universities, faculties as well departments to ICT nationwide. The government should assist by reducing the high cost of ICT hardware in Nigeria.

Utilization of ICT Infrastructures

Mamman (2015) carried out a similar study titled "utilization of information and communication technologies (ICTs) in public library services in Nigeria". Twelve public libraries from the six geo-political zones of the country comprised the sample of the study. The study aimed to inquire into the utilization of information and communication technologies in public library services in Nigeria. The questionnaires were validated by the expert opinions of three professionals in library and information science from the universities of Uyo, Maiduguri, and Abuja, respectively. A reliability test of the instrument (questionnaire) was done using 120 users and 30 staff (librarians and library officers) from Bauchi, Kano, and Nassarawa state public libraries. The study employed a descriptive survey research design. A stratified sampling technique was used in choosing the sample. The population of the study consisted of four thousand two hundred and forty-five (4,245) respondents which comprised librarians (74), library officers (164), and registered users (4,0007). Three researcher-designed instruments were used and these were questionnaires, interview schedule, and observation checklist. The mean was used in answering the research questions and bar charts were used to show-case the analysis of the study. Data collected from the questionnaires, interview schedules and observation checklist were analyzed using the descriptive statistical method. Based on the data collected and analyzed, findings revealed that: the commonly available ICT facilities in public libraries were computers, UPS, vide1otapes, television sets, photocopies, and printers; users were not satisfied with the ICT facilities available in public libraries; some of the barriers to effective utilization of ICTs in public libraries were inadequate funding, staff low level of computer literacy, inadequate ICT infrastructure and low level of ICT awareness among users: users of public libraries in Nigeria use ICTs mainly for accessing educational information, keeping abreast with current news, events, internet browsing, downloading and storing information for personal use and word processing. The study concluded that public

libraries in Nigeria need to employ the use of ICT facilities and resources if their services are to improve.

Oladele (2018) carried out a study on the impact of information and communication technology (ICT) on the management of universities in Nigeria". Nine objectives were postulated in line with research questions and hypotheses. The variables investigated in the objectives include communication, decision making, planning and staff development, maintenance of discipline, provision of welfare and health services, maintenance of records, interpersonal relationships and provision of games recreational services. The research design employed in this study was a descriptive survey design. The population for the study comprised 138 universities at the time of the study. These universities include 40 Federal, 40 state, and 58 private universities. These 138 universities were further grouped into six geo-political zones of Nigeria. A stratified sampling technique was adopted for this study to give equal chance to all sample representatives and be able to cover all the universities across the six geo-political zones. Consequently, one university was randomly selected from each of the three groups of universities in each geo-political zone, making a total of 18 selected universities. Purposive sampling was used to share 50 copies of the questionnaire in each of the 18 universities, which gave a total of 900 as a sample size. The data obtained were analyzed using percentages, descriptive statistics and analysis of variance (ANOVA) statistics. Results showed that information communication technology (ICT) enhanced better information dissemination in the Universities, there was an inadequate provision of welfare and health services such as lecture rooms, clinics, and accommodation for both staff and students in the Universities and there were inadequate computer centers where the youth, within the neighboring community, can learn in the Universities. Based on the findings, it was concluded that ICT has both positive and negative impacts on the communication in universities in Nigeria and that availability of ICT has a positive impact on communication in universities in

Nigeria. It was recommended among others that university authorities should be more proactive in the provision of modern or up-to-date information and communication systems in their universities. Furthermore, to enhance discipline in universities ICT should be used for payment of all fees and levies and be used in conducting computer-based tests and examinations.

Timothy Bariu (2021) conducted a study to investigate The Perceptions of teachers on the use ICT Infrastructure in education in Kenya. It adopted a descriptive survey research design. Random sampling method was used to sample 12 secondary schools from the twenty in the Sub-County and study respondents from the accessible population of the study. A sample of 276 respondents comprising 12 principals and 48 teachers and 216 form 3 students was used for the study. Questionnaires, interviews and observation schedules were used to collect data from the respondents. Reliability of the instruments was established through test re-test method. A Pearson correlation coefficient (r = 0.75) thus the instruments were internally consistent and would test what is required to be tested. The findings indicate that the teachers' perception towards ICT integration into teaching-learning process enhances efficiency, quality and accessibility.

Challenges in ICT Utilization

Martin Gellerstetstam., (2018) examined “the issues and challenges related to ICT use in teaching". The study was to analyze teachers’ perceptions of the challenges faced in using ICT tools in classrooms. A quantitative research design was used to collect the data randomly from a sample of 100 secondary school teachers in the state of Melaka, Malaysia. Evidence has been collected through distribution of a modified adopted survey questionnaire. Overall, the key issues and challenges found to be significant in using ICT tools by teachers were: limited accessibility and network connection, limited technical support, lack of effective training, limited time and lack of teachers’ competency. Moreover, the results from

independent to test show that use of ICT tools by male teachers (M =2.08, SD = .997) in the classroom is higher compared to female teachers (M = 2.04, SD = .992). It is hoped that the outcome of this research provides proper information and recommendation to those responsible for integrating new technologies into the school teaching and learning process.

Summary of Literature Review

The review of related literature on use of ICT for effective teaching by teachers was carried out by first presenting the concept of ICT in education where a brief history of ICT in education was discussed. The concept of teachers and ICT was also discussed likewise ICT policies in the Nigeria Education sector and ICT in secondary level were also reviewed. Pedagogical practice using ICT, Benefit of ICT in pedagogy, school administration as technology leaders as well parents support for ICT in Education.

A theoretic framework of ICT in Education which was anchored on theory of construction theory of Diffusion of innovation and technology Acceptance Model theory were extensively discussed.

Many empirical studies related to this study were reviewed. From the empirical reviews within the reach of the researcher, it was observed that there is a dearth of literature in this area of study and barely none had carried out any study using the secondary schools in River state. This is the gap the study filled.

CHAPTER THREE

METHODOLOGY

In this chapter, the method that was used in collecting and analyzing the data for this research work, which include the following: Research Design, Population of the Study,

Sample and Sampling Techniques, Research Instrument, Validity of the Instrument, Reliability of the Instrument, Method of Data Collection and Method of Data Analysis are discussed.

Research Design

The research design for this study was a correlational research design. This method is primarily concerned with the collection of data for the purpose of describing, correlating and interpreting existing conditions using a representative sample to represent the population.

Population of the Study

The population of this study was of 3000 teachers in private secondary schools in Rivers West Senatorial District of Rivers State. Rivers West Senatorial District is made up of Eight (8) local governments

A breakdown of the population is shown in the table 1.

Table 1: Population of the Study

S/N	Local Government	Numbers of Teachers
1.	Abua/Odual	470
2.	Ahoada East	380
3.	Ahoada West	578
4.	Akuku Toru	674
5.	Asari-Turu	472
6.	Bonny	580
7.	Degema	627
8.	Ogba/Egbema/Ndoni	445
	Total	**4226**

(Source: Post Primary Education Board, 2023).

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Sample and Sampling Technique

The sample size for this data was 300. Using the simple random sampling technique, 300 teachers representing 10% of the total population (3000) was selected from the 8 local government areas as the sample for this study. This decision was supported by Gay, Geoffrey,

Mills and Airasian (2009) who suggested that a sample size of educational research should be at least 10% (percentage) of the total population. This sample was drawn using the simple random sampling technique. A breakdown of the sample is contained in Table 2.

Table 2: Sample of the Study

S/N	Local Government	Samples of Teachers
1.	Abua/Odual	42
2.	Ahoada East	31
3.	Ahoada West	45
4.	Akuku Toru	36
5.	Asari-Turu	35
6.	Bonny	36
7.	Degema	35
8.	Ogba/Egbema/Ndoni	40
	Total	**300**

Research Instrument

The instrument that was used for data collection was a questionnaire. The questionnaire is made up of two section A and B. Section A contains items that seek the demographic information of respondents. While section B contains items that seek respondents view on the availability and utilization of information and communication technology (ICT) for effective teaching in secondary schools in Rivers Senatorial District of Rivers State.

Validity of the Instrument

After the supervisor has seen the draft of the questionnaire, it was then validated by three (3) other experts in the Department of Education, Benson Idahosa University, two in Education Administration and the other in Measurement and Evaluation. Their corrections, opinions, comments and contributions were collated and integrated into the final draft that was approved by the supervisor.

Reliability of the Instrument

The reliability of the instrument was carried out in order to determine its internal consistency. This was done by administering the questionnaire on thirty (30) secondary school teachers that are not part of the sample. Data collected were analyzed using Cronbach alpha reliability statistics and this yielded a coefficient of 0.83 which was considered high enough for the instrument to be considered viable.

Method of Data Collection

The researcher submitted a letter of introduction to the principals to seek for permission to administer the questionnaire. After this, copies of the questionnaire were administered on the respondents. This was done by the researcher and two other trained Research Assistants. The instrument was administered on respondents and retrieved on the spot after completion to avoid misplacement.

Method of Data Analysis

The data collected was analyzed using the descriptive statistics of mean and standard deviation to answer all the research Questions. The Pearson Product Moment Correlation Statistics was used to test the hypotheses at 0.05 alpha level of significance. The probability value (P) was used in taking decisions on null hypotheses. Of P- value is less than 0.05, the null hypothesis was rejected but when P- value was greater than 0.05, then null hypothesis was retained.

CHAPTER FOUR

ANALYSIS OF DATA AND PRESENTATION OF RESULTS

In this Chapter, the presentation and analysis of data collected, summary and discussion of findings are reported.

Demographic Analysis

Table 1: Gender of Teachers

Variable	Frequency	Percentage (%)
Male	104	34.6
Female	196	36.4
Total	**300**	**100**

Table 1 shows that majority of the respondents are female. The table also shows that all the genders are fairly represented in the study.

Table 2: Professional Qualification of the Teachers

Variable	Frequency	Percentage (%)
NCE	82	27.3
B.ED	186	62.0
PGDE	32	10.7
Total	**300**	**100**

Table 2 shows that majority of the teachers are B.Ed certified in terms of educational qualification followed closely by NCE teachers representing 27.3%

Data Analysis

Research questions

The data collected were analyzed to answer the research questions using mean (x) and standard deviation 9SD) and the results are shown in table 5- 9.

Research Question 1: What is the level of availability of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?

In using the mean and the standard deviation to answer the research questions, 3.0 were used as a benchmark for high indication of each of the items of the instrument. Thus, any item with a mean 3.0 and above was considered as strongly agreed, very high, and very available. 2.0-2.99 was considered as agreed, fairly available. Low availability and low usage on the other hand. The standard deviation was used to showcase or establish the extent to which each of the individual mean varies or disperses around the cluster mean.

The data in Table 3 was used to answer research questions.

Table 3: Mean Rating and Standard Deviation on the level of availability of ICT infrastructure for effective teaching in Rivers West Senatorial District of Rivers State.

S/N	**Level of availability of ICT**	**N**	$\overline{X}$	**SD**	**Remark**
1	Fuctional Computers	300	2.44	1.12	Agreed
2	Printers	300	2.55	1.10	Agreed
3	Internet services	300	2.39	1.07	Agreed
4	Electronic Notice Boards	300	2.60	1.06	Agreed
5	Standby Generators	300	2.43	1.11	Agreed
6	Multi-Media Projectors	300	2.67	1.09	Agreed

Analysis of the result of the mean responses of respondents on the level of availability of ICT for effective teaching in secondary schools in Rivers West Senatorial District indicates that all the 6 items had mean Reponses that ranged between 2.39 and 2.67.

The mean Reponses are indication that the respondents agreed to have available ICT infrastructure for effective teaching.

Research Questions 2: To what extent is ICT infrastructures utilized for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

The data in Table 4 below were used to answer research question 2.

Table 4: Mean Rating and Standard Deviation on the Extent to which ICT infrastructures are Utilized for Teaching in Secondary schools in Rivers West Senatorial District of Rivers State.

S/N	**Extent of Utilization of ICT Infrastructures**	**N**	***X***	**SD**	**Remark**
1	Teachers uses ICT tools to surport teaching and learning	300	2.51	1.045	Low
2	Teachers uses Overhead Projectors to motivate students to learn new experiences	300	2.52	1.055	Low
3	Utilizing Computer accessories for processing data	300	2.61	1.075	Low
4	The use of Computer system for practicals	300	2.59	1.089	Low
5	The use of photocopy Machine, Scanners and printers	300	2.53	1.146	Low
6	The uses of Computer based test (CBT) Software for internal and external Examinations	300	2.37	1.113	Low

Results of the data presented in Table 4 show the mean ratings of responses by teachers in secondary schools in Rivers West Senatorial District of Rivers State as regards the extent to which ICT infrastructures are utilized for teaching and learning in secondary school in Rivers State. The results revealed that all six items had mean rating that ranged from 2.37 to 2.61 indicating a low Utilization of these ICT infrastructures for teaching and learning in secondary schools in Rivers West Senatorial District of Rivers State.

Research Question 3: What are the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?

Table 5: Mean Rating and Standard Deviation on the Challenges militating against the utilization of ICT Infrastructures in teaching in secondary schools In Rivers West Senatorial District of Rivers State.

S/N	**Challenges militating against the Utilization of ICT infrastructures**	**N**	***X***	**SD**	**Remark**
1	Poor electric power supply	300	3.17	1.40	Agreed
2	Lack of knowledgeable ICT Teachers or Inadequacy trained Teachers	300	2.92	1.34	Agreed
3	High cost of ICT Equipment and accessories	300	2.89	1.39	Agreed
4	Inability to replace broken-down equipment and facilities	300	3.05	1.43	Strongly Agreed
5	Lack of adequate communication for ICT equipment	300	2.92	1.40	Agreed
6	Inadequate telephone service	300	2.91	1.38	Agreed

Results of the data presented in table 5 show the mean ratings of responses by teachers in secondary schools in Rivers State West senatorial district as regards the Challenges militating against the Utilization of ICT infrastructures for teaching and learning in secondary school. The results revealed that the 6 items had mean scores that range from 2.91 – 3.17 indicating that majority of the respondent agreed to the Challenges militating against the effective use of ICT for teaching and learning.

Research Question 4: What are the suggested solutions on the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?

Table 6: Mean Rating and Standard Deviation on the suggested solutions on the challenges militating against the Utilization of ICT infrastructures in Rivers West Senatorial District of Rivers State.

S/N	**Solutions on the challenges militating against the Utilization of ICT infrastructures.**	**N**	$\overline{X}$	**SD**	**Remark**
1	Constant electric power supply or use of Solar energy.	300	2.50	1.144	Agreed
2	Skilled or Knowledgeable ICT teachers to be employed	300	2.63	1.101	Agreed
3	Schools should make available funds for the purchase of ICT Equipment	300	2.54	1.116	Agreed
4	Schools should try to maintain broke-down equipment and facilities.	300	3.53	1.068	Agreed
5	Schools to seek for fund or assistant from government or non- governmental organizations for building accomodations for ICT equipments	300	2.46	1.134	Agreed
6	Telephone service should be made available by school management.	300	2.39	1.094	Agreed

Results of the data presented in Table 6 showed the mean ratings of responses by teachers in secondary schools in Rivers State as regards the suggested solutions on the challenges militating against the Utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial District of Rivers State. The results revealed that 6 items had mean scores that ranged from 2.39 to 2.63. These mean scores are indications that the suggested solutions on the challenges militating against the Utilization of ICT infrastructures will enhance effective teaching in secondary schools in Rivers West senatorial district of Rivers State.

Testing of Hypotheses

The following Three hypotheses were tested at 0.05 alpha level of significance. These are shown in tables 7– 8.

Hypothesis 1: There is no significant influence of the level of availability of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State.

The summary of the test of Hypothesis one is presented in table 7.

Table 7: Inferential statistics showing Pearson product Moment correlation coefficient of the level of availability of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State.

Variables	$\overline{X}$	***SD***	**r**	**r^2**	**Sig-(2-tailed)**	**Decision**
X	2.51	1.14				
			0.62	0.38	0.01	Reject Ho
Y	2.58	1.16				
r^2 = coefficient of determination						

The information in Table 7 showed that the mean score for level of availability of ICT Infrastructures for effective teaching was 2.51 with a standard deviation of 1.14 while the extent to which ICT Infrastructures are available was 2.58 with a standard deviation of 1.16. the table also showed that there is a high positive relationship (0.62) between extent of which ICT infrastructures is effective teaching and the level of availability of ICT infrastructures. The coefficient of determination (r^2) associated with the correlation coefficient of 0.62 was 0.38. The coefficient (r^2) indicates that the level of availability of ICT infrastructures has a close relationship therefore the relationship is significant at 0.01 since the significant value is lesser than 0.05 the alpha level of significance. The hypothesis which states therefore, that

there is no significant relationship between the level of availability of ICT infrastructures and the effective teaching in secondary schools in Rivers West Senatorial District of Rivers State is not retained. Null hypothesis is therefore rejected.

Hypothesis 2: There is no significant influence of the extent of utilization of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

The summary of the test of hypothesis two is presented in table 8.

Table 8: Inferential statistics showing Pearson product Moment correlation coefficient of the influence of the extent of utilization of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

Variables	$\overline{X}$	***SD***	**r**	**r^2**	**Sig-(2-tailed)**	**Decision**
X	2.01	1.07	0.18	0.03	0.75	Don't Reject Ho
Y	2.58	1.16				
r^2 = coefficient of determination						

The information in Table 8 showed that the mean score of extent to which ICT infrastructures is utilized for effective teaching was 2.01 with a standard deviation of 1.07; the effective teaching was 2.58 with a standard deviation of 1.16. The table also showed that there is a low positive relationship (0.18) between the two variables under study. The coefficient of determination (r^2) associated with the correlation coefficient of 0.18 was 0.03. the coefficient of determination (r) indicates that, utilization of ICT infrastructures has only 3% influence on effective teaching in secondary schools. The relationship is statistically insignificant at 0.75 since this significant value is greater than 0.05 the alpha level of significance. The hypothesis which states, therefore, that there is no significant influence of the extent of utilization of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts

of Rivers State is retained. We therefore conclude that there is no significant influence of the extent of utilization of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

Summary of Findings

The summary of findings that emanated from this study are presented as follows:

- there is a significant relationship between the level of availability of ICT infrastructures and the extent of usage of ICT infrastructure for teaching in secondary schools in Rivers West Senatorial Distinct of Rivers State.
- there is no significant relationship between the extent to which ICT infrastructures is Utilized for effective teaching and the extent of usage of ICT infrastructure for effective teaching in secondary schools in Rivers West Senatorial Distinct of State State.
- all the respondents agreed that poor electric power supply, lack of knowledgeable ict teachers or inadequacy trained teachers, high cost of ICT equipment and accessories inability to replace broken-down equipment and facilities, lack of adequate communication for ICT equipment and inadequate telephone service are the challenges militating effective teaching in secondary schools in West Senatorial Distinct in Rivers State.
- all the respondents also agreed that Constant electric power supply or use of Solar energy, Skilled or Knowledgeable ICT teachers to be employed, Schools should make available funds for the purchase of ICT Equipment, Schools should try to maintain broke-down equipment and facilities, Schools to seek for fund or assistant from government or non- governmental organizations for building accommodations for ICT equipment and Telephone service should be made available by school management in secondary schools in Rivers West Senatorial District of Rivers State.

Discussion of Findings

Level of availability of ICT infrastructures for effective teaching.

Data in table 3 of chapter four revealed the level of availability of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial District of Rivers State. The finding of hypothesis one revealed that there is significant relationship between the level of availability of ICT infrastructures and the extent of usage of ICT infrastructures. This finding is consistent with that Ghavifekr and Rosdy (2015) who carried out a study titled "Teaching and Learning with Technology: Effectiveness of ICT integration in schools. The study revealed that the availability of ICT infrastructures and ICT tools and facilities is one of the main factors in the success of technology based teaching and learning. The findings revealed that the more availability of ICT infrastructures and more trained teachers of ICT, the more the usage of ICT infrastructures for teachers.

To what Extent is ICT infrastructures utilized for effective teaching in secondary schools in Rivers West Senatorial District of Rivers State.

The finding of hypothesis two showed that there is no significant relationship between the extents of usage of ICT infrastructures for teaching. This shows that the mere fact that ICT infrastructures are Utilized does not guarantee that teachers will make use of it for teaching and learning processes. Therefore, this finding is in agreement with Adomiand Kpangban (2010), who carried out a study on application of ICTS in Nigerian secondary schools. The study indicated that though some efforts have been made to ensure the integration of ICTs in the system, the level of ICT adoption and use is low, due to poor policy/project implementation strategies and limited/poor information infrastructures. In the same view, Goshit (2006) stated from his study of ICT use in secondary school, that though efforts been made to ensure that ICTs are available, accessible and used in Nigerian secondary schools, the level of uptake is still low.

The challenges militating against the Utilization of ICT infrastructures for effective teaching in secondary schools, in Rivers West senatorial district of Rivers state.

It was established from the finding that all the respondents agreed that poor electric power supply, lack of knowledgeable ICT teachers or inadequacy trained teachers, high cost of ICT equipment and accessories inability to replace broken-down equipment and facilities, lack of adequate communication for ICT equipment and inadequate telephone service are the challenges militating effective teaching in secondary schools in West Senatorial Distinct in Rivers State.

The Solutions suggested against the challenges militating the Utilization of ICT infrastructures for effective teaching in secondary schools, in Rivers West senatorial district of Rivers state.

In the same vein, it was found in the study that all the respondents also agreed that constant electric power supply or use of solar energy, skilled or knowledgeable ICT teachers to be employed, schools should make available funds for the purchase of ICT equipment, schools should try to maintain broke-down equipment and facilities, schools to seek for fund or assistant from government or non- governmental organizations for building accommodations for ICT equipment and telephone service should be made available by school management in secondary schools in Rivers West Senatorial District of Rivers State.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary

This study examined the availability and utilization of information and communication technology (ICT) for effective teaching in secondary schools in Rivers West Senatorial District of Rivers State. Four research questions were raised to guide the study. These include:

1. What is the level of availability of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?
2. To what extent is ICT infrastructures utilized for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?
3. What are the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?
4. What are the suggested solutions on the challenges militating against the utilization of ICT infrastructures for effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State?

Hypotheses formulated include:

1. There is no significant influence of the level of availability of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State.

2. There is no significant influence of the extent of utilization of ICT infrastructures on effective teaching in secondary schools in Rivers West Senatorial Districts of Rivers State

Findings include:

1. There is significant relationship between the level of availability of ICT infrastructures and the extent of usage of ICT infrastructure for teaching in secondary schools in Rivers West Senatorial Distinct of Rivers State.

2. There is no significant relationship between the extent to which ICT infrastructures is Utilized for effective teaching and the extent of usage of ICT infrastructure for effective teaching in secondary schools in Rivers West Senatorial Distinct of State.

Educational Implications

From this study, it could be decided that

The use of information and communication technology will promote effective teaching by teachers. The level of availability of ICT infrastructures is increasing and others contextual factors being taken care of, the extent of Utilization ICT infrastructures by teachers will increase as well and this will cause teaching to be more effective and enhanced. the challenges militating against the utilization of ICT infrastructures in secondary schools will enable teachers and school management to work toward the Challenges thereby promoting effective teaching and learning. The use of facilities such as e-mail, computers and video conferencing have made it possible to overcome barriers of space and time and opened up new possibilities for learning. The use of technology in education is increasing and it is now possible to deliver teaching and training to a widely disperse audience.

The implication of this study will be important to proprietors and teachers of private secondary schools in Rivers state in particular and in Nigeria in general. Effective teaching depends on the ability of teachers to effectively transfer their knowledge to students. With the use of ICT Infrastructures, teachers will be better positioned to achieve the educational goal of teaching learning. Teachers will be able to collaborate more with their students, within and outside their communities.

Inability of teachers to use ICT infrastructures to teach will have negative effect on the students who would be deprived of technological ability that is needed in the global society. This study is significant to the level that it provides understanding of what an ideal teacher should do in order to improve their roles as facilitators using technology.

The study equally highlighted factors challenging the use of ICT infrastructure for teaching and learning processes. This will enable policy makers and administrators to be aware of the factors that can hinder them from enjoying the perceived benefits of using ICT for teaching. There is now an increasing awareness regarding the potentials of ICT in learning. Many private and public secondary schools in the country are now infusing ICT into their teaching activities. The race has become rather dramatic because students seem to be more aware and sometimes leading the teachers in the use of ICT. The computer and internet facilities in the home of the affluent and even the average, complemented by smart phones everywhere have provided hundreds of thousands of Nigeria secondary school students an unprecedented opportunity to join millions of their colleagues around the globe in using ICT to socialize.

This study has however shown that teachers also have perceived the usefulness of ICT though not every teacher seems interested. The need for further development and use among teachers particularly at the secondary education level is highly recommended.

It is shown in this study that all the respondents were selected from private schools. This indicates that proprietors of these schools are not really doing enough in providing ICT infrastructures in their school. It won't be out of place however if the ministries of Education and other policy making bodies insist on the provision ICT infrastructures before schools are approved. Teachers training and professional development oriented policies should support ICT provision in both public and private owned schools so as to encourage teachers and students to use them. Emphases must be placed on the pedagogy behind the use of ICTs for teaching/learning. Teachers need to adopt, develop and support the practice for students and encourage own theories in teaching/learning activities.

Contribution to Knowledge

The study has contributed a lot to knowledge as it has established the fact that teachers need to be fully aware of ICT infrastructures that can be used for teaching purposes in order to fully utilize them to achieve goals of teaching and learning. Also established is the fact that even when awareness is there, the teachers need to be motivated and encouraged in order to increase the extent of use of these ICT infrastructures. It is a fact that there are numerous challenges that must be overcome for teachers to fully embrace the use of ICT for effective dissemination of knowledge in secondary schools. The findings of the study should guide the efforts of the federal ministry of education, Rivers state ministry of education, Post Primary Education Board, Education policy makers in addressing schools for approval. The finding of this study will be shared with the school proprietors in the South Senatorial District of Rivers State to inform them of the immerse benefit in the use of ICT for effective dissemination of knowledge.

Conclusion

From the above, we can conclude that ICT plays a significant role in effective teaching and learning in Nigerian Educational Institutions, this is because it solves the problems of receiving, storage and retrieval of vital data at any point in time if the ICT facilities are available

Based on the findings of this study, the following conclusion are drawn

The level of availability of ICT infrastructures in private secondary school is moderate. Many teachers agreed, though not strongly, to the level of availability of ICT infrastructures for effective teaching.

There is moderate availability of ICT infrastructures in secondary schools for ICT Utilization by teachers.

There are many challenges militating against the Utilization of ICT by teachers in secondary school. These challenges range from lack of power, poor internet service. This prevent the teachers and students from easier sharing of information in the school system.

The suggested solutions on the challenges militating against the Utilization of ICT infrastructures for teaching in private secondary school will enable the teachers and the school management to make teaching effective. generally this will help in private secondary schools in Rivers West senatorial district of Rivers state.

Recommendations

Based on the findings of the study the following recommendations were made

Ministry of education should ensure that private schools have good number of ICT infrastructures before approval to manage a school is given to them.

Government in conjunction with ministry of education should organize ICT seminars, conferences and workshops for both public and private schools teachers and administrations to boost ICT awareness.

Management of schools should train and re-train teachers regularly to enable them make the use of ICT for effective teaching.

Teachers should be motivated by rewarding their willingness to adapt to the use of ICT in teaching and learning process.

School administrators should provide ICT infrastructures. There can be no use of ICT when the ICT infrastructures are not there to start with.

Government should provide subsidies for ICT infrastructures.

Financial houses like banks should provide ICT infrastructures loans to schools.

Government should provide regular power supply to schools. It is very frustrating having gadgets lying somewhere and not being able to use them due to power outages.

ICT programs should be included in teachers training curriculum.

Government should implement fully, ICT policies.

School administrators and teachers should imbibe good maintenance culture in order to keep those ICT infrastructures.

Schools should source for funds from school projects to boost their budgets.

ICT should be fully integrated into school curriculum.

Parents should provide enough support at home for ICT use by their children.

Communities should show support for the use of ICTs in school by embracing schools using ICT for teaching and learning process.

Suggestion for Further Studies

Since ICT is still relatively new in the teaching and learning process, a lot of research is needed to be carried out. This study has exposed many things that could not be covered thoroughly. The researchers, thus recommends the following possible research areas.

The impact of ICT on students' academic performance in difference subjects.

Students' use of ICT in the learning process benefits and challenges.

The use of ICT public secondary schools.

Students' perception of the use of ICT for pedagogy.

Comparative study of the use of ICT in public and private school, mixed and single schools, rural and urban schools, small and large schools.

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APPENDIX A

LETTER OF INTRODUCTION

School of postgraduate studies
Department of Education
Faculty of Arts and Education
Benson Idahosa University
Benin City.

Dear Respondent,

LETTER OF INTRODUCTION

The researcher is a master of education student carrying out a research dissertation on the use of information and communication technology (ICT) for effective dissemination of knowledge by secondary school teacher in Rivers State Senatorial district.

This researcher is designed to seek your opinion and elicit information for research purposes only. Please you are requested to cooperate and provide accurate information on each item.

Be assured that your response will be treated with utmost confidentiality.

Thank you.

Yours sincerely.

Michael Ben
(Researcher)

QUESTIONNAIRE

ICT AND EFFECTIVE TEACHING IN SECONDARTY SCHOOLS (ICTTSS)

SECTION A

To be completed by the teachers: Please supply information to the following items by indicating your response with a tick [√] in the appropriate box provided.

1. Name of School:

2. Gender: (a) Male [ ] (b) Female [ ]

3. Professional Qualifications of the teacher (a) N.C.E [] (b) B.Ed[ ] PGDE [ ] (d) M.Ed [ ] (e) Ph.D [ ] (f) Non-Professional teacher [ ]

SECTION B

Scale:

SA	Strongly Agree	VA	Very Available	HU	Highly Used
A	Agree	A	Available	MU	Moderately Used
U	Undecided	U	Undecided	U	Undecided
D	Disagree	FA	Fairly Available	LU	Low Used
SD	Strongly Disagree	NA	Never Available	NU	Never Used

S/N	Level of Availability of ICT Infrastructures	VA	A	U	FA	NA
1.	Projector					
2.	Podcast					
3.	Internet access					
4.	Desktop computers					
5.	Laptops/Tabs					

6.	Social media output channel					
	Extent of Utilization of ICT Infrastructures	**HU**	**MU**	**U**	**LU**	**NU**
1.	Teachers uses ICT tools to surport teaching and learning					
2.	Teachers uses Overhead Projectors to motivate students to learn new experiences					
3.	Utilizing Computer accessories for processing data					
4.	The use of Computer system for practicals					
5.	The use of photocopy Machine, Scanners and printers					
6.	The uses of Computer based test (CBT) Software for internal and external Examinations					
	Challenges militating against the utilization of ICT for effective teaching	SA				
1.	Poor electric power supply					
2.	Lack of knowledgeable ICT Teachers or Inadequacy trained Teachers					
3.	High cost of ICT Equipment and accessories					
4.	Inability to replace broken-down equipment and facilities					
5.	Lack of adequate communication for ICT equipment					
6.	Inadequate telephone service					
	Suggested solutions to the challenges of ICT for effective teaching					
1.	There should constant electric power supply or use of Solar energy.					
2.	Trained and qualified ICT teachers to be employed					
3.	Schools should make available funds for the purchase of ICT Equipment					
4.	Schools should try to maintain broken-down equipment and facilities.					
5.	Schools to seek for fund or assistant from government or non- governmental organizations for building accomodations for ICT equipments					
6.	Telephone service should be made available by school management.					

APPENDIX B

Calculated

```
NEW FILE.
DATASET NAME DataSet2 WINDOW=FRONT.
RELIABILITY
  /VARIABLES=SCORE1 SCORE2
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Reliability

Notes

Output Created		12-JUL-2023 06:50:24
Comments		
Input	Active Dataset	DataSet2
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	30
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=SCORE1 SCORE2 /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

[DataSet2]

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NEW FILE.
DATASET NAME DataSet2 WINDOW=FRONT.
RELIABILITY
  /VARIABLES=SCORE1 SCORE2
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.
```

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.779	2