ASSESSMENT OF PROVISION AND USAGE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FACILITIES ON STUDENTS' ACADEMIC PERFORMANCE IN SECONDARY SCHOOLS IN KADUNA STATE, NIGERIA

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER DEGREE (M.Ed) IN ADMINISTRATION AND PLANNING

DEPARTMENT OF EDUCATIONAL FOUNDATIONS AND CURRICULUM,
FACULTY OF EDUCATION,
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MARCH, 2025

DECLARATION

I declare that this dissertation entitled, "Assessment of Provision and Usage of Information and Communication Technology (ICT) Facilities on Students' Academic Performance in Secondary Schools in Kaduna State, Nigeria" is a result of my personal research work. It has never been presented anywhere for the purpose of the award of a higher degree or any other diploma certificate in Ahmadu Bello University or elsewhere. All sources of information are dully acknowledged by means of references.

_____ _____

TOBE,Elizabeth Date
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CERTIFICATION

This dissertation entitled, "ASSESSMENT OF PROVISION AND USAGE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FACILITIES ON STUDENTS' ACADEMIC PERFORMANCE IN SECONDARY SCHOOLS IN KADUNA STATE, NIGERIA" by TOBE, Elizabeth, meets the regulations governing the award of Master Degree in Educational Administration and Planning of Ahmadu Bello University, Zaria, Nigeria and is approved for its contributions to knowledge and literary presentation.

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DEDICATION

This work is dedicated to my family.

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TABLE OF CONTENTS

COVER PAGE i

TITLE PAGE ii

CERTIFICATION iv

DEDICATION v

ACKNOWLEDGEMENT vi

TABLE OF CONTENTS viii

LIST OF TABLES xi

LIST OF ABBREVIATIONS xii

OPERATIONAL DEFINITIONS OF TERMS xiii

ABSTRACT xiv

CHAPTER ONE: INTRODUCTION 1

1.1 Background to the Study 1

1.2 Statement of the Problem 5

1.3 Objectives of the Study 6

1.4 Research Questions 6

1.5 Research Hypotheses 7

1.6 Basic Assumptions 8

1.7 Significance of the Study 8

1.8 Scope of the Study 9

CHAPTER TWO: REVIEW OF RELATED LITERATURE 11

2.1 Introduction 11

2.2 Conceptual Framework 11

2.2.1 Concept of Information and Communication 11
2.2.2 Concept of Microphone 14
2.2.2 Concept of Technology 15
2.2.3 Concept of Communication 16
2.2.4 Concept of Information and Communication Technology (ICT) 18
2.2.4 Concept of Computer 33
2.2.5 Concept of Projectors 33
2.3 Theoretical Framework 35
2.3.1 Systems Theory 35
2.4 Provision and Usage of Computers on Students' Academic Performance 37
2.5 Provision and Usage of Projectors on Students' Academic Performance 41
2.7 Provision and Usage of Software Facilities on Students' Academic Performance 46
2.8 Provision and Usage of Hardware Facilities on Students' Academic Performance 49
2.9 Provision and Usage of Internet Facilities on Students' Academic Performance 50
2.10 Summary of Literature Review 62
CHAPTER THREE: RESEARCH METHODOLOGY 64
3.1 Introduction 64
3.2 Design of the Study 64
3.3 Population of the Study 64
3.4 Sample and Sampling Techniques 65
3.5 Instrumentation 66
3.5.1 Validity of the instrument 67
3.5.2 Pilot Testing 67
3.5.3 Reliability of the Instrument 68
3.6 Procedure for Data Collection 68

3.7 Method of Data Analysis 68

CHAPTER FOUR: DATA ANALYSIS, PRESENTATION, AND FINDINGS 69

4.1 Introduction 69

4.2 Answers to Research Questions 69

4.3 Hypotheses Testing 77

4.4 Summary of Findings 80

5.5 Discussion of the Findings 81

CHAPTER FIVE: SUMMARY, CONCLUSION, AND RECOMMENDATIONS 89

5.1 Introduction 89

5.2 Summary 89

5.3 Conclusions 90

5.4 Recommendations 91

5.5 Contributions to Knowledge 91

5.5 Suggestions for Further Studies 92

REFERENCES 94

APPENDICES 113

LIST OF TABLES

Table		Pages
3.1:	Population of the Study	76
3.2:	Sample Size of the Study	77
4.1:	Opinions of the Respondents on Provision and Usage of Computers	81
4.2:	Opinions of the Respondents on Provision and Usage of Projectors	83
4.3:	Opinions of the Respondents on Provision and Usage of Microphones	85
4.4:	Opinions of the Respondents on Provision and Usage of Software Facilities	87
4.5	Opinions of the Respondents on Provision and Usage of Internet Facilities	89
4.6:	ANOVA on the Provision and Usage of Computers	90
4.7:	ANOVA on the Provision and Usage of Projectors	91
4.8:	ANOVA on the Provision and Usage of Microphones	91
4.9:	ANOVA on the Provision and Usage of Software Facilities	92
4.10	ANOVA on the Provision and Usage of Internet Facilities	92
4.11:	Summary of Hypotheses Testing	93

LIST OF ABBREVIATIONS

1. **ICT** - Information and Communication Technology
2. **ANOVA** - Analysis of Variance
3. **SPSS** - Statistical Package for Social Sciences
4. **NUC** - National Universities Commission
5. **NERDC** - Nigerian Educational Research and Development Council
6. **JAMB** - Joint Admissions and Matriculation Board
7. **WAEC** - West African Examinations Council
8. **NECO** - National Examinations Council
9. **NABTEB** - National Business and Technical Examinations Board
10. **SSCE** - Senior Secondary Certificate Examination
11. **BECE** - Basic Education Certificate Examination
12. **ICTs** - Information and Communication Technologies
13. **GDP** - Gross Domestic Product
14. **UNESCO** - United Nations Educational, Scientific and Cultural Organization
15. **NUC** - National Universities Commission
16. **TETFund** - Tertiary Education Trust Fund
17. **NUC** - National Universities Commission
18. **ASUU** - Academic Staff Union of Universities
19. **NUC** - National Universities Commission
20. **NUC** - National Universities Commission

OPERATIONAL DEFINITIONS OF TERMS

Information and Communication Technology (ICT): In this study, ICT encompasses a wide range of technologies used to facilitate educational activities.

Open and Distance Learning: This involves the provision of education and training opportunities to learners who are separated from the instructor and the traditional classroom setting.

Digital Divide: It encompasses disparities in access to hardware, software, internet connectivity, and digital literacy skills.

Information Literacy: Information literacy refers to the ability to identify, locate, evaluate, and effectively use information from various sources.

ABSTRACT

The study is to assess the provision and usage of Information and Communication Technology (ICT) facilities on the students' academic performance in secondary school students in Kaduna State, Nigeria. Five specific objectives, research questions and null hypotheses were formulated based to guide the study. The study adopted descriptive survey research design with the population of 12488 and sample size of 378. The instrument used for data collection was structured questionnaire tagged "Assessment of the Provision and Usage of Information and Communication Technology (ICT) Facilities on Students' Academic Performance (APUICTFSAP) which contained 50 items. The data collected from the field were analysed using descriptive statistics of frequency and mean scores to answer all research questions. Inferential statistics of Analysis of Variance (ANOVA) was used to test all the null hypotheses at 0.05 level of significance. The results revealed that Provision and usage of computers influence students' academic performance by making them have access to educational resources, interact and collaborate on academic project and improve their critical thinking and stakeholders have similar views to that effect (p=221). Provision and usage of projectors influence students' academic performance through enhancing their understanding, interest and participation and promote collaborative learning among students and difference on the opinions of stakeholders on this (p=219). Provision and usage of microphones influence students' academic performance by helping them to hear teacher clearly during teaching, improve communication, confidence and clarity of instruction and difference that exist on the stakeholders' perception on that (p=412). Provision and usage of software facilities influence students' academic performance by enhancing them access to diverse learning resources, understanding, students' engagement in learning activities and help them to develop critical thinking and stakeholders hold the same opinions on the influence (p=114). Provision and usage of Internet facilities influence students' academic performance by making them have access to a wide range of educational resources, influences students' ability to conduct research for academic assignments, increased students' engagement in online learning activities and motivate and explore students to learn beyond traditional classroom materials (p=119). The study concluded that provision and usage of computers, projectors and microphones improve students' academic performances in secondary schools in Kaduna State. Software and internet facilities also enhance the academic performances of student in secondary schools in Kaduna State, Nigeria. The implication of these findings is that as many times as computers, projectors, microphones, software and Internet facilities were provided and used for teaching and learning, academic performances of secondary school students will improve. The study also recommended among others that Kaduna Stategovernment should make efforts to provide more computers and school authorities should ensure they are adequately used by the teachers for teaching and learning in secondary schools in Kaduna State. Kaduna Stategovernment should provide adequate projectors and alternative sources of power to use when the need arises by the teachers and students for teaching and learning in secondary schools in Kaduna State. Kaduna Stategovernment should make efforts to provide more microphones and school authorities should ensure they are adequately used by the teachers for teaching and learning in secondary schools in Kaduna State.

CHAPTER ONE
INTRODUCTION

1.1 Background to the Study

Information and Communication Technology (ICT) has significantly transformed various aspects of human activities, including education in the 21st century. One of its notable impacts is the shift from teacher-centred to learner-centred educational systems globally, which has been recognized over the past few decades. Reform efforts in education should prioritize equal access and quality while emphasizing the transformative potential of ICTs in equipping learners with skills essential for navigating the educational demands of this era.

Processed data, referred to as information, is crucial for decision-making, while communication involves the exchange of ideas, news, or information between individuals. According to Mbam (2016), communication entails the act of transmitting and transferring ideas or information from a sender to a receiver, either orally or in written form. Technology, on the other hand, is the application of scientific knowledge to address human challenges. It encompasses innovative methods and concepts drawn from various disciplines to fulfil specific needs or solve problems using tools, energy, and materials, including computers.

ICT, therefore, involves the handling and processing of information, such as text, images, graphics, and instructions, through electronic and communication devices like computers and cameras. It encompasses activities facilitated electronically, including the processing, transmission, and display of information. ICT integrates tools such as radio, television, cellular phones, videos, computers, sensors, interface boxes, email, satellite connections, and the internet, as well as software and materials utilized in teaching and learning. It covers equipment or

interconnected systems designed for the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data.The role of ICT in education has become a central focus in contemporary policy discussions. Its application in teaching and learning serves as an effective and practical approach to delivering education, equipping learners with the competencies required for the evolving demands of the modern workforce.

ICT enables teachers to transcend traditional teaching methods, fostering active student participation in the learning process while creating environments for experimentation and exploration, which positively impacts academic performance. Ema (2017) defines academic performance as the assessment of students' achievements across various subjects, typically evaluated through classroom performance, graduation rates, and standardized test results. Integrating ICT into education enhances quality and boosts student outcomes by increasing motivation, facilitating the acquisition of foundational skills, and improving teacher training.

ICT serves as a cornerstone for advancing knowledge, helping nations achieve Education for All (EFA) goals and bridging the global digital divide, aligning with globalization objectives. Recognizing its significance, the Federal Executive Council approved a national IT policy in March 2001, with implementation commencing in April under the National Information Technology Development Agency (NITDA). This policy recognized the private sector as a critical driver of the IT sector. An ICT policy provides a structured framework of objectives, goals, principles, and strategies to guide and regulate ICT development and application. However, with global and local advancements in ICT, the policy requires periodic review.

To address this need, the government initiated the Nigerian National ICT for Development Strategic Action Plan to chart a roadmap for ICT development. This plan outlines a five-year

implementation strategy targeting key sectors such as education, health, infrastructure, human resource development, agriculture, legal frameworks, private sector/industry, media, and community development. These efforts align with the Federal Government's Seven-Point Agenda, the National Economic Empowerment and Development Strategy (NEEDS), and other socio-economic initiatives to drive national progress.

The vision was to position Nigeria as an IT-capable nation in Africa and a significant player in the global information society by 2005, leveraging IT as a catalyst for sustainable development and global competitiveness. The mission encompassed using IT to enhance education, wealth creation, poverty eradication, job creation, and competitiveness on a global scale. ICT remains a fundamental pillar for business growth, productivity, trade, and social progress. For Nigeria and other West African nations, implementing ICT policies effectively is essential for establishing a robust market economy. Economic and social advancements rely on skilled labor and the strategic execution of ICT initiatives, as highlighted by Igyor (2016).

Recognizing the critical role of ICT, the Nigerian government has implemented supportive policy frameworks, including the National Information Technology Development Agency (NITDA), National Information Infrastructure (NII), and Local Information Infrastructure (LII). Among NITDA's objectives relevant to education are initiatives to empower youth with IT skills for global competitiveness, integrate ICT into mainstream education and training, and establish IT centres of excellence to enhance Nigeria's standing in international markets. These efforts have also led to the development of an e-education initiative aimed at modernizing the educational system.

The integration of ICT in teaching and learning, particularly in secondary schools, shifts the teacher's role to that of a course designer, facilitator, and coach while encouraging students to

become active learners. This approach enhances students' academic performance and aligns with the Chinese adage: *"If I hear, I forget; if I see, I remember; if I do, I understand."* However, a closer examination of Nigerian secondary schools reveals limited exposure of teachers and students to ICT facilities such as projectors, computers, microphones, internet access, and educational software and hardware. Compared to other sectors, education appears to lag behind significantly in ICT adoption and use.

In developing countries like Nigeria, several challenges hinder ICT integration in education. These include limited access to ICT facilities, unreliable internet connectivity, a significant disparity in the teacher-to-student ICT ratio, and insufficient time allocated for ICT usage. Additionally, the absence of ICT programs in secondary school curricula, lack of storage facilities for ICT equipment, and inadequate instructional materials—such as audio, visual, and audiovisual resources—have perpetuated reliance on traditional teaching methods. This "chalk and talk" approach leaves many teachers unprepared for the demands of the digital age, thereby limiting the acquisition of 21st-century skills like digital literacy, inventive thinking, effective communication, and higher-order reasoning.

Integrating ICT into teaching and learning in Nigerian secondary schools, particularly in Kaduna State, is essential to equip students with the skills required in this technological era. Effective ICT use involves providing tools such as projectors, computers, internet access, multimedia software, and audiovisual materials that present engaging, and authentic content. These resources not only enrich the learning process but also make it more concrete and impactful.

Against this backdrop, this study aims to evaluate the availability and utilization of ICT facilities and their impact on students' academic performance in secondary schools across Kaduna State, Nigeria. Addressing these challenges will ensure that secondary education remains relevant and

sustainable in the 21st century, ultimately fostering enhanced learning outcomes and preparing students for future challenges.

1.2 Statement of the Problem

Although ICT has begun to make inroads into education, its influence remains far less pronounced compared to fields like medicine, tourism, business, law, banking, engineering, and architecture. Within the education sector, the availability and use of ICT facilities in academic activities appear to lag significantly behind these other areas. Various organizations have highlighted the insufficient integration and use of ICT on students' academic performance.

In Kaduna State, the National Examination Council reported in 2019 that both teachers and students have limited access to ICT facilities each month. Time spent with reliable internet access is even less, and there is a notable disparity in the teacher-to-student ratio concerning ICT availability. Similarly, a 2020 report by the West African Examination Council indicated that inadequate provision and use of ICT tools such as projectors, computers, microphones, internet access, software, hardware, and video resources have hindered educational progress in the region. Furthermore, essential instructional materials, including audio, visual, and audiovisual aids, are not readily accessible.

Observations reveal that ICT tools are rarely available or utilized effectively in many public secondary schools in Kaduna State. Even where such tools exist, they are often insufficient to meet the schools' needs. Additionally, issues related to utilization persist, as available resources are either underused or overburdened. These challenges have compromised the effectiveness of ICT in enhancing teaching and learning processes.

The focus of this study is to examine the availability and usage of ICT facilities and their impact on the academic performance of secondary school students in Kaduna State, Nigeria. Addressing these gaps is essential for leveraging ICT to improve educational outcomes in the State.

1.3 Objectives of the Study

The study is designed to assess the provision and usage of Information and Communication Technology (ICT) facilities on the students' academic performance in secondary school students in Kaduna State, Nigeria. Specifically, the study seeks to:

1. ascertain the provision and usage of computers on students' academic performance in secondary schools in Kaduna State;
2. determine the provision and usage of projectors on students' academic performance in secondary schools in Kaduna State;
3. assess the provision and usage of microphones on students' academic performance in secondary schools in Kaduna State;
4. determine the provision and usage of software facilities on students' academic performance in secondary schools in Kaduna State; and
5. assess the provision and usage of internet facilities on students' academic performance in secondary schools in Kaduna State.

1.4 Research Questions

The study was guided by the following research questions:

1. in what ways do the provision and usage of computers improve students' academic performance in secondary schools in Kaduna State?

2. how do the provision and usage of projectors affect students' academic performance in secondary schools in Kaduna State?
3. how do the provision and usage of microphones improve students' academic performance in secondary schools in Kaduna State?
4. in what ways do the provision and usage of software facilities affect students' academic performance in secondary schools in Kaduna State?
5. how do the provision and usage of internet facilities improve students' academic performance in secondary schools in Kaduna State?

1.5 Research Hypotheses

The following research hypotheses were used to guide the study

H01: There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of computers on students' academic performance in secondary schools in Kaduna State**.**

H02: There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of projectors on students' academic performance in secondary schools in Kaduna State.

H03: There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of microphones on students' academic performance in secondary schools in Kaduna State.

H04: There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of software facilities on students' academic performance in secondary schools in Kaduna State.

H05: There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of internet facilities on students' academic performance in secondary schools in Kaduna State.

1.6 Basic Assumptions

The study assumed that:

1. adequate provision of ICT facilities will enhance academic performance among students in secondary schools in Kaduna State.
2. ICT facilities have great influence on students' academic performance in secondary schools in Kaduna State.
3. the provision and usage of computers have greatly influenced students' academic performance in secondary schools in Kaduna State.
4. the provision and usage of projectors have influenced students' academic performance in secondary schools in Kaduna State.
5. the provision and usage of internet facilities have great influence on students' academic performance in secondary schools in Kaduna State.

1.7 Significance of the Study

The findings of this study would benefit teachers, students, school administrators, curriculum planners, and ministries of education. For teachers, incorporating ICT facilities into secondary school education redefines their role as course designers, discussion facilitators, and coaches. This transition would enhance teaching effectiveness, improve lesson delivery, and encourage the adoption of ICT tools in classroom practices.

Students will also gain significantly from ICT integration. Access to resources such as internet-enabled facilities will foster active learning, enabling students to explore subjects independently. This approach is expected to enhance academic performance, spark interest in learning, and shift perceptions of traditionally abstract topics. ICT tools will increase student motivation and engagement, equipping learners with the skills necessary for the workforce and preparing them to navigate in a rapidly evolving technological world.

For ministries of education, the study would highlight the critical importance of adopting and adequately providing ICT resources in schools. It will emphasize the need for establishing functional ICT resource centres staffed by skilled personnel. Additionally, the findings will support recommendations for curriculum revisions to integrate ICT comprehensively. Education authorities will gain insights into leveraging ICT tools for responsible and creative information management, fostering informed decision-making in educational policies.

Community members and school administrators will also benefit from the study. They will learn to harness ICT to enable swift access to diverse ideas and experiences, enriching interactions among people, communities, and cultures. Enhanced ICT capabilities will encourage independent learning and innovation, enabling education administrators to make judicious decisions regarding the effective use of technology. This understanding would also help them anticipate and address the implications of ICT on home and workplace dynamics, ensuring its optimal integration both now and in the future.

1.8 Scope of the Study

The study was scoped at Kaduna Stateand itwasdelimited to senior public secondary schools in Kaduna State. The content is also restricted to the ascertain the provision and usage of computers, the provision and usage of projectors, the provision and usage of microphones, the

provision and usage of software facilities, the provision and usage of hardware facilities and the provision and usage of internet facilities.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter is presented under the following subheadings: Conceptual Framework, which discussed the concepts of Information, Communication, Technology, Information and Communication Technology (ICT), computer, projector, and microphones, amongst others. Theoretical Framework including Systems Theory (1902) andMary parker Follet (1920) were reviewed.

2.2 Conceptual Framework

This section provides insight into the major concepts in the study. Key terms are expounded to provide insight into the research problem.

2.2.1 Concept of Information and Communication

The term “information” is both imprecise and universally applicable, a duality that reflects its broad utility in modern society. In a world where reality is explored through increasingly sophisticated instruments such as telescopes and cyclotrons and communicated through advanced media like newspapers, radio, television, SMS and the Internet, having an abstract term to describe the "stuff" generated by these tools and transmitted through these channels becomes invaluable. Historically, the abstract and general use of the term "information" emerged relatively late, correlating with the advent of mass media and intelligence agencies, as noted by Devlin and Rosenberg (2018).

Consider, for instance, the Statement, “Secret services sometimes distribute false information,” which implies that information can be deliberately untrue. In contrast, “The information provided by the witnesses of the accident was vague and conflicting” suggests that information can be inconsistent or unclear. While the first example treats information as inherently true, the latter examples allow for its fallibility. Despite these conceptual inconsistencies, pragmatic contexts in everyday communication typically clarify the intended meaning, rendering these ambiguities manageable. As Ogo (2021) argued, relying on common linguistic intuitions offers little value when developing a rigorous philosophical theory of information. Everyday communication lacks the pragmatic necessity to converge on a more precise definition of the term.

Until the mid-20th century, few modern philosophers regarded “information” as a significant philosophical concept. The emergence of interest in the “Philosophy of Information” is, therefore, a relatively recent phenomenon. However, from a historical perspective, the concept of information has been a recurring theme in philosophical discourse. Reconstructing this intellectual history provides valuable insights into the development of the notion of information.

A challenge in using the "history of ideas" approach is ensuring that the concept under study has maintained continuity throughout philosophical history. For example, Argu (2019) questioned whether the notion of "information" discussed by Augustine has any real connection to Shannon's concept of information beyond the similarity in terminology. Similarly, Argu queried whether Locke's "historical, plain method" significantly influenced the modern concept of information, despite Locke's minimal use of the term in a technical sense. While a network of ideas involving information has evolved from antiquity to the present, the historical development of the concept demands further scholarly investigation.

In classical philosophy, "information" was a technical concept deeply rooted in theories of knowledge and ontology, originating from Plato's (427–347 BCE) theory of forms as explored in dialogues such as *Phaedo, Phaedrus, Symposium, Timaeus,* and *Republic.* Plato posited that the imperfect, physical manifestations of objects, such as individual horses, could be recognized as "horses" because they participated in the ideal, atemporal, and aspatial essence of "horseness" in the realm of forms. Later thinkers, including Cicero (106–43 BCE) and Augustine (354–430 CE), translated these Platonic ideas into Latin using terms like *informare* and *informatio* to correspond with Greek concepts such as *eidos* (essence), *idea* (idea), *typos* (type), *morphe* (form), and *prolepsis* (representation). The root word "form" remains evident in the modern term "information" (Capurro, 2023).

During the Middle Ages, the notion of *informatio* continued to be explored, particularly under Aristotelian influence. Augustine, in *De Trinitate* (Book XI), analysed vision as an analogy for understanding the Trinity, identifying three key components: the physical form in the external world, the *informatio* processed by the sense of vision, and the resultant form in the mind. To illustrate this process, Augustine used the imagery of a signet ring leaving an impression on wax, an analogy later interpreted as an early precursor to the modern concept of "sending a message" in information theory (Samuel, 2009). Agogo (2016) notes that this idea has its roots in Greek thought, where the human intellect was seen as a *tabula rasa* at birth, a blank slate actualized through education and empirical experiences, leading to the abstraction of universal concepts (Sajjad, 2016).

The modern philosophical history of "information" is intricate. By the 14th century, the term had gained prominence in European languages with meanings related to "education," "instruction," and "inquiry," as documented in Godefroy's French historical dictionary (*action de former,*

instruction, enquête, science, talent). It also found use in legal contexts, specifically for formal inquiries (Francisca, 2015). Despite its prominence in medieval texts, "information" nearly vanished from philosophical discussions during the modern era, persisting mainly in everyday language. Over time, the term evolved into an abstract mass-noun, diverging from its classical process-oriented meaning.

In the 20th century, researchers began employing formal methods to quantify "information," prompting renewed philosophical interest in the concept. This revival, however, underscored the difficulty of formulating a unified definition of "information" that encompasses its complex history and aligns with intuitive understandings (Fisher, 2019).

2.2.2 Concept of Microphone

A microphone, often referred to as a mic or mike (/maɪk/), is a transducer designed to convert sound waves into electrical signals. It serves various purposes across diverse fields, including telecommunication, hearing aids, public address systems, live and recorded audio engineering, motion picture production, two-way radios, and broadcasting in radio and television. Microphones are also integral to modern computing for tasks such as voice recording, speech recognition, and Voice over Internet Protocol (VoIP). Beyond acoustic applications, they are employed in ultrasonic and knock sensors (Barron, 2021).

Different types of microphones, each with unique mechanisms for converting sound to electrical signals, are commonly used. Dynamic microphones operate through a coil of wire in a magnetic field, condenser microphones utilize a vibrating diaphragm as a capacitor plate, and contact microphones rely on piezoelectric crystals. To function effectively, microphones often require connection to a preamplifier before their signals can be recorded or amplified (Rissanen, 2019).

Their role in teaching and learning is invaluable, as they enhance the instructional process and facilitate the achievement of educational objectives.

Education is widely recognized as a cornerstone of national development, with many nations viewing it as a vital investment. Effective education ensures the fulfilment of individual and societal aspirations, provided it incorporates appropriate instructional materials. The practice of using tools and aids to enhance teaching and learning dates back to ancient times. Effective educators leverage instructional materials, such as microphones, to foster better understanding among learners. However, the lack of availability or inadequate use of instructional materials, including microphones, in public secondary schools has been linked to declining student performance (Anyanwu, 2023).

In recent years, concerns over the declining standards of education have sparked widespread discussions and debates. While teachers, parents, and students are often blamed, the unavailability and underutilization of essential teaching aids are significant factors contributing to this challenge. Ensuring the availability and effective use of instructional materials like microphones is crucial for improving educational outcomes and addressing these concerns.

2.2.2 Concept of Technology

Technology encompasses the processes, concepts, methods, and scientific applications that humans employ to develop products and services, driving societal advancement. It influences all facets of culture, including engineering, education, manufacturing, communication, transportation, and healthcare (Gana, 2021). The technological achievements of the 20th and 21st centuries have profoundly transformed human existence. Innovations in how information is received—such as print media, radio, television, and the Internet—and how it is processed and

utilized—through computers, databases, applications, and artificial intelligence—are remarkable. Technology remains essential due to its capacity to propel humanity toward new horizons and continually improve quality of life (Osuji, 2015).

The United States stands out as a global leader in technology. A 2018 study revealed that the U.S. dominates high-tech manufacturing, research and development funding, and attracts the largest share of venture capital investments. Technology is a cornerstone of the U.S. economy, and as industries expand, so does technology's integration into daily life. Other nations with thriving technological sectors, as indicated by the prevalence of science and engineering degrees at the bachelor's and doctoral levels, include China, Germany, India, Russia, and the United Kingdom. Nigeria, too, has begun integrating technology into various aspects of its operations (Wealth, 2017).

The interconnected growth of science and technology continues to shape advancements in fields like artificial intelligence, space exploration, and financial innovations. Emerging scientific ideas drive breakthroughs in technology, and this synergy is critical for progress. As education increasingly leverages science and technology, humanity's reliance on these domains will persist, ensuring sustained development and innovation (Madu, 2017).

2.2.3 Concept of Communication

Communication is a universal and integral part of daily life, sparking considerable interest among researchers, governments, and organizations due to its pervasive nature. Its universality has led to numerous definitions of the term. Oche and Oludayo (2020) observed that communication has been defined in various ways, such as: the act of transferring a thought from one person to another (Chappell, 2024); a process where one person or group shares and conveys

information to another, ensuring mutual understanding (Udall, 2019); and the exchange of understandable information, where messages are delivered, received, and comprehended to prompt action (Eyre, 2023).

Abimbade (2017) defined communication as the exchange of ideas, thoughts, or knowledge between at least two people, with the intention of influencing the behaviour of the recipient, particularly the decoder. In the context of the classroom, communication encompasses all efforts by a teacher to achieve instructional objectives by effectively managing tasks, methods, media, learners, and the broader teaching and learning environment. It inherently involves an exchange of ideas or information between individuals, making it a process involving several interdependent variables. Consequently, communication is considered cyclical rather than linear.

This cyclical process includes the sender, the message or information, the medium or channel, and the receiver. Berlo (2020) highlighted the essential components of communication as the source, message, receiver, and channel. Bardell (2018) further identified the sender and receiver as the "encoder" and "decoder," respectively. For communication to be effective, all components must function harmoniously. Any disruption in these elements can impair communication, leading to partial or complete breakdowns.

Communication manifests in various forms, including verbal and written. Verbal communication, or oral communication, involves the use of spoken words to convey messages, requiring one person to speak while the other listens and understands the spoken words. Written communication, on the other hand, involves the use of written words to deliver messages. If well-structured, written communication is easily comprehended and can take the form of stories, memos, letters, or manuals (Ezirim, 2021). Each mode of communication plays a crucial role in ensuring effective information exchange and understanding.

Nonverbal communication relies on observing a person's behaviour and deriving meaning from those observations. Common examples include facial expressions, body language, and tone of voice. Scientists estimate that humans began speaking their first words approximately 100,000 years ago. As language evolved, symbols became a key medium for communication and for documenting human experiences. Writing, a significant milestone in communication history, emerged roughly 5,000 years ago.

This progression in communication development can still be seen in children worldwide. Typically, children start using spoken words to express themselves around the age of two. Soon after, they begin drawing as another form of communication. The final stage in this developmental journey occurs when they acquire the ability to write (Agu, 2020). This process mirrors humanity's broader communication evolution and highlights the interconnectedness of different forms of expression.

2.2.4 Concept of Information and Communication Technology (ICT)

Information and Communication Technologies (ICT) encompass tools designed for handling information through production, storage, processing, distribution, and exchange. These tools have increasingly been integrated into a global network, creating a connected world that spans virtually every region on Earth (UN Evaluation Office, 2001). ICT is recognized as a transformative tool for engaging in global markets, fostering political transparency, enhancing service delivery, and supporting local development initiatives (UN, 2016). Ogunsola (2015) describes ICT as "an electronic-based system for transmitting, receiving, processing, and retrieving information," fundamentally altering how individuals think, live, and interact with their environment.

ICT provides access to global knowledge and facilitates communication across the globe. Students who integrate ICT into their learning experience often achieve a deeper understanding of complex subjects, enhance their ability to retain knowledge, and apply it to problem-solving in real-world contexts. According to the 2002 Apple Computer publication, ICT enables students to broaden and deepen their exploration and inquiry, tailoring access to information based on their interests and academic needs (CEO Forum on Education and Technology, 2001).

Onuma (2017) emphasizes the role of Information Technology (IT) in generating, storing, retrieving, and safeguarding information for future purposes. Similarly, the National Policy on Information Technology (2020) defines IT as encompassing computers, auxiliary equipment, software, services, and established procedures, ensuring the efficient handling and protection of information resources.

The National Policy on Information Technology (IT) (2020) outlines several broad objectives, including empowering Nigerians to actively participate in software and IT development, embedding IT into education and training systems, and fostering the growth of human capital to support a knowledge-driven society. It also aims to enhance public access to government processes, promoting transparency and accountability, and to establish diverse IT institutions as centres of excellence to ensure Nigeria remains competitive in global markets.

Professor Cleopas Angaye, Director-General of the National Information Development Agency, highlighted that the policy is expected to significantly advance IT development within Nigeria. He emphasized that the agency, as a regulatory body, would collaborate with stakeholders, including the Ministry of Education, to integrate IT into schools and other learning institutions, aligning with the government's developmental goals.

Recent years have seen a gradual convergence of digital and telecommunications technologies, resulting in what is now commonly referred to as Information and Communication Technology (ICT). This field encompasses processes such as creating, processing, storing, retrieving, and sharing information and data through computers and telecommunications systems. ICT facilitates electronic communication through platforms like fax, email, voicemail, and video conferencing, alongside widespread networking technologies such as the internet, intranets, extranets, and mobile communications. These advancements have revolutionized how data is managed and shared globally.

Obanya (2023) described ICT as a groundbreaking human innovation that challenges traditional perceptions of time and space, breaking down geographical barriers to the exchange of knowledge and ideas. Its influence extends across all sectors, including education, where ICT integrates digital tools into teaching and learning processes. This integration involves technologies that collect, store, process, and communicate information essential for educational activities. ICT can also be defined as a combination of computing and telecommunication technologies, enabling the acquisition, processing, storage, and distribution of information in various formats, including text, audio, video, and numerical data.

Johnson (2017) further described ICT as a set of diverse tools and resources used for communication, creation, dissemination, storage, and management of information. These tools include computers, the internet, broadcasting technologies such as radio and television, and telecommunication systems like telephony, offering a comprehensive framework for modern information exchange.

In recent years, there has been a growing interest in exploring how computers and the internet can be effectively utilized to enhance the efficiency and quality of education at various levels,

both in formal and informal settings. However, ICT encompasses more than these modern technologies; traditional tools like the telephone, radio, and television have a longer history as educational resources. For example, radio and television have supported open and distance learning for over four decades, while print materials remain the most affordable and accessible medium, especially in both developed and developing countries. The adoption of computers and the internet is still at a nascent stage in many developing nations due to inadequate infrastructure and the high cost of access.

Technologies are often used in combination rather than as standalone tools. For instance, the Kothmale Community Radio Internet in Sri Lanka integrates radio broadcasts with computer and internet technologies to share information and provide educational opportunities to rural communities. Similarly, the UK Open University (UKOU), established in 1969 as the first institution solely dedicated to open and distance learning, combines print materials with radio, television, and online content. The Indira Gandhi National Open University in India also employs a mix of print, recorded audio and video, broadcast media, and audio-conferencing to deliver educational content.

Olumoye (2018) outlined the key operations of ICT, including determining the type of information required, gathering, processing, storing, and communicating information, and utilizing this information effectively. He emphasized ICT's significance, particularly its ability to make affordable, multimedia information accessible worldwide at any time, provided communication links are available.

Onuma (2017) highlighted several benefits of ICT, such as:

1. providing access to diverse services, including e-banking, e-learning, information retrieval, news, and financial reports;

2. offering fast and cost-effective access to information;
3. reducing the need for paper-based storage;
4. serving as a reliable and flexible means of communication; and
5. delivering fast and accurate information dissemination.

Despite these advantages, ICT faces several challenges, as outlined by Onuma.

1. **Weak signals**: Signals diminish in strength over long distances, limiting effective communication.
2. **Electronic noise**: Interference in data transmission makes signals difficult to interpret.
3. **Security issues**: Inadequate security measures expose networks to unauthorized access and hacking.
4. **Inadequate infrastructure**: Poor infrastructure hampers ICT adoption and usage.
5. **High costs**: The expense of acquiring and installing ICT equipment remains prohibitive.
6. **Computer viruses**: Malicious software disrupts systems, corrupting data and impacting functionality.

These factors underline the importance of addressing ICT limitations to maximize its potential for societal and educational development.

Maintaining a steady power supply is crucial for individuals and organizations to utilize ICT resources effectively. The Director-General of the National Information Development Agency, Professor Cleopas Angaye, emphasized that the National IT policy is designed to propel the advancement of IT in the country while supporting the government's seven-point agenda. He highlighted the agency's commitment to engaging stakeholders, including the Ministry of Education, in collaborative efforts to integrate IT into schools.

ICT plays an essential role in fostering effective school leadership and enhancing administrative processes. Within educational institutions, robust administrative systems are required to support school operations and decision-making. For data collection, entry, and workflow to function efficiently, it is necessary to establish clear roles for stakeholders and define well-structured processes.

The implementation of ICT in educational administration is resource-intensive, requiring significant investment of time and money. To ensure the effectiveness and sustainability of installed systems, evaluation programs should be designed to assess their quality and feasibility. Computers, which form the foundation of ICT, are categorized based on purpose, type, and capacity. Computers may serve general or specific purposes, and their types include digital, analog, and hybrid models. Their capacities range from microcomputers and minicomputers to supercomputers.

According to Olumoye (2018), computer systems consist of hardware and software. Hardware includes the physical components such as input/output devices and the Central Processing Unit (CPU), which supports standalone or multi-user operations. Software refers to the operational environment of the computer, enabling the execution of applications ranging from basic to advanced programming languages. Common software packages installed on microcomputers include word processing tools, database management systems, spreadsheets, and graphic design software.

Word processing software is particularly popular in modern office automation, replacing typewriters as a vital tool for document production. Spreadsheets, another key application, consist of electronic sheets divided into cells with reference codes. Changes made in one part of the spreadsheet automatically reflect across linked worksheets. The computer's capability to

process vast amounts of data makes it indispensable in ICT, functioning as an electronic device that executes programmed commands for input, output, arithmetic, and logic operations.

Effective training is essential to familiarize educational administrators with ICT systems, as lack of understanding can lead to low confidence and resistance for adoption. Administrators must also assess the success of ICT implementation by observing how these systems meet their daily operational needs.

Computer-based communication systems are pivotal in enabling multiple users across different locations to transmit and exchange data via communication networks. Networking is a critical component of data communication, facilitating interactions between computers. Among various ICT applications, the internet—commonly referred to as "the Net"—stands out as a global network that originated from a U.S. Department of Défense initiative to connect scientists and academics worldwide. Today, it links thousands of networks across over 200 countries, making global communication and information sharing possible.

Olumoye (2018) described the internet as one of the most transformative advancements in the history of information systems, describing it as the largest and most widely used network globally. It serves as a highly adaptable platform, allowing the dissemination of information at minimal cost to millions worldwide. The internet's flexibility ensures its continued functionality even when networks are added, removed, or face disruptions. Its introduction has enabled companies and individuals to exchange business transactions, text, graphics, video, and audio across distances ranging from local offices to international locations. Communication between computers on the internet relies on a standard protocol called TCP/IP (Transmission Control Protocol/Internet Protocol), which ensures seamless interaction among various networks.

Key Applications of ICT

The following are key applications of ICT:

1. **Electronic Mail (E-mail):**

   E-mail connects computers through wired or wireless networks, enabling users to send and receive messages electronically. Messages are addressed to recipients' mailboxes, where they remain stored until accessed. An email address has two components: the identifier (left of the "@" symbol) representing the individual or organization, and the domain name (right of the "@"), which specifies the network. Examples include addresses like *example@yahoo.com*.

   The confidentiality of email systems ensures only those with the correct password can access messages. E-mail has become a vital tool for scheduling meetings, distributing internal communications, and maintaining correspondence with clients and suppliers. Researchers also use email to exchange ideas, share documents, and collaborate globally.

2. **E-Learning:**

   E-learning refers to educational content delivered through digital platforms such as CDs, DVDs, Local Area Networks (LAN), or the internet. It includes Computer-Based Training (CBT), Web-Based Training (WBT), Electronic Performance Support Systems (EPSS), online learning, and tutorials. These methods allow students to access learning materials anytime and anywhere. The flexibility of e-learning makes it especially advantageous for distance education. Other ICT-enabled tools include e-commerce and e-banking.

Impacts of ICT

1. **Economic Impact**
    - **Employment:** ICT is reshaping global employment patterns, making traditional skills obsolete while demanding new, technologically advanced competencies. Although this shift may result in job redundancies, it often leads to increased productivity and job satisfaction when implemented thoughtfully.
    - **Banking and Finance:** ICT has revolutionized banking operations, improving efficiency and accessibility in financial institutions.
2. **Education**

    ICT fosters global knowledge-sharing networks. Educational materials based on current research and alternative interpretations can now reach a worldwide audience in seconds.
3. **Legal Considerations**
    - **Evidentiary Challenges:** Questions often arise about the admissibility of electronically created and stored data in legal proceedings, affecting contract enforcement and debt recovery.
    - **Intellectual Property:** The widespread use of digital reproduction tools (e.g., photocopiers, audio/video recorders) raises concerns about copyright violations, necessitating stronger legal frameworks to protect creators' rights.
    - **Contingent Liabilities:** Organizations providing electronic services face potential liabilities, such as copyright infringement by users.
4. **Social Impact**

    ICT significantly influences society and individual lives in several ways:

- **Data Management:** Hospitals, schools, banks, and government agencies use ICT to store and manage data, including births, passports, licenses, academic records, and financial transactions.
- **Business Operations:** Businesses rely on ICT for data access and operational efficiency.
- **Social Menaces:** Cybersecurity has become critical as incidents of computer crimes and data breaches rise, necessitating robust measures to secure digital communication systems.

The role of ICT in modern society extends across economic, legal, and social dimensions, making it an indispensable component of daily life.Olakulehin (2017) distinguished two key categories in the application of information and communication technologies (ICT) in education: ICT for Education and ICT in Education. The former refers to the development of ICT tools specifically designed for teaching and learning purposes, while the latter involves the integration of general ICT tools into the teaching and learning process. He emphasized the significant educational value of computers and other information technologies, noting their historical development—from Skinner's use of programmed instruction in teaching machines, to Brunner's experiments with computers in education, to the current use of the internet for information exchange—demonstrating ICT's growing role in enhancing cognitive development.

In their classification, Thomas and Ranga (as cited in UNESCO, 2014) identified three primary applications of computers and communication technologies in education: Pedagogy, Training, and Continuing Education. The pedagogical application of ICT focuses on enhancing learning and supporting various ICT components. Almost all subjects, from structured fields like mathematics to more fluid ones like music, can be taught with the help of computers.

Olakulehin (2017) further emphasized that ICT's pedagogical use involves the integration of computers and other technologies as learning aids that complement, rather than replace, the teacher. In this context, computers are seen as supportive tools rather than substitutes for instructors. Effective pedagogical use of ICT requires the development of both teachers' and students' skills and attitudes toward technology.

Beyond literacy, ICT also facilitates programming, subject-specific learning, and independent learning at home. This necessitates the adoption of new methods such as modelling, simulation, database use, guided discovery, and exploratory learning. The implications for teaching strategies, content delivery, the teacher's role, and curriculum context are clear and inevitable. Pedagogically, the use of ICT enhances motivation, aids in recalling previous learning, introduces new instructional stimuli, encourages student responses, provides systematic feedback, facilitates appropriate practice, sequences learning logically, and offers a rich source of information to support learning. Teachers employing these ICT-based strategies can inspire students to develop a positive attitude toward information technology in all aspects of their lives.

Marshall (2012) highlighted that a variety of technology types can support and enhance administrative functions. From video content and digital filmmaking to laptop and handheld computing, various technological applications have been employed in school management. New technologies like podcasting are continually emerging, offering diverse ways to deliver educational content and support administrative tasks. According to Marshall, these technologies serve different purposes: word processing and e-mail facilitate communication skills, while database and spreadsheet programs enhance organizational abilities.

The range of available technologies spans from simple tool-based applications, such as word processors, to online scientific data repositories and primary historical documents. Prensky

(2021) pointed out that even the cell phones many people carry can be utilized for communication. Zhao (2016) emphasized that each technology tends to serve a unique role within the administrative process. Instead of considering all technologies as interchangeable, researchers and educational administrators need to focus on the specific tools being used and their intended administrative outcomes. Educational administrators can benefit from learning with computers, as these technologies serve as versatile tools applicable to multiple goals within the administrative process.

Reeves (2018) and Ringstaff and Kelley (2012) emphasized that software applications, alongside word-processing tools, are among the most widely used educational technologies in schools today, having supported classroom activities for over 20 years. These applications operate on two key assumptions about the role of computers in learning: first, the interaction with the software is intentionally structured to promote learning, and second, computers are primarily seen as a medium for learning rather than tools to further support learning.

In a study by Afonja (2015), it was noted that the success of ICT in secondary education in sub-Saharan Africa is often hindered by two main factors:

1. the lack of effective policies to promote technology awareness across all levels of the educational system, and
2. significant deficiencies in the training of technical personnel.

The current State of school management in Nigeria is concerning, with the country lagging behind other African nations like Kenya, Uganda, South Africa, and Tanzania in terms of ICT adoption. Despite its considerable human and material resources, Nigeria remains behind in using ICT for educational administration. Educational administrators still face the tedious task of manually registering students and recording academic performance. The time-consuming nature

of these tasks could be significantly reduced by implementing ICT, which would streamline administrative processes. Thomas (2017) noted that computers offer tremendous speed and accuracy for these tasks, while also providing the convenience of storing vast amounts of data on small storage devices like disks or tapes.

Several challenges hinder the effective use of Information and Communication Technology (ICT) by secondary school students in Nigeria. These challenges include, but not limited to the following:

Power Supply

A stable electricity supply is crucial for the functioning of most communication and technological tools. Unfortunately, Nigeria faces persistent power supply issues, with electricity often unavailable in rural areas. For the past 15 years, the country has struggled to provide reliable electricity nationwide. Even when power is available, voltage fluctuations frequently damage electronic devices. Devices such as computers, radios, televisions, and video recorders are often affected by the erratic power supply, making it difficult to maintain high-tech equipment. The extreme weather conditions in Nigeria exacerbate this issue (Aderounmu, 2015). Additionally, many public secondary schools in Kaduna and some other State lack backup power sources like generators to mitigate these challenges.

Poverty

A significant portion of the Nigerian population still lives in poverty, making ICT resources such as computers unaffordable for many. As a result, computer literacy remains low, especially in rural areas where access to electricity is limited. Many rural schools are unable to benefit from the use of electronic equipment like computers, radios, and televisions due to these constraints. Even internet access is largely confined to urban centres, further exacerbating the digital divide.

Poor Funding

Education in Nigeria suffers from inadequate funding, which limits the availability of ICT resources in secondary schools. The high cost of both hardware and software makes investment in ICT for education difficult. Successful educational policies depend on the involvement and support of all stakeholders, particularly the government, which plays a critical role in funding (Yusuf, 2016).

Internet Connectivity

Nigeria faces challenges with low internet connectivity, which hampers efforts to improve digital literacy among both students and teachers. To effectively integrate ICT into education, the government must prioritize the expansion of internet access.

Low Tele-density

Limited access to telecommunications services presents another barrier to ICT use in secondary schools. Despite the introduction of GSM mobile networks, ICT usage in education remains low. For many years, Nigeria's telecommunications sector was controlled by a government monopoly, which prevented competition and kept service prices high. According to Paltridge (2016), countries with competitive telecom markets saw a much faster growth in internet access than those with monopolies. Although the Nigerian government has now opened the telecom sector to private participation, it may take years to fully realize the benefits for the education system. Despite these challenges, overcoming these obstacles would significantly benefit educational administrators, particularly in areas like Eti-Osa LGA of Lagos State and Nigeria as a whole.

Proposed Strategies for Improvement

Various studies have suggested strategies to improve ICT use in schools, focusing on both professional development and technical support. Tinio (2023) emphasized the importance of continuous skill upgrading for both students and educational administrators, given the rapidly evolving nature of ICT. Professional development is seen as crucial for the effective integration of ICT into education (Way & Webb, cited in Neyland, 2021).

Technical Support

Adequate technical support is vital for the successful implementation of ICT in schools. Hayes (2017) recommended that all ICT components, both hardware and software, should be well-maintained, with technical support available for educators facing difficulties. Employing dedicated ICT support staff in schools could help resolve technical issues and facilitate smoother operations.

Reducing Teachers' Workload

Providing teachers with adequate time for preparation is another strategy to enhance ICT usage. Hammond (2017) suggested that a well-structured timetable can help reduce teachers' workloads, allowing more time for collaborative lesson planning, experimenting with new teaching methods, and focusing on pedagogical improvements (Hayes, 2017).

Facilitating Collaboration

Schools should encourage collaboration among teachers by creating workgroups focused on producing learning materials. This initiative can save time and increase productivity, allowing teachers to share resources and expertise more efficiently.

Adopting Context-Appropriate ICT Solutions

Coopers (2020) recommended the adoption of ICT tools that are suitable for the local context. In areas with limited internet access, such as rural schools, establishing Local Area Networks

(LANs) can be a more cost-effective solution. This approach would enable schools to host educational resources on their own networks rather than relying on expensive internet access.

While these strategies offer potential solutions, it is important to recognize that their successful implementation may be limited by the financial constraints faced by rural schools. The costs associated with these strategies might be prohibitive for many schools, particularly in underfunded areas.

2.2.4 Concept of Computer

A computer is a machine designed to carry out sequences of arithmetic or logical operations automatically through programming. Modern computers can execute a wide variety of tasks by running programs that dictate specific operations. A computer system refers to a complete setup that includes not only the hardware but also the operating system (the primary software) and the peripheral equipment necessary for full functionality. This term can also describe a network of interconnected computers working together, such as in a computer cluster or network (Lance, 2021).

Computers are integral to a wide range of industries, education, and consumer products, serving as control systems. They are found in simple devices like microwave ovens and remote controls, as well as in more complex systems such as industrial robots, computer-aided design (CAD) tools, personal computers, and mobile devices like smartphones. The Internet, which connects millions of computers and users globally, is powered by computer systems (Austen, 2020).

2.2.5 Concept of Projectors

A projector, also known as an image projector, is an optical device that projects images (or moving images) onto a surface, typically a projection screen. Traditionally, projectors create

images by shining light through a transparent lens, but newer models use lasers to project images directly. One advanced type of projector, called a virtual retinal display or retinal projector, projects images directly onto the retina, bypassing the need for an external screen. The most common projectors today are video projectors, which have replaced older devices like slide projectors and overhead projectors. While digital video projectors became widespread in the 1990s and early 2000s, some places still use older analogue projectors. The latest projectors are handheld devices that use lasers or LEDs for image projection. However, their images may be difficult to see in environments with high ambient light (Odebero, 2021).

Teaching is the process of providing instruction to facilitate learning (Nwachukwu, 2021). Teaching and instruction are closely linked, both aiming to impart knowledge to learners. In any educational institution, the primary goal is to help students learn. To achieve this, schools, teachers, and students each set their own objectives, which must align for successful educational outcomes. To accommodate individual learning needs, educators have developed various instructional approaches and tools. Instructional strategies, which are methods used to facilitate learning, provide support to students to enhance their ability to absorb information.

According to Landu (2005), the use of projectors in teaching can be categorized into two main types: Projector-Assisted Instruction (CAI) and Projector-Managed Instruction (CMI). These strategies involve projectors either assisting or managing some or all aspects of instruction. Advocates of individualized instruction see projectors as valuable tools to enhance the design and delivery of learning in an electronic environment. Projectors are particularly effective because they offer user-friendly interfaces that engage learners, allowing them to progress at their own pace and making them active participants in the learning process.

2.3 Theoretical Framework

This study was anchored on two theories human relations theory and systems theory.

2.3.1 Systems Theory

The theory, introduced by Talcott Parsons in 1902, was developed by the American sociologist who taught at Harvard University from 1927 to 1973. Parsons' theory is based on the idea that all organisms, including human organizations and educational institutions, are systems that likely follow similar principles. This suggests that organizations should be studied not just as formal structures of authority and subordination or as social systems where individuals influence each other, but as entire systems in which the environment, formal structures, social dynamics, and technical aspects constantly interact (Carzor, in Unachukwu, 1997). The term "system" is widely used to describe the functioning of various entities, such as car systems, human body systems, electrical systems, educational systems, and information management systems. The central idea is that the components of any system are so interconnected and interdependent that changes in one part can affect the whole system.

Many of the challenges facing Nigeria's secondary education system today can be addressed through systems analysis. This is possible because several systems-oriented management techniques, developed for physical, biological, and social sciences, can be applied to the administration of secondary schools. Techniques such as Planning, Programming, and Budgeting System (PPBS) and Management by Objectives (MBO) involve structured approaches, often incorporating mathematical calculations, which educational administrators can use to

systematically evaluate educational programs. The relevance of this theory to the current study lies in the notion that decisions and changes in the environment can influence the entire educational system. Consequently, the use of advanced mathematics and computers can play a crucial role in addressing the challenges faced by educational administrators in secondary schools within the Zaria Education Zone. These systematic techniques, which often require mathematical analysis, can be effectively employed to assess and improve educational programs.

2.3.2 Human Relations Theory

The human relations theory, developed by Mary Parker Follett and Elton Mayo in the early 1920s during the industrial revolution, emphasizes the importance of the human factor in achieving organizational goals. This theory posits that workers will perform better when their personal welfare is considered. Unachukwu, cited in Njoku (2018), explains that human relations theory focuses on fostering morale and individual satisfaction among workers.

Morale, in this context, encourages group cohesion and a sense of belonging. Follett extended this idea by suggesting that the theory leads to the diffusion of authority, promoting wider participation in decision-making and a decentralized approach to organization, in contrast to a centralized structure. The core argument of the theory is that individuals are more motivated to contribute to the achievement of organizational goals when treated humanely, differing from classical management theorists who believed that productivity could be achieved at the expense of workers' well-being. Instead, the focus in human relations theory is on the people and how they interact.

Follett, a social philosopher, focused on the human problems within organizations and concluded that these problems can be minimized through cooperation among workers. She emphasized the importance of coordination as the key to organizational effectiveness.

The relevance of this theory to the application of ICT in secondary schools lies in the idea that management issues related to ICT can only be effectively addressed through strong relationships and cooperation among the various groups within the school. This includes administrators, teachers, and students, all of whom play a role in managing ICT resources for educational purposes. Effective cooperation among all parties can help achieve the goals and objectives of the educational system. Also, school administrators should involve students, principals, and teachers in decision-making processes related to ICT, ensuring that decisions are comprehensive and collectively supported.

2.4 Provision and Usage of Computers on Students' Academic Performance

A computer is a programmable machine capable of performing sequences of arithmetic or logical operations automatically. Modern computers can execute a variety of operations, referred to as programs, which allow them to handle a wide range of tasks. A computer system is a complete setup consisting of hardware, the operating system (main software), and peripheral devices needed for full operation. The term can also describe a network or cluster of computers functioning together as a unified system (Lance, 2021). Computers serve as control systems for various industrial, educational, and consumer products. These include simple devices like microwave ovens and remote controls, factory equipment like industrial robots and computer-aided design tools, and general-purpose devices such as personal computers and smartphones. Additionally, computers drive the Internet, connecting millions of computers and users globally (Austen, 2020).

Bais (2023) specifically highlights several capabilities of computers in school systems as follows:

1. **Electronic impulses:** Computers operate using electronic pulses moving through circuits, which allow them to function at speeds once considered science fiction.
2. **Data comparison:** Computers can compare data pieces, performing logical operations.
3. **Internal data storage and retrieval:** Modern computers can store millions of data characters within their central processing units.
4. **Program storage:** Computers can store instructions for program execution.
5. **Program modification during execution:** Computers can adjust outputs based on input values and program specifications. For instance, a payroll program might execute different steps depending on whether an employee is paid by hours worked or a fixed salary.

Surveys of secondary school students, teachers, and administrators in Africa regarding their experiences and perceptions of computer use in schools show that while they generally view computers as valuable tools for classroom learning, they are seen as less important for administration (Makewa et al., 2023; Muncheru, 2021; Etudo-Eyo et al., 2020). Challenges in computer use reported by students include difficulty obtaining suitable software, computer viruses, hardware malfunctions, insufficient numbers of computers and printers, and unreliable power supply.

The use of Information and Communication Technology (ICT) in secondary schools has significantly influenced the management and communication processes. As modern organizations rely more on ICT to achieve results, contemporary managers' effectiveness is increasingly tied to their ability to use ICT tools. In the context of secondary schools, ICT has streamlined communication processes, both within the school and with external stakeholders. It

enhances communication by reducing distortion and duplication of information, leading to more efficient and effective exchanges (Oyedemi, 2015).

However, while electronic communication is valuable, it cannot fully replace human interaction, particularly in fostering enthusiasm and a sense of unity within the school community (Azewena, 2009). Despite the increasing use of ICT in some secondary schools in Kaduna State, Nigeria, its integration into teaching and learning processes remains limited. Several challenges hinder the widespread use of ICT, including inadequate funding to maintain ICT infrastructure, a lack of staff with the necessary skills, and the absence of policies to guide ICT usage in schools.

In many secondary schools, manual methods of operation still dominate. Secretaries and typists often work with outdated typewriters, highlighting the slow adoption of modern technology. However, surveys conducted through interviews and questionnaires on students, principals, and teachers revealed that the use of computers has made administrative tasks such as record-keeping easier for principals and teachers (Nasong, 2012). Without ICT, most principals rely on traditional pen-and-paper methods for record-keeping, which consumes more time and effort.

With the introduction of ICT tools such as computers, laptops, flash drives, and email, record-keeping has become more efficient. These tools not only improve the confidentiality of school information but also allow staff to prepare professional records digitally. The use of computers and storage devices offers significant advantages, including easier storage and retrieval of information, as well as the ability to print, scan, or email documents.

Research by Wakhanu and Kamper (2020) found that ICT usage positively impacted the registration and confirmation of SSCE candidates, record-keeping, and the management of supplies and meeting minutes in secondary schools. The integration of ICT led to improved

efficiency in data storage and retrieval, better time management, and enhanced work quality. In large schools, the use of ICT is particularly beneficial in reducing financial costs. For example, computers, printers, and photocopy machines enable bulk typing and printing at a lower cost, which helps principals save time and resources. The quality of administrative work is also higher when using ICT tools compared to handwritten methods.

Makewa et al. (2023) suggested that for efficient student administration, principals should incorporate ICT not only into teaching and learning but also into administrative functions. According to Saiti and Prokopiadou (2019), ICT in the school setting is often viewed as synonymous with the modernization of schools. The integration of ICT into education is an essential part of the broader technological advancement in both teaching and administration. Although challenges persist, principals recognize the importance of ICT in their overall planning process (Makewa et al., 2023), and the successful implementation of computer technology requires strong leadership and effective management. Afshari, Bakar, and Wong (2020) emphasized that principals must understand the advantages of new technologies. When principals grasp the value of ICT, they are better equipped to implement these innovations in their schools. Surveys conducted in Kano Stateon the perceptions of teachers and principals about students' use of computers found that both groups saw the use of computers as beneficial. The attitudes and perceptions of teachers and principals are crucial in determining the extent of computer usage. This highlights the importance of providing both pre-service and in-service training to equip teachers to effectively teach using computers and to enable principals to utilize ICT for administrative purposes. Key administrative functions where ICT is applied include student administration, personnel management, financial administration, general administration,

and instructional supervision. To perform effectively, secondary school principals require efficient communication and easy access to information for their administrative duties.

2.5 Provision and Usage of Projectors on Students' Academic Performance

A projector, also known as an image projector, is an optical device designed to display an image or a sequence of moving images onto a surface, typically a projection screen. Traditional projectors create images by shining light through a transparent lens, while more recent models utilize lasers to project images directly. One advanced type of projector is the virtual retinal display, which projects an image directly onto the retina, bypassing the need for an external screen. Among the most commonly used projectors today are video projectors, which serve as digital replacements for older devices like slide projectors and overhead projectors. Although these digital video projectors replaced many older models during the 1990s and early 2000s, some places still use older analogue projectors. The newest projectors are portable, handheld devices that rely on lasers or LEDs for image projection, though their effectiveness can be compromised in brightly lit environments (Odebero, 2021).

Teaching, as defined by Nwachukwu (2021), refers to the act of providing instruction to facilitate learning. Teaching and instruction are closely related, as both aim to impact knowledge in learners. In every educational setting, the ultimate goal is to foster learning. To achieve this, various stakeholders—such as the school, teachers, and students—must set and align their individual goals. For an effective learning experience, these goals must be congruent. Scholars and educators have developed diverse instructional approaches and tools to cater to the varied needs of learners. Instructional strategies, which encompass a range of methods, are designed to assist learners in assimilating knowledge more effectively and efficiently.

According to Landu (2005), the use of projectors in education can be categorized into two main types: Projector-Assisted Instruction (CAI) and Projector-Managed Instruction (CMI). These strategies involve using projectors to perform, manage, or support certain or all of the instructional functions provided by the teacher. Advocates of individualized instruction view projectors as a means to enhance the design and delivery of personalized learning, particularly in a digital environment. The effectiveness of this method lies in its ability to provide a user-friendly setting that engages students, allowing them to work at their own pace and become active participants in their learning.

To address the issues of instructional facility quality and availability, several strategies are recommended to improve students' academic achievement. These include organizing regular seminars and workshops for teachers to share universally accepted teaching strategies, ensuring adequate ICT facility provision, and training teachers through government-led initiatives to ensure proficiency with the essential projector skills required for effective teaching. Local and State governments should also focus on the regular supply of projector textbooks. Other suggested strategies include providing standard libraries through Parent-Teacher Associations (PTA) for daily use by both teachers and students, forming partnerships with internet service providers like MTN and GLO, and implementing ongoing in-service training programs for teachers to master the skills necessary for effective teaching with projectors. Additionally, recruiting qualified teachers, acquiring or receiving donations of instructional materials and equipment from local communities, and making practical classes mandatory are crucial steps in improving the use of projectors in education.

In the modern era, technology has become an integral part of daily life, mediating communication and interactions across vast distances (Aduwa & Iyamu, 2005). Aduwa and

Iyamu noted that technology is gradually replacing the two traditional environments of nature and society. The environment they refer to encompasses the tools and systems that sustain and endanger us while simultaneously shaping our interactions with the world. They emphasized that contemporary individuals have become heavily reliant on gadgets such as mobile phones, projectors, computers, and the internet, often placing technology in a dominant position over humanity.

The rapid advancements in high-tech innovations have significantly transformed both professional and personal aspects of life, necessitating the adoption of modern technology in areas like social interaction, business, and education. Breakthroughs in high technology have spurred organizations to integrate innovations swiftly into their operations. Aduwa and Iyamu highlighted that Nigeria's development programs have reaped substantial benefits from these advancements, particularly in information and communication technology. In developed nations, the combination of cellular, satellite, and wireless technologies with innovative business practices has begun to address the limitations of traditional analogue systems.

The introduction of cellular technologies in Nigeria over a decade ago revolutionized the country's communication sector, although the high costs associated with these services have limited access for many, particularly in the education sector (Aduwa & Iyamu, 2005). For Nigeria to align itself with developed nations, there is an urgent need to embrace technological innovations, abandon outdated practices, and overhaul its approach to integrating technology. A redefined vision and strategic planning are essential to navigate the challenges of a technologically driven society, especially in leveraging tools like projectors to enhance the academic performance of secondary school students in Kaduna State and Nigeria at large.

2.6 Provision and Usage of Microphones on Students' Academic Performance

A microphone, often referred to as a mic or mike (/maɪk/), is a transducer that transforms sound into an electrical signal. Widely used in various applications, microphones play a crucial role in telecommunication, hearing aids, public address systems, audio production, broadcasting, and even non-acoustic purposes such as ultrasonic or knock sensors (Barron, 2021). Several types of microphones exist, employing different mechanisms to convert sound waves into electrical signals. Among the most common are dynamic microphones, which use a wire coil suspended in a magnetic field; condenser microphones, which utilize a vibrating diaphragm as a capacitor plate; and contact microphones, which rely on piezoelectric crystals. Before recording or reproducing sound, microphones typically require connection to a preamplifier (Rissanen, 2019).

In the educational sector, microphones have become indispensable tools for enhancing teaching and learning processes, helping educators achieve set educational objectives. Education itself is a vital component of national development, as it serves to meet both individual and societal aspirations. For education to fulfil its purpose, appropriate materials must support teaching activities. Since ancient times, the use of tools and aids in education has been integral to effective instruction. Educators have long recognized the value of instructional materials like microphones in fostering better understanding and learning outcomes (Anyanwu, 2023).

Despite their importance, many public secondary schools lack adequate instructional materials, including microphones, and the available ones are often underutilized. This shortage has been identified as a significant factor contributing to students' poor academic performance. Research has shown that alongside other variables—such as teacher qualifications, school environment, and student factors—the availability and proper use of instructional materials significantly affect teaching and learning outcomes. Abdu-Raheem (2016) defined instructional materials as

essential tools for promoting teaching efficiency and enhancing student performance. However, their impact depends on how effectively teachers integrate them into their lessons.

Microphones, when used effectively, facilitate better communication between teachers and students, especially in large classrooms. Teachers need to be trained on proper microphone usage to ensure students remain focused and engaged during lessons. Poor performance in public examinations has often been linked to inadequate use of such devices, underscoring their importance in modern teaching practices (Coomb, 2016).

Instructional materials, including microphones, not only enhance the teaching process but also make learning more engaging, interactive, and efficient. They provide diverse learning experiences, sustain student interest, and support interaction with the social and physical environment. Mangel (2009) emphasized the role of microphones in enabling teachers to communicate effectively, achieving educational goals where mere verbalization falls short. The Federal Republic of Nigeria's National Policy on Education (FRN, 2023) also advocates for the integration of innovative materials to make learning more meaningful and realistic.

Instructional materials can be categorized based on sensory engagement. Audio materials, such as microphones, rely on sound, while audiovisual aids combine sight and hearing, including tools like projectors and smartboards. Visual aids encompass materials such as textbooks, charts, and models (Ibe, 2020). Microphones, in particular, are invaluable for bridging communication gaps in classrooms where students may struggle to grasp concepts due to insufficient instructional materials (Emmana, 2024).

Effective utilization of available instructional materials is critical for achieving academic success. Teachers must systematically manage and organize these resources to help students acquire essential competencies (Olagunju & Abiona, 2018). Utilization involves the practical

application of educational facilities, ensuring they contribute to effective teaching and learning. Ekenedo (2014) noted a direct correlation between knowledge of instructional materials and their actual utilization. Offorma (2002) further emphasized that teaching becomes more effective with active learner participation, facilitated by appropriate instructional resources.

Given these considerations, exploring the extent of microphone provision and utilization in Kaduna State's secondary schools is vital. Such an investigation could reveal the impact of these tools on teaching effectiveness and students' performance, laying the foundation for targeted improvements in educational practices.

2.7 Provision and Usage of Software Facilities on Students' Academic Performance

Software refers to a set of instructions and data that guide a computer on how to operate. Unlike physical hardware, which constitutes the tangible components of a system, software is intangible and enables the actual execution of tasks. Within the fields of computer science and software engineering, software encompasses all information processed by computer systems, including programs, libraries, and associated non-executable data such as digital media or online documentation. Hardware and software are interdependent, as neither can function effectively in isolation (Samson, 2021).

At its most fundamental level, executable software comprises machine language instructions tailored to a specific processor, such as a central processing unit (CPU) or graphics processing unit (GPU). Machine language uses binary values to encode processor instructions, which trigger changes in the computer's State. For instance, an instruction might modify the data in a specific memory location or initiate an input/output operation, such as displaying text on a screen. Processors execute instructions sequentially unless directed to skip or modify the sequence

through a "jump" instruction or an operating system interruption (Barry, 2017). Modern personal computers, smartphones, and servers typically feature multi-core processors or multiple processors that perform computations collaboratively, enhancing efficiency and performance.

According to Boas (2021), software can be broadly categorized into the following types:

1. **Application Software**: Programs designed for specific tasks or entertainment purposes, extending beyond basic computer functions. The variety of application software reflects the vast range of tasks modern computers can perform.
2. **System Software**: This type of software manages hardware functionality and provides the foundational platform for running application programs. System software ensures smooth operation and includes components like operating systems, device drivers, and utilities.
    - **Operating Systems**: Comprehensive software collections that manage resources and offer services to other programs. They encompass core elements like boot loaders, shells, and window systems and often include bundled application software to facilitate basic tasks.
    - **Device Drivers**: These control specific hardware devices attached to a computer, enabling smooth communication between the system and peripherals.
    - **Utilities**: Programs designed to assist users in maintaining and optimizing computer performance.
    - **Malicious Software (Malware)**: Programs created to damage or disrupt systems, often linked to cybercrime. Malware, while sometimes crafted as pranks, generally serves harmful purposes.

Despite the advances in software, many Nigerian establishments, including educational institutions, still rely heavily on manual record-keeping. Important documents are often stored in physical files within cabinets, where they face risks from pests and environmental damage, making retrieval difficult or impossible. Routine administrative tasks in government offices are predominantly handled manually, reflecting a lack of commitment to adopting ICT solutions (Aduwa, 2005).

Administrative tasks in educational institutions encompass a broad spectrum of activities, including governance, supervision, infrastructure management, finance, budgeting, accounting, personnel selection and training, system monitoring, facility procurement and maintenance, and research (Thomas, 2017). Integrating software solutions into these processes could significantly enhance efficiency and reduce the burden of manual operations, as highlighted by Springer (2019).

In many Nigerian schools, officials still rely on tedious manual processes for tasks such as student registration, maintaining pupil records, tracking performance, managing inventories, performing cost accounting, processing payments, generating reports, and even creating architectural designs (Iyamu, 2005). These time-consuming activities significantly drain human resources, yet they can be streamlined and expedited using software solutions that enhance overall management efficiency. Thomas (2017) highlighted that software applications improve the speed and accuracy of such tasks while providing the convenience of storing vast amounts of information on compact storage devices like disks or tapes.

The current State of school management in Nigeria remains troubling and uninspiring. While other African countries, including South Africa, Kenya, Uganda, and Tanzania, are making significant strides in adopting software solutions for educational management, Nigeria lags

behind, seemingly stuck in outdated practices (Aduwa & Iyamu, 2005). Despite its abundant natural resources and large population, Nigeria struggles to leverage software technology to advance educational activities and improve secondary school students' academic outcomes. This underutilization of technology in education underscores a missed opportunity, given its proven role as a critical tool for achieving success in the modern educational landscape.

2.8 Provision and Usage of Hardware Facilities on Students' Academic Performance

Hardware facilities refer to tangible components of a computer system, such as disks, disk drives, display screens, keyboards, printers, circuit boards, and chips. Unlike software, which consists of intangible concepts, ideas, and symbols, hardware has a physical presence and can be interacted with directly. The relationship between hardware and software can be likened to that of a book: the pages and ink represent the hardware, while the content—words, sentences, and their meaning—symbolize the software. Without software, hardware is as meaningless as a book with blank pages (Daniel, 2023).

The importance of hardware facilities in secondary schools cannot be overstated. In today's interconnected world, where information is disseminated within seconds and paperless systems are becoming the norm, digitalization plays a crucial role. This transformation relies heavily on information and communication technology (ICT) tools like computers, the internet, mobile phones, and satellites (Usoroh, 2018). However, the benefits of digitalization can only be fully realized in a society that is hardware-literate. Secondary schools bear the responsibility of equipping students with the hardware skills required to thrive in the information age. Achieving hardware literacy is essential if Nigeria is to participate effectively in the global ICT ecosystem.

Efforts to bridge the gap between Nigeria and more technologically advanced countries have seen some citizens initiate strategies to improve hardware literacy. These efforts aim to empower

individuals with IT skills that open pathways to self-employment, such as operating business centres, becoming programmers, or working as tele-engineers. For business-minded individuals, hardware literacy offers advantages in speed, data management, accuracy, and efficient information processing. In many job interviews today, hardware literacy has become a prerequisite, with candidates often missing opportunities despite meeting other qualifications due to a lack of knowledge in hardware operations (Ayogu, 2018).

Incorporating hardware facilities into the school curriculum is both possible and necessary. Their use enhances communication among students and enables faster, more accurate interactions through tools like email (Okonkwo, 2016). Hardware facilities are not limited to schools but also find applications in offices, hospitals, libraries, and homes. At the secondary school level, these tools help students engage with modern communication technologies while presenting challenges for teachers. Many educators now pursue training to build confidence in teaching computer-related courses and foster better rapport with students. Such training also highlights the problem-solving potential of hardware tools (Okonkwo, 2016).

Despite these advancements, traditional methods, such as chalkboards and textbooks, continue to dominate classrooms in many Nigerian secondary schools, particularly in Kaduna State. Emphasizing hardware literacy within the educational system is crucial to preparing students for the demands of the modern world.

2.9 Provision and Usage of Internet Facilities on Students' Academic Performance

The Internet, a global system of interconnected computer networks, operates through the Internet protocol suite (TCP/IP) to enable communication among networks and devices. It serves as a network of networks that spans private, public, academic, business, and government domains, employing various technologies like electronic, wireless, and optical networking. This vast

infrastructure supports an array of information resources and services, including the World Wide Web (WWW), email, telephony, and file sharing (Luis, 2021).

The Internet's origin is traced back to the 1960s with the advent of packet-switching technology, driven by research from the United States Department of Défense to enable computer time-sharing. The ARPANET, a foundational network developed in the 1970s, connected regional academic and military systems. Further expansion in the 1980s, with the National Science Foundation Network serving as a backbone and private funding supporting commercial applications, accelerated technological advancements and the convergence of networks. The commercialization of Internet services in the 1990s catalysed its exponential growth, transforming it from an academic tool into a ubiquitous feature of modern life (Rudolf, 2019).

Traditional communication media like telephony, radio, television, and print publications have been profoundly reshaped or supplanted by Internet-enabled alternatives. New platforms for communication and media consumption, such as email, Internet telephony, video streaming, and digital newspapers, have emerged. Blogging, online news aggregators, and social networking platforms have transformed personal interactions and how people access information. Furthermore, e-commerce has revolutionized retail, allowing businesses to expand their reach globally or operate exclusively online, while business-to-business services have reshaped supply chains across industries (Doyne, 2017).

Global Internet usage has grown at an unprecedented pace. Between 2000 and 2009, the number of users increased from 394 million to 1.858 billion. By 2020, 22% of the world's population had access to computers, with daily activities including 1 billion Google searches, 300 million blog readers, and 2 billion YouTube video views. In 2014, Internet users reached over 3 billion, with Europe leading in penetration rates at 78%, followed by the Americas at 57.4%. By 2018, Asia

became the dominant region, accounting for 51% of global users. China alone reported 802 million Internet users in 2018, making it the leading country, followed by India with 700 million and the United States with 275 million. Despite these numbers, penetration rates varied significantly, with the U.S. at 80%, India at 40%, and China at 38.4%. As of 2020, over 4.5 billion people—more than half of the global population—were Internet users (Jorma, 2019).

The primary language of communication on the Internet has consistently been English. This dominance can be attributed to the origins of the Internet and its establishment as a global lingua franca. Early computer systems were restricted to the American Standard Code for Information Interchange (ASCII), which uses a subset of the Latin alphabet. While English accounts for 27% of Internet usage, other languages also have significant representation, with Chinese at 25%, Spanish at 8%, Japanese at 5%, and Portuguese and German each at 4%. Arabic, French, and Russian each comprise 3%, and Korean accounts for 2%. Regional statistics indicate that 42% of Internet users are in Asia, followed by 24% in Europe, 14% in North America, 10% in Latin America and the Caribbean, 6% in Africa, 3% in the Middle East, and 1% in Australia and Oceania. Advances in technology, particularly Unicode, have facilitated effective communication and content development across multiple languages globally (Steven, 2020).

The Internet has revolutionized flexibility in working hours and locations, particularly with the proliferation of high-speed, unmetered connections. Access is available almost everywhere through devices such as mobile phones, data cards, and cellular routers, enabling wireless connectivity. Although the limited screen sizes and capabilities of such devices present challenges, services like email and web browsing remain accessible. However, service providers often impose restrictions, and mobile data charges are typically higher than other access methods (Claudio, 2017).

Educational resources spanning all levels, from preschool to advanced post-doctoral studies, are readily accessible online. Platforms like CBeebies, virtual universities, and Google Scholar offer diverse content ranging from revision guides to scholarly literature. For distance learning, homework assistance, or exploring areas of interest, the Internet has made educational information more accessible than ever. It has become a vital tool for both formal and informal education, enabling researchers, especially in the social and behavioural sciences, to conduct remote studies through virtual labs. This capability has expanded the scope and applicability of research findings and transformed communication and publication among scholars (Oge, 2021).

The Internet has significantly enhanced collaborative work by enabling the efficient and low-cost exchange of ideas, knowledge, and skills. Groups can form easily and work together using tools like collaborative software, exemplified by the free software movement that has produced platforms like Linux, Mozilla Firefox, and LibreOffice. Communication tools, including chat rooms, instant messaging, and social networking services, facilitate seamless interactions among colleagues. These platforms also support file sharing, image and drawing exchange, and even voice and video communication, making collaboration more dynamic and effective (Nick, 2015).

Remote access to computers and information storage has transformed traditional work environments. With appropriate security measures like authentication and encryption, users can access resources from virtually any location. This capability has fostered innovative work models such as telecommuting and global collaborations. For instance, an accountant can audit a company's books remotely, with data stored on servers in another country and maintained by IT specialists in a third. These technological advancements have reduced dependency on costly private leased lines, enabling efficient and secure operations like email access and remote desktop sessions via virtual private networks (VPNs) (Hartmann, 2014).

The Internet's impact on education is profound, surpassing traditional tools like chalkboards, textbooks, and audiovisual media. Unlike television and film, which primarily stimulate the audiovisual senses, the Internet engages sight, hearing, and touch, offering higher interactivity that enhances intellectual and creative development (Aduwa & Iyamu, 2005). Information and Communication Technology (ICT) not only fosters knowledge acquisition but also facilitates the creation of new knowledge, making it indispensable in today's educational landscape (Shavinina, 2021).

Traditional educational methods, often passive and rigid, lack the transformative potential that ICT brings. In developed nations, computers are now integral to teaching and learning, addressing subjects ranging from reading and mathematics to health practices. Multimedia educational applications are tailored to domain-specific knowledge areas such as history, physics, and biology. ICT's interactive capabilities, including audio, text, multicolour images, and graphics, provide exceptional opportunities for innovative learning. Nigeria must embrace these technologies to prepare its youth for a digital future. Educational programs enriched with multimedia content are essential for cultivating intellectual and creative capacities in children, equipping them for an evolving cyber-driven world (Shavinina, 1997).

2.10 Review of Empirical Studies

This section reviewed literature and studies on the provision and utilization of ICT facilities relevant to the current research.

Agbo (2016) examined the challenges associated with ICT in educational administration and planning within the secondary education system in Ebonyi State. A descriptive survey design was used for data collection, targeting all 600 staff members of the Secondary Education Board in Ebonyi State. A structured questionnaire divided into three sections was employed as the data

collection instrument. The data were analysed using mean scores and t-test statistics. Findings indicated that the absence of essential facilities and equipment, such as computer systems and data storage banks, constituted significant obstacles to effective data management for educational administration and planning in the State.

Ibezim (2016) conducted a study assessing electronic records management practices in select universities in Nigeria's South-East. The research employed a survey design and involved 42 respondents, including directors, system analysts, computer programmers, engineers, and data administrators/operators in electronic records management departments. Data analysis utilized mean scores, standard deviation, and t-tests to test hypotheses. Key findings revealed that electronic record management was not universally implemented in the selected universities, and strategies for capturing, maintaining, and securing students' electronic records were often ineffective.

Ezema (2023) investigated ICT management practices among secondary school administrators in the Nsukka Education Zone of Enugu State. The study adopted a descriptive survey design, gathering opinions from 58 principals and 2,004 teachers engaged in administrative functions. A researcher-designed questionnaire was used for data collection. Results highlighted several challenges faced by educational administrators, including inadequate ICT management knowledge and insufficient data storage facilities in the schools.

Okanume (2014) explored ICT-related challenges faced by counsellors in secondary schools within Enugu State. The study involved a population of 100 counsellors from the old Nsukka Education Zone and utilized a descriptive survey design. Data were collected through a questionnaire and analysed using mean scores for each response item. The findings revealed no

significant differences in information management practices between experienced and inexperienced counsellors, male and female counsellors, or trained and untrained counsellors.

Akachukwu and Osiowor (2020) examined the maintenance of information services in secondary schools within the Oji-River Education Zone. The study focused on 50 practicing school administrators selected through purposive sampling. Data collection was conducted using a questionnaire, and mean scores were used for analysis. Results indicated that financial constraints and inadequate resource centres hindered the maintenance of information services in secondary school guidance programs, whereas accommodation and personnel were not significant obstacles.

Etudor-Eyo, Ante, and Emah (2012) investigated the role of ICT in predicting communication effectiveness among secondary school administrators in Akwa Ibom State, Nigeria. The study collected data from 396 administrators using two instruments: the *Administrators' Use of ICT Questionnaire (AUIQ)* and the *Administrators' Communication Questionnaire (ACQ)*. Findings showed that administrators' use of ICT and communication effectiveness were both high. A significant positive relationship was established between ICT usage and communication effectiveness, with ICT use predicting communication success. Recommendations included the provision of ICT tools in all secondary schools by the government, periodic workshops for ICT literacy, and the employment of skilled personnel to train administrators lacking ICT knowledge.

Okon, Ekaette, and Ameh (2015) investigated the relationship between ICT utilization and principals' administrative effectiveness in public secondary schools in Akwa Ibom State. Using an ex-post facto research design, the study targeted a population of 348 principals and vice-principals, with a sample of 255 principals selected through purposive sampling. Two instruments, the *Information and Communication Technology Utilization Questionnaire*

(ICTUQ) and the *Principals' Administrative Effectiveness Questionnaire (PAEQ)*, were used for data collection. Analysis revealed a significant relationship between ICT usage in communication, record-keeping, and principals' administrative effectiveness. The study recommended that ICT-compliant administrators be rewarded to encourage wider adoption of ICT for enhanced administrative efficiency.

Adeyemi and Otileye (2020) examined the use of Information and Communication Technology (ICT) for effective school management in secondary schools across Ekiti State, Nigeria. The study utilized a descriptive survey design, with a sample selected from 160 secondary schools out of the 182 in the State. Additionally, 812 teachers, including 160 principals and 652 teachers, were chosen using stratified random sampling. A questionnaire was the primary data collection instrument, and the data were analysed through frequency counts, percentages, and Pearson Product Moment Correlation analysis. The findings revealed that the provision of ICT equipment in secondary schools was inadequate, and the principals' management of schools was also found to be insufficient. Major challenges included frequent electricity disruptions and insufficient funding, which hindered the effective use of ICT for school management. The study concluded that the State government had not fully embraced ICT for school management. It recommended that the State government provide necessary ICT equipment to all secondary schools and enhance training for principals, teachers, and ICT personnel through seminars, workshops, and in-service training.

Kukali, Kawasonga, and Rabari (2018) explored the role of principals' leadership in the integration of ICT in public secondary school management in Benue State. The study aimed to assess the impact of principals' leadership on ICT integration in public secondary schools. It was guided by Hasan's (1998) Activity Theory, which breaks work activities into subject (person),

tool (mediating device), and object (intended outcome). A descriptive survey design was used, and the study population consisted of 272 principals and 272 deputy principals from public secondary schools. Simple random and saturated sampling techniques were employed to select 82 principals and 245 deputy principals. Data were collected through interviews, questionnaires, observation checklists, and document analysis guides. The validity of the instruments was ensured through expert reviews, and a pilot study yielded a reliability coefficient of 0.74 for the deputy principals' questionnaire. Quantitative data were analysed using frequencies and percentages, while qualitative data were analysed thematically. The findings indicated a high impact of ICT integration on registration processes and time management, moderate impact on communication with stakeholders and record preparation, and no impact on financial accountability. Based on these findings, the study recommended that the Ministry of Education increase the budget for ICT equipment and implement in-service programs on financial management systems to improve ICT integration in school management.

Onyeike and Nwosu (2018) investigated the role of principals' administrative and supervisory functions in enhancing students' effectiveness through the use of ICT in secondary schools in Rivers State, Nigeria. The study was guided by two research questions and hypotheses, and employed a descriptive survey design. The population consisted of 8,452 teachers in secondary schools across the State, from which a sample of 265 teachers was selected using cluster sampling. Data were collected using a questionnaire titled *Principal's Administrative and Supervisory Roles for Teachers' Job Effectiveness Questionnaire (PASTJEQ)*. The results were analysed using mean scores, standard deviation, rank order statistics, and z-test for hypothesis testing. The findings revealed that principals actively engage in staff personnel administration and provide instructional support to teachers. The study recommended that principals adopt

modern ICT-based supervisory techniques and that the government initiate periodic ICT training for principals to enhance their administrative performance.

Makewa, Meremo, Role, and Role (2023) investigated the difference in perceptions between students and administrators regarding the importance of ICT in secondary school administration and the extent to which it is utilized. The study utilized a descriptive-comparative research design, focusing on secondary school administrators (principals, deputy principals, and heads of departments). Data were analysed using t-tests to assess differences in perceptions and Pearson's product-moment correlation to measure the relationship between the perceptions of ICT importance and its use. The study found that both teachers and administrators considered ICT important for secondary school administration, with administrators rating its use in student administration, general administration, and instructional supervision more highly. There was a significant difference in perceptions between students and administrators, particularly in areas related to the administration of students and supervision of instruction.

Adewole (2016) examined the impact of ICT on principals' administrative effectiveness in secondary schools in Kwara State, Nigeria. The study employed a descriptive survey design and used random sampling to select 60 secondary schools, with a total of 180 respondents (principals and vice-principals). Data were collected using the *ICT and Principal's Administrative Effectiveness Questionnaire (ICTPAEQ)*, and analysed using frequency counts, cross-tabulations, and percentages. The study revealed that ICT facilities were moderately available in the sampled schools. Principals frequently used ICT tools such as radios for global news, handsets for communication, and scanners for document processing. The study concluded that principals effectively used ICT for tasks like browsing the internet for up-to-date information. It recommended that the federal government should improve the power supply to schools and that

State governments increase funding for secondary education in alignment with UNESCO's recommendation of allocating 26% of national budgets to education.

Merirenga and Koringura (2023) studied the utilization of computers by principals, deputy principals, and teachers in managing secondary school students in West Pokot County. The study found that the use of computers in administrative tasks enhanced efficiency in managing student records, making documentation and storage safer. Computer-generated data improved overall performance in school administration, making decision-making, accountability, communication, and record-keeping more effective and cost-efficient. Manduku, Kosgey, and Sang (2012) supported these findings, noting that while ICT improved school management functions, full potential had not yet been realized due to underutilization of these tools in Kesses Zone, Kenya.

Afshari et al. (2020) conducted a study in Tehran, Iran, on the level of computer usage by students and principals, identifying contributing factors to their use. The study established that ICT usage enhanced students and principals' abilities in school budgeting, monitoring, reporting, and management skills. The use of the Internet also allowed for improved decision-making and problem-solving skills, making it an essential tool for the modern educational environment.

In a separate study in Tema Metropolis, Ghana, Amenyedzi, Latery, and Dzomeku (2020) examined the use of computers and the Internet as supplementary sources of educational materials in senior high schools. The study revealed that about 30% of teachers utilized computers and the Internet for research and to easily retrieve students' academic performance records. The computerization of reporting systems saved time for administrative staff and helped streamline the process of monitoring and tracking students' academic performance. Additionally, parental alert software enabled faster communication with parents, providing automatic updates

on students' progress via phone calls, text messages, and emails. This not only improved communication but also enhanced the involvement of parents in their children's education.

Uba (2016) conducted a study on strategies to improve the teaching and learning of computer studies in secondary schools in Ebonyi State. The research followed a survey design and addressed four key research questions. A 33-item questionnaire was distributed to 190 participants, including computer teachers and students from 18 secondary schools across three zones of the State. The study used random sampling, and data were analysed using frequency counts and simple means. The results revealed that effective teaching methods, proper facilities, hiring qualified teachers, fostering positive relationships between parents and teachers, providing instructional materials, engaging students in practical tasks, and monitoring students' abilities were critical factors in enhancing computer studies in secondary schools. This study aligns with the current research, as both emphasize the importance of teaching methodology and teacher training as key strategies for improving computer education in secondary schools. However, the scope of Uba's study differs from the present work.

Hammer (1973) conducted a study on strategies to increase female students' enrollment in technical subjects in Bauchi State. The study formulated three research questions and three null hypotheses. A 51-item questionnaire was administered to 87 teachers and 192 students from three government secondary schools. The data were analysed using mean and standard deviation. The findings suggested that recruiting qualified technical teachers, providing regular in-service training, ensuring the availability of necessary facilities, and offering incentives for female students were essential strategies. Hammer's research is similar to the current study in that both emphasize the recruitment of qualified teachers as a key strategy. However, Hammer's study

broadly focused on increasing female students' enrolment in technical subjects, while the present study specifically targets improving computer studies in secondary schools.

Orajekwe (2018) investigated strategies for improving secondary school health education in the information age. The study used a descriptive design and included three research questions. A random sample of 342 health education teachers from secondary schools in Anambra State participated. Data were collected using a 21-item questionnaire with a 4-point Likert scale, and analysed using mean and standard deviation. The study concluded that improving health education instruction required ICT infrastructure, teacher capacity building, and ICT skill development for teachers. Recommendations included the provision of ICT facilities, development of locally produced software, and collaboration among government, parents, teachers, and school administrators. Orajekwe's study is closely related to the current research in that both emphasize infrastructure as a key strategy for improving a program. However, while Orajekwe focused on health education, the present study focuses on enhancing computer studies in secondary schools in Asaba, Delta State.

2.10 Summary of Literature Review

It has been noted that Information and Communication Technologies (ICT) play a crucial role in organizations, particularly in the education sector. ICT is a key factor that determines the success or failure of secondary schools in achieving their educational goals. For this reason, the researcher reviewed the relevant literature for this study under several sub-headings to ensure comprehensive coverage of the necessary areas. These sub-headings include: the concept of technology, information, academic achievement, communication, ICT, and its various uses in secondary schools. Additionally, the theoretical framework was discussed, focusing on

management theories such as systems theory and human relations theory. The relevance of these theories to the current study was also highlighted. Over fifteen empirical studies were reviewed.

While various studies have been conducted in areas such as the challenges of ICT management for educational administration and planning in secondary schools, ICT management practices among secondary school students, the assessment of electronic records management in selected universities, the maintenance of ICT services in secondary schools, and the problems of ICT management among secondary school students, there appears to be no research, to the best of my knowledge, on the assessment of the provision and usage of ICT facilities by secondary school students in Kaduna State. This gap is what the current study seeks to address, thus underscoring the need for the study.

CHAPTER THREE
RESEARCH METHODOLGOY

3.1 Introduction

This chapter discusses the research design, areas of the study, population of the study, sample and sampling technique, instrument for data collection, validation of the instrument, reliability of the instrument, method of data collection and method of data analysis.

3.2 Research Design

This research adopts a descriptive survey design. According to Ali (2016), a descriptive survey is a type of study that seeks to collect data and systematically describe the characteristics and facts about a given population. This design is appropriate for the study as it allows for the use of a representative sample from the entire population. Furthermore, it enables the researcher to gather data on the provision and usage of Information and Communication Technology (ICT) facilities and assess their impact on the academic performance of secondary school students in Kaduna State.

3.3 Population of the Study

The population of the study was12488comprising of 541 principals, 11,718 teachers and 229 Ministry of Education Officials obtained from the 12 Educational zones of Kaduna State Ministry of Education (KSMOE, 2023). The breakdown of the population is as shown in Table 1.

Table 1: Population of the Study

S/N	Educational Zones	No of principals	No of teachers	No of MOE officials	Total
1.	Anchau	67	856	18	941
2.	Birningwari	21	832	11	864
3.	Giwa	33	628	13	674
4.	Gwado-gwado	36	477	16	529
5.	Kachia	56	573	11	640
6.	Kaduna	38	1762	32	1832
7.	Kafanchan	52	1256	18	1326
8.	Lere	44	476	11	531
9.	Rigachukwu	30	435	19	484
10.	Sabon tasha	66	1446	34	1546
11.	Zaria	55	1524	19	1598
12.	Zonkwa	48	678	23	749
	TOTAL	**541**	**11,718**	**229**	**12488**

Source: (Ministry of Education Kaduna, 2023)

3.4 Sample and Sampling Techniques

The sample size for this study was 378 participants, consisting of 30 principals, 318 teachers, and 30 Ministry of Education (MOE) officials. This sample size was determined using the Research Advisors (2016) Table of Sample Determination. To select the educational zones, 50% of the 12 educational zones in Kaduna State Ministry of Education were chosen, resulting in the selection of 6 zones. This approach aligns with Nworgu's (2016) recommendation that 25% to 50% of the population is an appropriate representation in research. For sufficient representation, 5 principals and 5 MOE officials were selected from each educational zone. Teachers were selected using proportionate sampling, based on the number of teachers in each educational zone. A convenience sampling technique was used to select respondents, as it allowed the researcher to include only those who were available and willing to participate in the study. Table 2 displays the sample details.

Table 2: Sample Size of the Study

S/N	Educational Zones	No of principals	No of teachers	No of MOE officials	Total
1.	Giwa	5	28	5	38
2.	Kachia	5	25	5	35
3.	Kaduna	5	78	5	88
4.	Kafanchan	5	56	5	66
5.	Sabon tasha	5	64	5	74
6.	Zaria	5	67	5	77
	TOTAL	**30**	**318**	**30**	**378**

3.5 Instrumentation

The instrument used for data collection in this study was a self-structured questionnaire titled *"Assessment of the Provision and Usage of Information and Communication Technology (ICT) Facilities on Students' Academic Performance (APUICTFSAP)."* The questionnaire was designed with two sections: Section A and Section B. Section A gathered demographic data from the respondents, while Section B collected information necessary to answer the research questions.

The questionnaire consisted of 60 items, organized into clusters, each based on a 4-point rating scale with the following response options: Strongly Agree (SA) (4 points), Agree (A) (3 points), Disagree (D) (2 points), and Strongly Disagree (SD) (1 point).

- **Cluster A** (Items 1-10) focused on the provision and usage of computers and their impact on students' academic performance in secondary schools.
- **Cluster B** (Items 11-20) examined the provision and usage of projectors and their effect on academic performance.
- **Cluster C** (Items 21-30) addressed the provision and usage of microphones in relation to students' academic performance.

- **Cluster D** (Items 31-40) looked at the provision and usage of software facilities and their impact on academic performance.
- **Cluster E** (Items 41-50) focused on the provision and usage of hardware facilities in secondary schools and their influence on students' academic performance.
- **Cluster F** (Items 51-60) evaluated the provision and usage of internet facilities and their effect on students' academic performance.

This structure was aimed at comprehensively assessing the impact of various ICT facilities on students' academic performance in secondary schools.

3.5.1 Validity of the Instrument

A measuring instrument is valid when it truly and accurately measures what it is designed to measure. The research's supervisors and other experts in the field of educational measurement and evaluation vetted and offered useful suggestions on each item of the instrument to ensure the questions attained both content and face validity. Their suggestions and corrections were used for the correction of the instrument.

3.5.2 Pilot Testing

To determine the reliability of the instrument, pilot test was carried out among 40 staff comprising 5 principals and 35 teachers in 5 schools outside the selected sample within the population. The instrument was administered once to the respondents. Split half method of odd and even numbered items was observed and Cronbach's Alpha was employed in reliability analysis. The justification for pilot testing was to check the consistency of the measuring instrument.

3.5.3 Reliability of the Instrument

The data collected from the pilot study was subjected to reliability analysis using Cronbach's Alpha with the aid of Statistical Package for Social Sciences Software version 24.2.

3.6 Procedure for Data Collection

The researcher used the direct delivery and retrieval technique to administer the instrument to the respondents. The services of two research assistants were used for the distribution and retrieval of the instrument through the guidance of the researcher to ensure safe handling. These research assistants assisted the researcher in both the administration and collection of the questionnaires as soon as they are completed by the respondents.

3.7 Method of Data Analysis

Real limit of number was used in interpreting the analysed data.

Thus: 3.50 – 4.00 (SA)

2.50 – 3.49 (A)

1.50 – 2.49 (D)

0.50 – 1.49 (SD).

The research questions were answered using mean score and standard deviation. The null hypotheses were tested using ANOVA at 0.05 level of significance. The decision rule for the hypotheses was that any calculated value which was less than the critical value was considered not significant while any value that was greater than the critical value was considered significant. The bio-data of the respondents was analysed using frequency counts and simple percentage.

CHAPTER FOUR
DATA PRESENTATION, ANALYSIS AND DISCUSSIONS

4.1 Introduction

This chapter presents the analysis of data collected for the study as well as result and discussion of the findings. Descriptive statistics of table of frequency and mean scores were used to answer research questions. All null hypotheses were tested using inferential statistics of Analysis of Variance (ANOVA) at 0.05 level of significance.

4.2 Answers to Research Questions

This section deals with the analysis of research questions raised for the study.

Research Question One: In what ways do provision and usage of computers improve students' academic performance in secondary school in Kaduna State?

The items and the responses of the respondents were computed using table of frequency and mean scores on modified 4-point Likert scale as presented in Table 4.1.

Table 4.1: Opinions of the Respondents on how does provision and usage of computers improve students' academic performance in secondary school

S/N	Item	Status	SA	A	D	SA	MEAN
1	The provision of computers in secondary schools positively impacts students' access to educational resources.	Principal	10	14	4	2	3.2
		Teachers	87	321	10	7	3.7
		MOE Off	5	10	5	10	3.5
2	The usage of computers enhances students' understanding of academic subjects.	Principal	11	13	3	3	3.6
		Teachers	86	222	9	8	3.8
		MOE Off	5	10	5	10	3.2
3	Computers contribute to improved research skills among secondary school students.	Principal	9	15	2	4	3.0
		Teachers	82	225	11	8	3.1
		MOE Off	10	10	5	5	4.0
4	The availability of computers in schools positively influences students' engagement in classroom activities.	Principal	12	12	1	5	3.8
		Teachers	220	85	11	9	3.1
		MOE Off	5	10	5	10	3.2
5	The usage of computers facilitates a more interactive and dynamic learning environment.	Principal	10	12	4	4	3.3
		Teachers	88	219	11	8	3.3
		MOE Off	10	10	5	5	3.4
6	Access to computers enhances students' ability to collaborate on academic projects.	Principal	8	16	4	2	3.6
		Teachers	80	226	9	10	3.8
		MOE Off	5	10	5	10	3.6
7	The provision of computers in secondary schools positively affects students' academic motivation.	Principal	11	15	3	2	3.0
		Teachers	83	222	11	8	3.1
		MOE Off	10	10	5	5	3.8
8	Computer usage is associated with increased academic performance in standardized tests.	Principal	6	17	5	2	3.7
		Teachers	85	220	12	8	3.5
		MOE Off	5	10	5	10	3.2
9	The integration of computers in teaching improves students' critical thinking skills.	Principal	14	12	2	3	3.0
		Teachers	89	220	9	6	3.2
		MOE Off	10	10	5	5	3.2
10	The availability of computers in secondary schools positively influences students' overall academic performance.	Principal	13	11	2	4	3.3
		Teachers	81	224	12	9	3.1
		MOE Off	5	10	5	10	3.4
		Grand Mean					**3.5**

The analysis of data in Table 4.1 shows how provision and usage of computers improve students' academic performance in secondary school in Kaduna State. The analysis revealed mean scores of items 1-10 to be more than the benchmark of 2.5. This means that respondents have all agreed that provision and usage of computers make students have access to educational resources, interact and collaborate on academic project and improve their critical thinking. The

grand mean was also 3.5 which indicate that provision and usage of computers improve students' academic performance in secondary school in Kaduna State.

Research Question Two: How does provision and usage of projectors affect students' academic performance in secondary school in Kaduna State?

The items and the responses of the respondents were computed using table of frequency and mean scores on modified 4-point Likert scale as presented in Table 4.2.

Table 4.2: Opinions of the Respondents on provision and usage of projectors affect students' academic performance in secondary school in Kaduna State

S/N	Item	Status	SA	A	D	SA	MEAN
11	The availability of projectors enhances students' understanding of academic subjects.	Principal	10	12	4	4	3.3
		Teachers	88	219	11	8	3.3
		MOE Off	10	10	5	5	3.4
12	Projector usage facilitates a more engaging and visually appealing learning environment for students.	Principal	8	16	4	2	3.6
		Teachers	80	226	9	10	3.8
		MOE Off	5	10	5	10	3.6
13	The provision of projectors positively impacts students' interest and participation in classroom activities.	Principal	11	15	3	2	3.0
		Teachers	83	222	11	8	3.1
		MOE Off	10	10	5	5	3.8
14	Projector-assisted lessons contribute to improved retention of academic content among students.	Principal	6	17	5	2	3.7
		Teachers	85	220	12	8	3.5
		MOE Off	5	10	5	10	3.2
15	Access to projectors enhances students' ability to grasp complex concepts through visual representation.	Principal	14	12	2	3	3.0
		Teachers	89	220	9	6	3.2
		MOE Off	10	10	5	5	3.2
16	The usage of projectors promotes collaborative learning among secondary school students.	Principal	13	11	2	4	3.4
		Teachers	81	224	12	9	3.4
		MOE Off	5	10	5	10	3.7
17	Projector integration positively influences students' motivation to actively participate in class discussions.	Principal	10	12	4	4	3.5
		Teachers	88	219	11	8	3.4
		MOE Off	10	10	5	5	3.8
18	The provision of projectors in secondary schools is correlated with increased academic performance in assessments.	Principal	8	16	4	2	3.3
		Teachers	80	226	9	10	3.3
		MOE Off	5	10	5	10	3.4
19	Projector-assisted teaching methods improve students' critical thinking and analytical skills.	Principal	11	15	3	2	3.6
		Teachers	83	222	11	8	3.8
		MOE Off	10	10	5	5	3.6
20	Students perceive that projectors have a positive impact on their overall academic performance in secondary schools.	Principal	6	17	5	2	3.0
		Teachers	85	220	12	8	3.1
		MOE Off	5	10	5	10	3.8
		Grand Mean					**3.4**

The analysis of data in Table 4.2 shows how provision and usage of projectors affect students' academic performance in secondary school in Kaduna State. The analysis revealed mean scores of items 11-20 to be more than the benchmark of 2.5. This means that respondents have all agreed that provision and usage of projectors enhance students' understanding, interest and participation and promote collaborative learning among students. The grand mean was also 3.4 which indicate that provision and usage of projectors improve students' academic performance in secondary school in Kaduna State.

Research Question Three: How does provision and usage of microphones improve students' academic performance in secondary school in Kaduna State?

The items and the responses of the respondents were computed using table of frequency and mean scores on modified 4-point Likert scale as presented in Table 4.3.

Table 4.3: Opinions of the Respondents on provision and usage of microphones improve students' academic performance in secondary school in Kaduna State

S/N	Item	Status	SA	A	D	SA	MEAN
21	The availability of microphones in classrooms enhances students' ability to clearly hear and understand the teacher during lectures.	Principal	9	15	2	4	3.0
		Teachers	82	225	11	8	3.1
		MOE Off	10	10	5	5	3.8
22	The usage of microphones positively influences students' engagement in classroom discussions and activities.	Principal	12	12	1	5	3.7
		Teachers	220	85	11	9	3.5
		MOE Off	5	10	5	10	3.2
23	Microphone-assisted lessons contribute to improved communication between teachers and students.	Principal	10	12	4	4	3.0
		Teachers	88	219	11	8	3.2
		MOE Off	10	10	5	5	3.2
24	Access to microphones in classrooms positively impacts students' confidence in participating in oral presentations.	Principal	8	16	4	2	3.4
		Teachers	80	226	9	10	3.4
		MOE Off	5	10	5	10	3.7
25	Microphones facilitate a more inclusive learning environment, ensuring all students can hear and participate effectively.	Principal	11	15	3	2	3.5
		Teachers	83	222	11	8	3.4
		MOE Off	10	10	5	5	3.8
26	The provision of microphones enhances the overall quality of classroom communication and interaction.	Principal	6	17	5	2	3.3
		Teachers	85	220	12	8	3.3
		MOE Off	5	10	5	10	3.4
27	Microphone usage positively influences students' perception of the clarity of instructional content.	Principal	14	12	2	3	3.6
		Teachers	89	220	9	6	3.8
		MOE Off	10	10	5	5	3.6
28	Microphone-assisted teaching methods contribute to increased student attentiveness and focus during lessons.	Principal	13	11	2	4	3.0
		Teachers	81	224	12	9	3.1
		MOE Off	5	10	5	10	3.8
29	Students believe that the availability of microphones in classrooms positively affects their academic performance.	Principal	9	15	2	4	3.0
		Teachers	82	225	11	8	3.1
		MOE Off	10	10	5	5	3.8
30	The usage of microphones is associated with improved understanding of complex academic concepts among students.	Principal	12	12	1	5	3.7
		Teachers	220	85	11	9	3.5
		MOE Off	5	10	5	10	3.2
			Grand Mean				**3.3**

The analysis of data in Table 4.3 shows how provision and usage of microphones affect students' academic performance in secondary school in Kaduna State. The analysis revealed mean scores of items 21-30 to be more than the benchmark of 2.5. This means that respondents have all agreed that provision and usage of microphones help students to hear teacher clearly during teaching, improve communication, confidence and clarity of instruction. The grand mean

was also 3.3 which indicate that provision and usage of microphones improve students' academic performance in secondary school in Kaduna State.

Research Question Four: In what ways does provision and usage of software facilities affect students' academic performance in secondary school in Kaduna State?

The items and the responses of the respondents were computed using table of frequency and mean scores on modified 4-point Likert scale as presented in Table 4.4.

Table 4.4: Opinions of the Respondents on provision and usage of software facilities affect students' academic performance in secondary school in Kaduna State

S/N	Item	Status	SA	A	D	SA	MEAN
31	The availability of educational software and apps enhances students' access to diverse learning resources.	Principal	8	16	4	2	3.4
		Teachers	80	226	9	10	3.4
		MOE Off	5	10	5	10	3.7
32	The usage of educational software and apps positively influences students' understanding of academic subjects.	Principal	11	15	3	2	3.5
		Teachers	83	222	11	8	3.4
		MOE Off	10	10	5	5	3.8
33	Educational software and apps contribute to increased student engagement in learning activities.	Principal	6	17	5	2	3.3
		Teachers	85	220	12	8	3.3
		MOE Off	5	10	5	10	3.4
34	Access to educational software and apps enhances students' ability to learn at their own pace.	Principal	14	12	2	3	3.6
		Teachers	89	220	9	6	3.8
		MOE Off	10	10	5	5	3.6
35	The provision of educational software and apps positively impacts students' motivation to learn.	Principal	13	11	2	4	3.0
		Teachers	81	224	12	9	3.1
		MOE Off	5	10	5	10	3.8
36	Educational software and apps support differentiated instruction, catering to individual learning styles.	Principal	9	15	2	4	3.0
		Teachers	82	225	11	8	3.1
		MOE Off	10	10	5	5	3.8
37	The usage of educational software and apps is associated with improved academic performance in assessments.	Principal	12	12	1	5	3.7
		Teachers	220	85	11	9	3.5
		MOE Off	5	10	5	10	3.2
38	Students believe that educational software and apps have a positive impact on their overall academic performance.	Principal	8	16	4	2	3.0
		Teachers	80	226	9	10	3.2
		MOE Off	5	10	5	10	3.2
39	Educational software and apps contribute to the development of critical thinking and problem-solving skills.	Principal	11	15	3	2	3.4
		Teachers	83	222	11	8	3.4
		MOE Off	10	10	5	5	3.7
40	The integration of educational software and apps positively influences students' collaboration on academic projects.	Principal	6	17	5	2	3.0
		Teachers	85	220	12	8	3.1
		MOE Off	5	10	5	10	3.8
			Grand Mean				**3.5**

The analysis of data in Table 4.4 shows how provision and usage of software facilities influence students' academic performance in secondary school in Kaduna State. The analysis revealed mean scores of items 31-40 to be more than the benchmark of 2.5. This means that respondents have all agreed that provision and usage of software facilities enhances students' access to diverse learning resources, understanding, students' engagement in learning activities and help them to develop critical thinking. The grand mean was also 3.5 which indicate that provision and usage of software facilities influence students' academic performance in secondary school in Kaduna State

Research Question Five: How does provision and usage of internet facilities improve students' academic performance in secondary school in Kaduna State?

The items and the responses of the respondents were computed using table of frequency and mean scores on modified 4-point Likert scale as presented in Table 4.5.

Table 4.5: Opinions of the Respondents on provision and usage of internet facilities improve students' academic performance in secondary school

S/N	Item	Status	SA	A	D	SA	MEAN
41	The availability of internet facilities enhances students' access to a wide range of educational resources.	Principal	14	12	2	3	3.6
		Teachers	89	220	9	6	3.8
		MOE Off	10	10	5	5	3.6
42	Internet usage positively influences students' ability to conduct research for academic assignments.	Principal	13	11	2	4	3.0
		Teachers	81	224	12	9	3.1
		MOE Off	5	10	5	10	3.8
43	Access to the internet contributes to increased student engagement in online learning activities.	Principal	9	15	2	4	3.0
		Teachers	82	225	11	8	3.1
		MOE Off	10	10	5	5	3.8
44	The provision of internet facilities supports students in staying updated with current academic content.	Principal	12	12	1	5	3.7
		Teachers	220	85	11	9	3.5
		MOE Off	5	10	5	10	3.2
45	Internet usage positively impacts students' motivation to explore and learn beyond traditional classroom materials.	Principal	8	16	4	2	3.0
		Teachers	80	226	9	10	3.2
		MOE Off	5	10	5	10	3.2
46	The availability of internet facilities supports collaborative learning among secondary school students.	Principal	11	15	3	2	3.4
		Teachers	83	222	11	8	3.4
		MOE Off	10	10	5	5	3.7
47	Internet usage is associated with improved academic performance in assessments and examinations.	Principal	6	17	5	2	3.0
		Teachers	85	220	12	8	3.1
		MOE Off	5	10	5	10	3.8
48	Students believe that access to the internet positively influences their overall academic performance.	Principal	14	12	2	3	3.6
		Teachers	89	220	9	6	3.8
		MOE Off	10	10	5	5	3.6
49	Internet facilities contribute to the development of critical thinking and analytical skills among students.	Principal	13	11	2	4	3.0
		Teachers	81	224	12	9	3.1
		MOE Off	5	10	5	10	3.8
50	The integration of internet facilities positively influences students' ability to adapt to new learning technologies.	Principal	9	15	2	4	3.0
		Teachers	82	225	11	8	3.1
		MOE Off	10	10	5	5	3.8
		Grand Mean					**3.6**

The analysis of data in Table 4.5 shows how provision and usage of Internet facilities influence students' academic performance in secondary school in Kaduna State. The analysis revealed mean scores of items 41-50 to be more than the benchmark of 2.5. This means that respondents have all agreed that provision and usage of Internet facilities enhances students' access to a wide range of educational resources, influences students' ability to conduct research

for academic assignments, increased student engagement in online learning activities and motivate and explore students to learn beyond traditional classroom materials. The grand mean was also 3.6 which indicate that provision and usage of Internet facilities influence students' academic performance in secondary school in Kaduna State

4.3 Hypotheses Testing

The null hypotheses that were formulated to test differences of opinion among the group of respondents involved in the study were analysed using One-way Analysis of Variance (ANOVA) at 0.05 level of significance. The used of ANOVA statistics was informed because the respondents were more than two groups and the data were non-parametric.

Null Hypothesis 1 There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of computers on students' academic performance in secondary school in Kaduna State

Table 4.6: One-way Analysis of Variance (ANOVA) on the provision and usage of computers on students' academic performance in secondary school

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	.196	2	.127	2.114	.221	Retained
Within Groups	26.001	376	.048			
Total	**26.197**	**378**				

The analysis of result in Table 4.6 shows difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of computers on students' academic performance in secondary school in Kaduna State. The result reveals p-value of .221 and is greater than the fixed probability level of 0.05 which shows no significant difference among the respondents on the influence of computers students' academic performance in secondary school in Kaduna State. Hence, the null hypothesis is retained.

Null Hypothesis 2 There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of projectors on students' academic performance in secondary school in Kaduna State

Table 4.7: One-way Analysis of Variance (ANOVA) on the provision and usage of projectors on students' academic performance in secondary school

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	.106	2	.133	1.215	.219	Retained
Within Groups	29.617	376	.064			
Total	**29.723**	**378**				

The analysis of result in Table 4.7 shows difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of projectors on students' academic performance in secondary schools in Kaduna State. The result reveals p-value of .219 and is greater than the fixed probability level of 0.05 which indicates no significant difference among the opinions of respondents on the influence of projectors on students' academic performance in secondary school in Kaduna State. Hence, the null hypothesis is retained.

Null Hypothesis 3 There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of microphones on students' academic performance in secondary school in Kaduna State

Table 4.8: One-way Analysis of Variance (ANOVA) on the provision and usage of microphones on students' academic performance in secondary school

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	.183	2	.022	3.210	.412	Retained
Within Groups	17.672	376	.231			
Total	**17.855**	**378**				

The analysis of result in Table 4.8 shows difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of microphones on students' academic performance in secondary schools in Kaduna State. The result reveals p-value of .412 and is

greater than the fixed probability level of 0.05 which indicates no significant difference among the opinions of respondents on the influence of microphones on students' academic performance in secondary school in Kaduna State. Hence, the null hypothesis is retained.

Null Hypothesis 4 There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of software facilities on students' academic performance in secondary school in Kaduna State.

Table 4.9: One-way Analysis of Variance (ANOVA) on the provision and usage of software facilities on students' academic performance in secondary school

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	91.130	2	145.567	1.176	.114	Retained
Within Groups	33.470	376	.201			
Total	**124.604**	**378**				

The analysis of result in Table 4.9 shows difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of software facilities on students' academic performance in secondary schools in Kaduna State. The result reveals p-value of .112 and is greater than the fixed probability level of 0.05 which indicates no significant difference among the opinions of respondents on the influence of software facilities on students' academic performance in secondary school in Kaduna State. Hence, the null hypothesis is retained.

Null Hypothesis 5 There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of internet facilities on students' academic performance in secondary school in Kaduna State

Table 4.10: One-way Analysis of Variance (ANOVA) on the provision and usage of internet facilities on students' academic performance in secondary school

	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Between Groups	.283	2	.142	1.921	.119	Retained
Within Groups	21.207	376	.107			
Total	**21.480**	**378**				

The analysis of result in Table 4.10 shows difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of Internet facilities on students' academic performance in secondary schools in Kaduna State. The result reveals p-value of .119 and is greater than the fixed probability level of 0.05 which indicates no significant difference among the opinions of respondents on the influence of Internet facilities on students' academic performance in secondary school in Kaduna State. Hence, the null hypothesis is retained.

Table 4.11: Summary of Hypotheses Testing

	Statement	Stat. Tool	P-value	Decision
1	There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of computers on students' academic performance in secondary school in Kaduna State	ANOVA	P=.221	Retained
2	There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of projectors on students' academic performance in secondary school in Kaduna State	ANOVA	P=.219	Retained
3	There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of microphones on students' academic performance in secondary school in Kaduna State	ANOVA	P=.412	Retained
4	There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of software facilities on students' academic performance in secondary school in Kaduna State	ANOVA	P=.114	Retained
5	There is no significant difference in the opinion of principals, teachers and Ministry of education officials on the provision and usage of internet facilities on students' academic performance in secondary school in Kaduna State.	ANOVA	P=.119	Retained

4.4 Summary of Findings

The following are the summary of major findings based on the analysis of research questions and test of null hypotheses.

1. Provision and usage of computers influence students' academic performance by making them have access to educational resources, interact and collaborate on academic project and improve their critical thinking and stakeholders have similar views to that effect (p=221).
2. Provision and usage of projectors influence students' academic performance through enhancing their understanding, interest and participation and promote collaborative learning among students and difference on the opinions of stakeholders on this (p=219).
3. Provision and usage of microphones influence students' academic performance by helping them to hear teacher clearly during teaching, improve communication, confidence and clarity of instruction and difference that exist on the stakeholders' perception on that (p=412).
4. Provision and usage of software facilities influence students' academic performance by enhancing them access to diverse learning resources, understanding, students' engagement in learning activities and help them to develop critical thinking and stakeholders hold the same opinions on the influence (p=114).
5. Provision and usage of Internet facilities influence students' academic performance by making them have access to a wide range of educational resources, influences students' ability to conduct research for academic assignments, increased student engagement in online learning activities and motivate and explore students to learn beyond traditional classroom materials (p=119).

5.5 Discussion of the Findings

The following are discussions of findings of the study:

Provision and usage of computers influence students' academic performance by making them have access to educational resources, interact and collaborate on academic project and improve

their critical thinking and stakeholders have similar views to that effect (p=221). This is in line with the position of Bais, (2023) who posited that A computer is a machine that can be programmed to carry out sequences of arithmetic or logical operations automatically. Modern computers can perform generic sets of operations known as programs. These programs enable computers to perform a wide range of tasks. A computer system is a "complete" computer that includes the hardware, operating system (main software), and peripheral equipment needed and used for "full" operation. This term may also refer to a group of computers that are linked and function together, such as a computer network or computer cluster (Lance, 2021). A broad range of industrial, education and consumer products use computers as control systems. Simple special-purpose devices like microwave ovens and remote controls are included, as are factory devices like industrial robots and computer-aided design, as well as general-purpose devices like personal computers and mobile devices like Smartphone. Computers power the Internet, which links hundreds of millions of other computers and users (Austen, 2020). Bais, (2023), explained specifically that a computer has the following capabilities in a school system.

Makewa et al (2023) opined that for effective administration f students, principal should adopt ICT not only for teaching and learning but also for administrative transactions. Saiti and Prokopiadou (2019) in the research on the impact of ICT on secondary schools indicated that ICT in the school environment may be considered as a synonym for modernization of schools. The use of ICT in schools is part of the extensive technological modernization of education and administration. Principals perceive the importance of the use of ICT in their broad planning process, despite the challenges (Makewa et al, 2023), computer technology – support demands good leadership and effective management from school principals.

Provision and usage of projectors influence students' academic performance through enhancing their understanding, interest and participation and promote collaborative learning among students and difference on the opinions of stakeholders on this (p=219). This is in line with the report of Odebero (2021) who said that A projector or image projector is an optical device that projects an image (or moving images) onto a surface, commonly a projection screen. Most projectors create an image by shining a light through a small transparent lens, but some newer types of projectors can project the image directly, by using lasers. A virtual retinal display, or retinal projector, is a projector that projects an image directly on the retina instead of using an external projection screen.The most common type of projector used today is called a video projector. Video projectors are digital replacements for earlier types of projectors such as slide projectors and overhead projectors. These earlier types of projectors were mostly replaced with digital video projectors throughout the 1990s and early 2000s, but old analogue projectors are still used at some places. The newest types of projectors are handheld projectors that use lasers or LEDs to project images. Their projections are hard to see if there is too much ambient light (Odebero, 2021).

The act of receiving instruction is teaching (Nwachukwu, 2021). The concept of teaching and instruction are therefore related in terms of their objectives-impacting knowledge (Nwachukwu, 2021). In every institution of learning, its major purpose is to help learners learn. To achieve this, each part (school, teacher and learner) set its own goal. All these goals must be congruent for them to achieve the goal of education by providing for different individual. In other to provide for different individual, scholars and educationist have been able to provide different instructional approach and facilities for use in education. Instructional strategies, which are varieties of an instructional approach, mean help given to learner to easy their rate of

assimilation. According to Landu (2005) the use of projectors for instruction can be classified into two major categories: projectors Assisted Instruction (CAI) and projectors Managed Instruction (CMI). This strategy refers to any instructional program whereby projectors perform, manages or supports some or the entire teacher provided functions. Most proponent of individualized instruction saw the projectors as a way to further improve the design and delivery of individualize instruction – now in an electronic environment. It is so effective in that they offer user-friendly environment, which can entertain and allow individual to work at own pace thus making them active participants.

Provision and usage of microphones influence students' academic performance by helping them to hear teacher clearly during teaching, improve communication, confidence and clarity of instruction and difference that exist on the stakeholders' perception on that (p=412). This agrees with the Statement of Barron, (2021) who Stated that A microphone, colloquially called a mic or mike (/maɪk/), is a device – a transducer – that converts sound into an electrical signal. Microphones are used in many applications such as telephones, hearing aids, public-address systems for concert halls and public events, motion picture production, live and recorded audio engineering, sound recording, two-wayradios, megaphones, radio and television broadcasting.They are also used in computers for recording voice, speech recognition, VoIP, and for non-acoustic purposes such as ultrasonic sensors or knock sensors (Barron, 2021).

Several types of microphones are used today, which employ different methods to convert the air pressure variations of a sound wave to an electrical signal. The most common are the dynamic microphone, which uses a coil of wire suspended in a magnetic field; the condenser microphone, which uses the vibrating diaphragm as a capacitor plate; and the contact microphone, which uses

a crystal of piezoelectric material. Microphones typically need to be connected to a preamplifier before the signal can be recorded or reproduced (Rissanen, 2019). This device is an indispensable tool in teaching and learning process in other to achieve the Stated educational objectives.

Education is an indispensable component in the development of any nation. As a result, many countries in the world view education as a good investment for national development. This is because it ensures that the needs and aspirations of individuals are met. This means that education can only provide and meet the needs of the individual and society when it is taught with the right materials. The idea of using materials and equipment to enhance effectiveness in the instructional process is as old as mankind. The wise teacher will always use tools or aids in form of instructional materials to help the learners understand and learn better. The unavailability of instructional materials like microphones for effective teaching in Public Secondary Schools and the little or no use of the available ones have been perceived to have impacted negatively on the performance of students at the secondary level (Anyanwu, 2023). In recent years, there have been discussions and debates on the falling standard of education. The blame has always been on teachers, parents and students.

Provision and usage of software facilities influence students' academic performance by enhancing them access to diverse learning resources, understanding, students' engagement in learning activities and help them to develop critical thinking and stakeholders hold the same opinions on the influence (p=114). This is in line with the view of Samson (2021) who viewed Software is a collection of instructions and data that tell a computer how to work. This is in contrast to physical hardware, from which the system is built and actually performs the work. In computer science and software engineering, computer software is all information processed

by computer systems, including programs and data. Computer software includes computer programs, libraries and related non-executable data, such as online documentation or digital media. Computer hardware and software require each other and neither can be realistically used on its own (Samson, 2021).

At the lowest programming level, executable code consists of machine language instructions supported by an individual processor—typically a central processing unit (CPU) or a graphics processing unit (GPU). A machine language consists of groups of binary values signifying processor instructions that change the State of the computer from its preceding State. For example, an instruction may change the value stored in a particular storage location in the computer, an effect that is not directly observable to the user. An instruction may also invoke one of many input or output operations, for example displaying some text on a computer screen; causing State changes which should be visible to the user. The processor executes the instructions in the order they are provided, unless it is instructed to "jump" to a different instruction, or is interrupted by the operating system (Barry, 2017). As of 2015, most personal computers, smartphone devices and servers have processors with multiple execution units or multiple processors performing computation together.

Provision and usage of Internet facilities influence students' academic performance by making them have access to a wide range of educational resources, influences students' ability to conduct research for academic assignments, increased student engagement in online learning activities and motivate and explore students to learn beyond traditional classroom materials (p=119). This is in line with the Statement Luis (2021) whoStated that The Internet (or internet) is the global system of interconnected computer networks that uses the Internet protocol suite (TCP/IP) to communicate between networks and devices. It is a network of networks that consists of private,

public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies. The Internet carries a vast range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), electronic mail, telephony, and file sharing (Luis, 2021).

The origins of the Internet date back to the development of packet switching and research commissioned by the United States Department of Defence in the 1960s to enable time-sharing of computers. The primary precursor network, the ARPANET, initially served as a backbone for interconnection of regional academic and military networks in the 1970s. The funding of the National Science Foundation Network as a new backbone in the 1980s, as well as private funding for other commercial extensions, led to worldwide participation in the development of new networking technologies, and the merger of many networks. The linking of commercial networks and enterprises by the early 1990s marked the beginning of the transition to the modern Internet, and generated a sustained exponential growth as generations of institutional, personal, and mobile computers were connected to the network. Although the Internet was widely used by academia in the 1980s, commercialization incorporated its services and technologies into virtually every aspect of modern life (Rudolf, 2019).

Most traditional communication media, including telephony, radio, television, paper mail and newspapers are reshaped, redefined, or even bypassed by the Internet, giving birth to new services such as email, Internet telephony, Internet television, online music, digital newspapers, and video streaming websites. Newspaper, book, and other print publishing are adapting to website technology, or are reshaped into blogging, web feeds and online news aggregators. The Internet has enabled and accelerated new forms of personal interactions through instant

messaging, Internet forums, and social networking services. Online shopping has grown exponentially for major retailers, small businesses, and entrepreneurs, as it enables firms to extend their "brick and mortar" presence to serve a larger market or even sell goods and services entirely online. Business-to-business and financial services on the Internet affect supply chains across entire industries (Doyne, 2017).

CHAPTER FIVE
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary, conclusions, recommendations suggestions for further study as well as contributions to knowledge drawn from the research findings. The main objective of this study is to assess the provision and usage of Information and Communication Technology (ICT) facilities on the students' academic performance in secondary school students in Kaduna State, Nigeria.

5.2 Summary

The study is to assess the provision and usage of Information and Communication Technology (ICT) facilities on the students' academic performance in secondary school students in Kaduna State, Nigeria. Five specific objectives, research questions and null hypotheses were formulated based to guide the study. The study adopted descriptive survey research design with the population of 12488 and sample size of 378.The instrument used for data collection was structured questionnaire tagged "Assessment of the provision and usage of information and communication technology (ICT) facilities on students' academic performance (APUICTFSAP) which contained 50 items. The data collected from the field were analysed using descriptive statistics of frequency and mean scores to answer all research questions. Inferential statistics of Analysis of Variance (ANOVA) was used to test all the null hypotheses at 0.05 level of significance. The results revealed that Provision and usage of computers influence students' academic performance by making them have access to educational resources, interact and collaborate on academic project and improve their critical thinking and stakeholders have similar

views to that effect (p=221). Provision and usage of projectors influence students' academic performance through enhancing their understanding, interest and participation and promote collaborative learning among students and difference on the opinions of stakeholders on this (p=219). Provision and usage of microphones influence students' academic performance by helping them to hear teacher clearly during teaching, improve communication, confidence and clarity of instruction and difference that exist on the stakeholders' perception on that (p=412). Provision and usage of software facilities influence students' academic performance by enhancing them access to diverse learning resources, understanding, students' engagement in learning activities and help them to develop critical thinking and stakeholders hold the same opinions on the influence (p=114). Provision and usage of Internet facilities influence students' academic performance by making them have access to a wide range of educational resources, influences students' ability to conduct research for academic assignments, increased student engagement in online learning activities and motivate and explore students to learn beyond traditional classroom materials (p=119).

5.3 Conclusions

Based on the findings of this study, it was concluded that;

Provision and usage of computers, projectors and microphones improves students' academic performances in secondary schools in Kaduna State. Software and internet facilities also enhance the academic performances of student in secondary schools in Kaduna State, Nigeria. The implication of these findings is that as many times as computers, projectors, microphones, software and Internet facilities was provided and used for teaching and learning academic performances of secondary school students will improve.

5.4 Recommendations

Based on the findings and conclusions of this study, the following recommendations were made.

1. Kaduna State government should make efforts to provide more computers and school authorities should ensure they are adequately used by the teachers for teaching and learning in secondary schools in Kaduna State.
2. Kaduna State government should provide adequate projectors and alternative sources of power to use when the need arises by the teachers and students for teaching and learning in secondary schools in Kaduna State.
3. Kaduna State government should make efforts to provide more microphones and school authorities should ensure they are adequately used by the teachers for teaching and learning in secondary schools in Kaduna State.
4. Kaduna State government should provide adequate software facilities and alternative sources of power to use when the need arises for teaching and learning in secondary schools in Kaduna State.
5. Kaduna State government should provide adequate Internet facilities and alternative sources of power to use when the need arises for teaching and learning in secondary schools in Kaduna State

5.5 Contributions to Knowledge

Based on the findings, conclusions and recommendations of this study, the following are the contributions to knowledge.

1. The study established that provision and usage of computers, projectors and software facilities improve students' academic performances in secondary schools in Kaduna State.
2. The study also added to knowledge that provision and usage of software and Internet facilities enhance the performances of students in secondary schools in Kaduna State.

5.5 Suggestions for Further Studies

The following were suggested for further studies:

1. There is a need to conduct longitudinal studies to assess the long-term impact of provision and usage of technology on students' academic performance. This can help in understanding how technology integration evolves over time and its sustained effects on learning outcomes.
2. It is necessary to compare the effectiveness of different types of technology interventions (e.g., computers, projectors, microphones, software facilities, Internet facilities) on students' academic performance. Investigate which technologies yield the most significant improvements and under what conditions.
3. Further studies should focus on qualitative research to delve deeper into the mechanisms through which technology influences students' academic performance. Explore students' and teachers' perceptions, experiences, and attitudes towards technology integration in education.
4. There is a need to investigate the role of teacher training and professional development programs in effectively integrating technology into the classroom. Explore how teachers' pedagogical practices and technological skills impact the outcomes of technology integration initiatives.

5. It is necessary to examine the disparities in access to technology among students from different socio-economic backgrounds. Investigate strategies to bridge the digital divide and ensure equitable access to technology-enhanced learning environments.
6. Further research should explore innovative pedagogical approaches that leverage technology to enhance student learning outcomes. Investigate the effectiveness of blended learning, flipped classrooms, and other technology-enabled instructional models.
7. Further studies should investigate the effectiveness of technology interventions for students with diverse learning needs, including those with disabilities or special educational requirements. Explore how adaptive technologies can be tailored to meet the unique needs of these populations.

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APPENDICES

QUESTIONNAIRE

ASSESSMENT OF PROVISION AND USAGE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) FACILITIES ON STUDENTS' ACADEMIC PERFORMANCE IN SECONDARY SCHOOLS IN KADUNA STATE, NIGERIA

SECTION A: BIO-DATA OF RESPONDENTS

Gender: Male ( ) Female ( )

Category: Principal ( ) Teacher ( ) M.o.E Official ( )

SECTION B: ITEMS

Research Question One: In what ways does the provision and usage of computers improve students' academic performance in secondary schools in Kaduna State?

No.	Item	Strongly Agree	Agree	Disagree	Strongly Disagree
1.	The provision of computers in secondary schools positively impacts students' access to educational resources.				
2.	The usage of computers enhances students' understanding of academic subjects.				
3.	Computers contribute to improved research skills among secondary school students.				
4.	The availability of computers in schools positively influences students' engagement in classroom activities.				
5.	The usage of computers facilitates a more interactive and dynamic learning environment.				
6.	Access to computers enhances students' ability to collaborate on academic projects.				
7.	The provision of computers in secondary schools positively affects students' academic motivation.				
8.	Computer usage is associated with increased academic performance in standardized tests.				
9.	The integration of computers in teaching improves students' critical thinking skills.				
10.	The availability of computers in secondary				

	schools positively influences students' overall academic performance.				

Research Question Two: How does the provision and usage of projectors influence students' academic performance in secondary schools in Kaduna State?

No.	Likert Scale Item	Strongly Agree	Agree	Disagree	Strongly Disagree
1.	The availability of projectors enhances students' understanding of academic subjects.				
2.	Projector usage facilitates a more engaging and visually appealing learning environment for students.				
3.	The provision of projectors positively impacts students' interest and participation in classroom activities.				
4.	Projector-assisted lessons contribute to improved retention of academic content among students.				
5.	Access to projectors enhances students' ability to grasp complex concepts through visual representation.				
6.	The usage of projectors promotes collaborative learning among secondary school students.				
7.	Projector integration positively influences students' motivation to actively participate in class discussions.				
8.	The provision of projectors in secondary schools is correlated with increased academic performance in assessments.				
9.	Projector-assisted teaching methods improve students' critical thinking and analytical skills.				
10.	Students perceive that projectors have a positive impact on their overall academic performance in secondary schools.				

Research Question Three: How does the provision and usage of microphones influence students' academic performance in secondary schools in Kaduna State?

No.	Item	Strongly Agree	Agree	Disagree	Strongly Disagree
1.	The availability of microphones in classrooms enhances students' ability to clearly hear and understand the teacher during lectures.				
2.	The usage of microphones positively influences students' engagement in classroom discussions and activities.				
3.	Microphone-assisted lessons contribute to improved communication between teachers and students.				
4.	Access to microphones in classrooms positively impacts students' confidence in participating in oral presentations.				
5.	Microphones facilitate a more inclusive learning environment, ensuring all students can hear and participate effectively.				
6.	The provision of microphones enhances the overall quality of classroom communication and interaction.				
7.	Microphone usage positively influences students' perception of the clarity of instructional content.				
8.	Microphone-assisted teaching methods contribute to increased student attentiveness and focus during lessons.				
9.	Students believe that the availability of microphones in classrooms positively affects their academic performance.				
10.	The usage of microphones is associated with improved understanding of complex academic concepts among students.				

Research Question Four: How does the provision and usage of educational software and appsinfluence students' academic performance in secondary schools in Kaduna State?

No.	Item	Strongly Agree	Agree	Disagree	Strongly Disagree
1.	The availability of educational software and apps enhances students' access to diverse learning resources.				
2.	The usage of educational software and apps positively influences students' understanding of academic subjects.				
3.	Educational software and apps contribute to increased student engagement in learning activities.				
4.	Access to educational software and apps enhances students' ability to learn at their own pace.				
5.	The provision of educational software and apps positively impacts students' motivation to learn.				
6.	Educational software and apps support differentiated instruction, catering to individual learning styles.				
7.	The usage of educational software and apps is associated with improved academic performance in assessments.				
8.	Students believe that educational software and apps have a positive impact on their overall academic performance.				
9.	Educational software and apps contribute to the development of critical thinking and problem-solving skills.				
10.	The integration of educational software and apps positively influences students' collaboration on academic projects.				

Research Question Five: How does the provision and usage of internet facilities influence students' academic performance in secondary schools in Kaduna State?

No.	Item	Strongly Agree	Agree	Disagree	Strongly Disagree
1.	The availability of internet facilities enhances students' access to a wide range of educational resources.				
2.	Internet usage positively influences students' ability to conduct research for academic assignments.				
3.	Access to the internet contributes to increased student engagement in online learning activities.				
4.	The provision of internet facilities supports students in staying updated with current academic content.				
5.	Internet usage positively impacts students' motivation to explore and learn beyond traditional classroom materials.				
6.	The availability of internet facilities supports collaborative learning among secondary school students.				
7.	Internet usage is associated with improved academic performance in assessments and examinations.				
8.	Students believe that access to the internet positively influences their overall academic performance.				
9.	Internet facilities contribute to the development of critical thinking and analytical skills among students.				
10.	The integration of internet facilities positively influences students' ability to adapt to new learning technologies.				

APPENDIX VI

Required Sample Size†

Population Size	Confidence = 95% Margin of Error				Confidence = 99% Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1176	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

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