USMANU DANFODIYO UNIVERSITY, SOKOTO
(POSTGRADUATE SCHOOL)

EFFECTS OF DEMONSTRATION AND COMPUTER- ASSISTED INSTRUCTIONAL STRATEGIES ON ACADEMIC PERFORMANCE AMONG SECONDARY SCHOOL PHYSICS STUDENTS IN BUNZA, KEBBI STATE, NIGERIA

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DEDICATION

This research work is dedicated to my parents for all the material and moral supports they accorded me throughout my studies.

CERTIFICATION

This dissertation by DAUDA Sufiyanu (14210415003) has met the requirements for the award of the degree of Master of Education (Science and Vocational Education) of the Usmanu Danfodiyo University, Sokoto, and is approved for its contribution to knowledge.

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LIST OF ACRONYMS

BSC: Biological Science Curriculum

BSNSS: Basic science for Nigeria secondary school

CAI: Computer Assisted Instructions

CAIS: Computer Assisted- Instructional Strategies

CAIS: Computer Assisted Instructional Strategies

CAL: Computer Aided Learning

CD – ROM: Compact Disc – Read Only Memory

CD: compact disk

DSS: Digital Satellite System

DTM: Demonstration Teaching Method

E-learning: Electronics Learning

FCT: Federal Capital Territory

FGN: Federal Government of Nigeria

GSS: Government Secondary School

GPS: Global Positioning System

HSC: Higher School Certificate

ICT: Information Communication Technology

IT: Information Technology

IUPAP: International Union of Pure and Applied Physics

JAMB: Joint Admission and Matriculation Board

MIU: Mobile Internet Unit

NABTEB: National Business and Technical Examination Board

NCEC: National Computer Education Curriculum

NECO: National Examination Council

NEPAD: New Partnership for African Development

NERDC: Nigerian Educational Research and Development Council

NISP: Nigeria Integrated Science Project

NITDA: National Information Technology Development Agency

NOUN: National Open University of Nigeria

PDA: Personel Digital Assistant

NPE: National Policy on Education

NSSP: Nigeria Secondary Schools Project

PPMCC: Pearson Product Moment Correlation Coefficient

PSSC: Physical Science Study Committee

SHM: Simple Harmonic Motion

SPSS: Statistical Package for Social Sciences

SPTP: Students' Performance Test in Physics

SSCE: Senior Secondary Certificate Examination

SSMB: Secondary Schools Management Board

STAN: Science Teachers Association of Nigeria

TM: Teaching Method

TV: Television

UK: United Kingdom

UNESCO: United Nations Educational Scientific and Cultural Organization

USA: United State of America

WAEC: West African Examination Council

ABSTRACT

The study investigated effects of Demonstration and Computer- Assisted Instructional Strategies on Academic Performance among Secondary School Physics Students in Bunza, Kebbi State, Nigeria. Among the objectives of this study was to investigate the difference between the performances of students taught Physics using Computer- Assisted Instructional Strategies (CAIS) and those taught using demonstration method. The study adopted quasi - experimental design of the pre-test, post-test, non-randomized control group type. The population was 2,280 SS II students out of which a sample size of 377 students purposively drawn from the population. Three Research Questions and three null Hypotheses were used for this study. Two instruments: CAIS and Students' Performance Test in Physics (SPTP) were used to generate data. Results of the two groups were collected and analyzed using descriptive statistics of mean, standard deviation and inferential statistics of t-test. Findings of the study showed that *p-value* (0.00) was less than 0.05 level of significance. CAIS group achieved higher than Demonstration group in post-test. Recommendations such as Conferences, seminars and workshops and relevant programmes should be organized by professionals of ICT to teach physics teachers on modern technology such as CAIS and its application in teaching Physics.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Physics is an everyday science that affects man in everything he does. Inevitably, we apply the knowledge and principles of physics to our day to day activities to achieve our desired goals. Take a look at the car we drive, the electric bulb, the camera for taking pictures, the radio/TV for information dissemination, X-ray machines used for detecting fracture in bones, the electric heater used for warming water and many more are some things we enjoyed from the knowledge of physics. Physicists ask questions like: how did the universe begin? How does the Sun keep on shining? What are the principles of Matter? Importance of physics in the development of any society cannot be over emphasized as it paves way for technological advancement of any nation (Nigeria included). Probably that is why Aina (2013) opined that launching of Sputnik by the Russian government in October, 4 1957 would not have been possible if not for the position they placed physics in science education.

Emphasizing on the importance of science education, Musa and Dauda (2014) concluded that, there is no doubt that what distinguishes the developed nations from the developing nations of the world is the degree of science and technology prevalent in these nations. In view of its role, Nigeria made physics one of the important subjects to be taken by science students of senior secondary school with the aim of producing scientists for economic and national development (FGN 2013: 16). Other important of science education stated by the curriculum is to

provide knowledge and understanding of the complexity of the physical world. Hence physics is in better position to address such target.

Sadly, despite the importance of physics for national development, it is surprising to note that over the years, the academic performance of students in the subject is discouraging in both internal and external examinations. It can be observed that there has been continuous decline of students' performance and mass failure in the subject in senior secondary certificate examinations in Nigeria.

Moreover, Physics is abstract in nature hence its teaching is difficult. This decline in academic performance of students in the subject may not be unconnected with the abstract nature of physics concepts and/or teaching methods employ by physics teachers in lesson delivery. Various methods of teaching are used by many science teachers as cited by Bello and Hassan (2015) that included lecture method, demonstration method, inquiry method and laboratory teaching method and problem solving method. By considering the abstract nature of Physics, its teaching requires the relevance of effective and efficient method(s), skills and knowledge. This is in order to make the learning of the subject real and practical for learners and to increase students' performance, interest and participation. Different teaching methods are available to use in communicating ideas, knowledge, skills, and attitudes etc. to the learners in order to achieve the stated objectives of a given lesson.

Demonstration method according to Maun and Winnitoy (n.d) is an effective technique which emphasizes interaction among students and teachers, and

students themselves. Students are induced to think, reason, and argue their viewpoints. They further revealed the importance of demonstration as it provides a valuable complement to lectures by providing opportunity for personal contact between students and teachers and among students themselves. The active participation by the students in the learning process makes it an effective teaching technique.

The challenges of classroom instruction in Nigeria's school system and research started changing dramatically with the emergence of new technologies which included Computers. This period of computer age had ushered in a new dimension of processing, preservation and dissemination of information among other vital roles of computer through the help of ICT. Today Computer has become an inevitably integral part of the instructional process. Research had it that Computer as an instructional material can make teaching and learning easy, interesting and students centered also enhances student - teacher relationship. No wonder Nigeria government through National Policy on Education (FGN, 2013; 28) committed herself in providing necessary infrastructure and training for the integration of ICT in the schools system in recognition of its rolein advancing knowledge and skill in the modern world. Shedd (2004) stressed that physics teachers should incorporate technology into their physics classes since teaching has gone beyond traditional method.

ICT provides an avenue for people in all aspects of life to access and profit from the power of computer as a personal tool, to collaborate in groups and to disseminate information locally and globally. In same direction, Computer

instructional method makes class interesting, lively and students centered. Zubairu (2012) reported that there is no doubt that ICT provides productive teaching and learning in order to increase people's creative and intellectual resources especially in today's information society. ICT gives ample and exceptional opportunities to the students to develop capacities for high quality learning. This view is supported by Obahiagbon and Otabor (2014) findings which indicated that the use of Computer in classroom can motivate students in their learning by bringing variety into the lessons and at the same time sustaining physics teachers own interest in teaching. However, Shavinina(2001) sees ICT as all the digital technologies, including: computer, scanner, printer, telephone, and internet, digital satellite system(DSS), fiber optic cables, laserdisc, and multi-media systems for collection, processing, storage and dissemination of information all-over the world. Similarly, the role of Computer in curriculum implementation is recognized by the Nigeria National Policy on Education (FGN, 2013:53) where it stated that, "the government shall provide facilities and necessary infrastructures for the promotion of ICT and e-learning.

The advantage of integrating ICT in classroom through the use of Computer Assisted Instruction (CAI) cannot be underestimated in the modern-day world. There is an excess of recognized findings on the instructional value of computer, particularly in advanced countries. Yusuf and Afolobi (2010) reported that there are now several CAI packages on different subjects. He further opined that it is obvious that the current trend in research all over the world is the use of computer facilities and resources to enhance students' learning. This may be the reason why

Handelsman, Ebert-May, Beichner, Bruns, Chang, et al (2004) opined that many exercises that depart from traditional method are now readily accessible on the web (p. 521), even though teachers do not use these facilities. They further showed that the interactive approaches to teaching and learning significantly enhance learning.

1.2 Statement of the Problem

Poor academic performance of Nigerian students especially those in senior secondary schools in both internal and external examinations have been a serious concern by education stakeholders. Over the years, research carried by physicists and educators have shown that students' performance in physics has been repeatedly poor and recording mass failure. For instance, the examination taken in June 2014 by 618,119 students, 14.2% passed with Distinction and Credit levels in Physics, the failure rate for the subject was 56.3% (WAEC;Aina, 2014). In May/ June 2012 WAEC, Physics recorded only 13.8% passes from A-C grades, while with 59.6% of the total 381,506 candidates failed (WAEC, 2013). In a different examination, of the 35,057 candidates that sat for Physics November/December NECO, 2012, only 94 or 0.26% had credit in Physics; 33,000 failed (Wole, 2013).

For some years now, Kebbi State has been recording high rate of external Examinations failures. For instance, of the 37 States (FCT inclusive) Kebbi State happened to be among thepoorest performed States in WAEC.

Table 1.1: State by State Ranking of May/June WAEC in Nigeria, 2013 - 20 17.

S/N	YEAR	POSITION
1	2013	36th
2	2014	34th
3	2015	32nd
4	2016	32nd
5	2017	32nd

Source: Statistics section, West African Examination Council (WAEC) National Head quarters Lagos, Nigeria.

Individuals are pointing accusing fingers at poor teaching facilities, inadequate and poorly trained teachers, under funding and so on. Olailejo, Olosunda, Ojebisi and Ishola (2011), gives one of the reasons for such poor achievement in physics as teaching methods employ by teachers. There is therefore a great need to improve academic performance of students in physics. This can be done through changing the teachers' methods of teaching by using appropriate teaching method that is central to a successful learning in physics (Wanbugu & Changeiro, 2008). Most of the studies conducted in Nigeria on effect of teaching methods concentrated on examining other teaching method(s) such as lecture method and the use of Computer Assisted- Instructional Strategies (CAIS) but none of these studies have specifically investigated the effect of Demonstration method and use of CAIS on students' performance in Physics. It is against this background that this study aims to bridge this existing gap and therefore this study investigated effects of Computer- Assisted Instructional Strategies (CAIS) and Demonstration Method on Academic Performance among Secondary School Physics Students in Bunza Education Zone, Kebbi State, Nigeria**.**

1.3 Objectives of the Study

This study investigated effects of Computer- Assisted Instructional Strategies (CAIS) and Demonstration Method on Academic Performance among Secondary School Physics Students in Bunza Education Zone, Kebbi State, Nigeria**.**

Specifically, the study investigated;

1. The difference between the performance of students taught physics using CAIS and those taught using Demonstration method of teaching in Bunza Education Zone.

2. The effect of CAIS on the academic performance of male and female students taught physics in Bunza Education Zone.

3. The difference between the performance of male and female students taught physics using Demonstration method in secondary schools in Bunza Education Zone.

1.4 Research Questions

To guide the investigation, the following research questions were posed;

1. Is there any difference in performance of students taught physics using CAIS and those taught using Demonstration method in Bunza Education Zone?

2. What is the effect of CAIS on the academic performance of male and female students taught physics in Bunza Education Zone?

3. Is there gender difference between performances of students taught physics using Demonstration method in Bunza Education Zone?

1.5 Null Hypotheses

Based on research questions the following null hypotheses are stated:

H_{01} There is no significant difference on academic performance of students taught Physics using CAIS and those taught using Demonstration method in senior secondary schools in Bunza Education Zone.

H_{02} There is no significant gender difference on academic performance of students taught physics using CAIS in secondary schools in senior secondary Bunza Education Zone.

H_{03} There is no significant gender difference on academic performance of students taught physics using Demonstration method in senior secondary schools in Bunza Education Zone.

1.6 Significance of the Study

The study is expected to investigate the effect of CAIS on students' performance in secondary schools and contributes to the body of knowledge. The findings of this study will be useful to the students, teachers, education administrators and governments through the following ways.

Students: the study enables students acquire familiarity with Computer facilities and be acquainted with its roles to their environment as well as their life.

Teachers: the study will facilitate the acquisition of Computer knowledge and skills for technological advancement among physics teachers of secondary schools in Kebbi State.

Education Administrator: the study will assist education planners and administrators in formulating ICT policies that would enhance development to the students, parents, teachers and entire populace to understand the impact of Computer and its roles to the society at large.

Government: this study will encourage government to provide more ICT facilities and maintenance of the available one to secondary schools for the improvement of Physics knowledge and understanding.

Researcher: the study will serve as a reference material to the researcher and educators.

1.7 Scope and Delimitation of the Study

The study was limited to the investigation of effects of Computer- Assisted Instructional Strategies (CAIS) and Demonstration Method on Academic Performance in Physics to all Government owned secondary schools in Bunza Education Zone, Kebbi State. The scope will be senior secondary school two (SSII) drawn from the zone. This is because SSI students have just enrolled while SSIII are preparing for external examinations. This study would have covered all the topics in Physics but was limited to Simple Harmonic Motion (SHM) due to the fact that the 2017 WAEC examiner's report recommended that more attention should be paid on topics like Circular motion and SHM. The study does not cover,

Islamic and Arabic, private and technical schools due to the time constraint and inadequate finance. The variable of this study included demonstration, CAIP and academic performance of students.

1.8 Operational Definitions of Terms

For the avoidance of doubt and vague, it was consider necessary to explain the major terminologies used in the study. These include:

Secondary school: This is the education a learner receives after primary school before proceeding to tertiary institution. This shall be according to FGN (2013:14) of six years duration, given in two stages:-a junior and senior secondary school stages; each shall be of three years duration.

Physics: Is a physical Science subject taught at Senior Secondary Schools that deals with matter, energy, forces and interactions between them.

Academic Performance: This is the outcome of student in Physics after Senior School Certificate Examination (SSCE) that is the extent to which a student has performed in Physics examination.

Teaching Method (TM): This refers to all activities that included procedure, plan, and technique a teacher does in the classroom in order to attain stated objectives of the lesson.

Computer-Assisted Instructional Strategies: This refers to educational system of instruction or remediation presented on a Computer to teach Physics concept (SHM)

Demonstration Method: This is a method of teaching that requires using of voice, movement of the body, chalk, drawing and illustration by the teacher to the learner, although Abdullahi (1990) clarified that Demonstration is not synonymous with 'Experiment', because Experiment is carried out to verify a scientific principle in the laboratory.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

The purpose of this study was to investigate Effects of Demonstration and Computer- Assisted Instructional Strategies (CAIS) on Academic Performance among Secondary School Physics Students in Bunza, Kebbi State, Nigeria.

This chapter reviews literature on the following sub-headings:

2.2 Conceptual Framework

2.3 Theoretical Framework

2.4 Academic Performance of Students in Physics

2.5 Computer/ ICT in Nigerian Educational System

2.6 Benefits of Integrating ICT in Physics Education

2.7 Obstacles/ Challenges to ICT Integration in Nigerian Secondary Schools

2.8 Review of Related Empirical Studies

2.9 Summary and Uniqueness of the Study

2.2 Conceptual Framework

To carry out this study, the following concepts are considered keys and relevance and therefore discussed under conceptual framework. These are:

2.2.1 Concept of Information and Communication Technology (ICT)

The acronym “ICT” simply stands for information and communication technology. ICT is seen by Aina (2013) as an umbrella term that includes any communication device or application. He added that it comprises of radio,

television, cellular phones, computers, networks, hardware and software and services and applications associated with them. Pelgrum and Law (2003) narrated the history that near the end of the 1980's, the term computer was replaced by "IT" (information technology) signifying a shift of focus from computing technology to the capacity to store and retrieve information. This was followed by the introduction of the term "ICT" around 1992, when e-mail started to become available to the general public. However, according to a United Nations report as cited by Syeed (n.d), ICTs cover internet service provision, telecommunication equipments and services, information technology equipment and service media and broadcasting, libraries and documentation centres, commercial information providers, etc. Other ICT application, services and devices are camera(video/photo), computer, GPS, PDA or tablet computer, phones, radio, remote, smartcard; Internet: email, websites, instant messaging, video-conference; Software: CAL, CAI, text messaging (sms or mms) etc. the different ICT tools are to work together and combine to form networked world noted by Mikre in Agommouh (2015).

2.2.2 Concept of Academic Performance

There is no single simple definition of the term "academic performance", but when it comes to operative measurement, the most commonly adopted yardstick has been the grades teachers (or examiners) give to students upon completion of evaluation. This therefore, means that performance measures the behaviours or an aspect of a feat that can be observed at a specific period. Adedeju in Olanipekum and Aina (2014) stated that students' performance is very important because, it

appears to be the major criteria by which the effectiveness and success of any educational institution could be judge. Moreover, the targeted goals can be measured according to experts through reports, examinations, researches, and rating with numerals factors of variable exerting influence. Adeola (2007); and Ali, Haidar, Munir, Khan and Ahmed (2013) observed that students' performance in examination and school subjects depends on a number of factors. Joyce in Adeola (2007) identified some of the factors that influence performance as; lack of good method of teaching, poor motivation.

In the last two decades, ICTs too have affected the academic performance of students. Yusuf (2005) had this to add; the field of education has been affected by ICTs, which have undoubtedly affected teaching, learning and research in all level of schooling.

2.2.3 Concept of Secondary Education

The history of secondary education in Nigeria can be traced as far back as one hundred years before independence, when the first senior secondary school (Church Missionary School) was established in 1859 in Lagos by the missionary. Prior to that time, Adeyemo (2010a) reported that no science was taught in any school in Nigeria. The teaching of science dated back to the era of Christian missionary, who brought the western education into the country. Then the fields of study like arithmetic, algebra, geometry, and physiology were introduced into the school curriculum (Adeyemo, 2010b).

The teaching of science in Nigeria gained a better footing about 1920 as a result of recommendations made by African Education Commission for the inclusion of science subjects in curriculum of all secondary schools and sponsorship of the Phelps Stoke fund of America (Martin's library, 2013:12). The major development in science curriculum took place starting from 1932 with the establishment of Yaba College which later upgraded to Yaba college of Technology to run courses in Engineering, medicine, science, Agriculture, survey, etc. More so, Igbokwe (2015) reported that the introduction of higher school certificate (HSC) in 1951 gave schools the opportunities to offer Chemistry, Biology and Physics at higher level. The history of modern science world over cannot be completed without mentioning of the launching into space of the satellite "Sputnik" by the Soviet Union (Russia) in 1957, this geared science curriculum development efforts in all parts of the globe. Martin's library (2013:14) added that several science curricula were developed in many countries among which were: physical science study committee (PSSC), chemical education material study (CHEM. study) and biological science curriculum (BSC) all in USA; and Nuffield Science Project in UK.

In Nigeria context, the historic nation curriculum conference held in 1969 motivated various bodies to develop science curricula for both primary and secondary school levels of education which brought about the new NPE of 1977 which ushered 6-3-3-4 system of education. The following curricula efforts were recorded according to Martin's library (2013: 13):

a. Nigeria Secondary Schools Project (NSSP) by CESAC Nigeria
b. Integrated Science Project (NISP)
c. Basic Science for Nigeria Secondary School (BSNSS)
d. Science is Discovering.

Other contributory bodies that their effort made education what it is today at different capacity included STAN, NERDC, WAEC, NECO, NABTEB, JAMB, etc. Establishment of such bodies and continuous demand for economic and societal development led to the revision of science curriculum. Today science education is well defined at secondary schools in Nigeria. Secondary education is a very important level of schooling as it bridges the gap between early (primary) education and higher (tertiary) education. Nigeria referred secondary education as the education children received after primary education and before the tertiary stage (FGN, 2013:14). The goals of secondary education shall be to prepare the individual for:

a) Useful living within the society, and
b) Higher education. (FGN,2013:14)

To buttress on the importance of secondary education, Muhammad and Ahmad (2014) opined that, the quality of higher education (which is expected to produce high quality professionals in the different fields) depends upon the quality of secondary education. To achieve the stated goals , secondary education shall be according to FGN (2013:14) of six years duration, given in two stages :-a junior and senior secondary school stages; each shall be of three years duration.

2.2.4 Different Methods used in Teaching

Teaching method (TM) refers to all activities that included procedure, plan, technique a teacher does in the classroom in order to attain stated objectives of the lesson. Obunadike and Omeye (2014) opined that the concept of teaching method is derived from teaching approach and it is procedural. Teaching method is the series of actions or activities planned by the teacher and systematically provided to the learner to enable him receive and process the information; retain and recall it in order to be able to use it to tackle emerging life tasks and problems. Amadi (1992) asserted that teaching method refers to all the things the teacher does in the classroom to enable the learner learn. Asikhia (2010) saw TM as the overall procedure in which the process of an instruction is organized and executed. Teaching method involves the teacher's skills and manipulations on the subject matter and the learning situations in order to secure positive and desired response from the learner, Ugboaja (2008). For quite long time, a lot of different methods are in use in teaching and learning transaction and the main purpose is to make classroom lively, manageable as well as to produce fruitful academic performance. Some of the teaching methods include:

a) Demonstration teaching method
b) Discussion teaching method
c) Brainstorming teaching method
d) Lecture teaching method
e) Presentation teaching method
f) Seminar teaching method

g) Inquiry method and

h) Laboratory teaching method

i) Problem solving method, etc.

Many issues have to be considered on choosing a particular method of teaching by the teacher. Ndirangu (2007) revealed some these factors which include the content to be taught, the objectives which the teacher plans to achieve, availability of teaching and learning resources and the ability and willingness of the teacher to improvise if convectional teaching aids are not available, evaluation and follow-up activities and Individual learner differences. Mwanahamisi (2014) concluded that despite these arrays of teaching methods being advocated in literature there is no one universally accepted method. This is because the best method to a particular teacher in a particular field and teaching situation may be the worst method with another group of students in another teaching- learning situation. The question still remains which of these teaching methods contribute to failure or success of students' performance especially in developing countries. But this work is limited to investigate the effect of Demonstration method and use of CAIP on secondary schools students' performance in Physics in Bunza Education Zone, Kebbi State, Nigeria.

2.2.5 Demonstration Teaching Method (DTM)

Demonstration according to dictionary is the act of showing or explaining something. In classroom settings, Obunadike and Omeye (2014) saw demonstration as a teaching method which combines telling, showing and doing for the benefit of the students. However, it is a teacher-centred method of teaching

because he does the demonstration using his voice, movement of the body, his chalk, drawing and illustrating. To further stress the relevance of participation of learners as a facilitating factor in concretizing learning experiences, Muhammad, Bala, and Ladu (2016) observed that the DTM has been found to be extensively used in sciences, and by extension should be applied in teaching Agricultural lessons. Maun and Winnitoy (n.d) added that demonstration is a teaching technique which provides a synthesis between formal lecture sessions and personalized systems of instruction. Demonstration teaching method is consider to be an effective method in teaching science most especially at secondary schools level as reported by (Mwanahamisi, 2014; Ja'afar-Furo, Abdullahi, & Badgal, 2014; Obunadike & Omeye, 2014; and Muhammad, Bala & Ladu, 2016). Probably, that is why (NOUN) observed that teaching of science requires the application of effective and efficient method(s), skills and attitude. This is in order to make the learning of science real and practical for students and to increase students' interest and participation in science both when still in school and when they must have left school. DTM provides a valuable complement to lectures providing the opportunity for personal contact between students and teacher and among students themselves. The active participation by the students in the learning process makes it an effective teaching technique.

There is a clear distinction between demonstration method and laboratory work as the former does not require probing of scientific theory and principle. Abdullahi (1990) clarified and opined that, it is important to note that demonstration is not synonymous with "experiment", this is because demonstration is used to enable

the learner see an object or the process of doing something while an experiment is carried out to verify a scientific principle or used as a means of observing, measuring and interpreting data in the laboratory.

2.2.6 Concept of Physics

Physics is considered importance in Nigeria senior secondary school curriculum. It occupies a very sensitive position in physical science reported (International Union of Pure and Applied Physics, IUPAP, 1999). The general objectives of Physics as stated in the revised curriculum documents of Federal Ministry of Education are to:

i. provide basic literacy in physics for functional living in the society
ii. acquire basic concepts and principles of physics as a preparation for further studies
iii. acquire essential scientific skills and attitude as a preparation for the technological application of physics; and
iv. stimulate and enhance creativity. (NERDC, 2013)

In order to response to the calls for reforms to meet the need of the new age, NERDC developed a new curriculum structure for the senior secondary schools in Nigerian nine – year basic education curriculum in 2011. The new Physics curriculum has the same objectives as the old one.

NERDC (2013) reported that the new senior secondary school curriculum structure at a glance shows a five compulsory cross – cutting core subjects. Students will offer 3 – 4 subjects from their field of specialization. One elective

may be offered outside their field of specialization provide the total number of subjects is not more than nine. The minimum number of subjects is eight.

The structure of the new Physics curriculum is changed from conceptual approach to the thematic approach. The thematic approach is to ensure compliance with the national and global issues without necessarily overloading the contents (Augustine & Adeoye, 2011). The new curriculum has six themes unlike the old one that had five. The six themes which have related topics and contents are:

a. Interaction of matter, space and time
b. Conservation of principles
c. Waves
d. Fields at rest and in motion
e. Energy quantization and duality of matter
f. Physics in Technology.

The new theme added, is 'Physics in Technology'. As in old curriculum, new curriculum too has been organized in a spiral form, that is, the sections occur every year in order to aid learning. According to Daramola and Omosewo (2012) both old and new curricula recommended that mathematics is to be used to clarify the physics objectives and guided discovery method is to be used in teaching. On the period of contents delivery, four 35 – 40 minutes period per week is allotted on the school time table. Although, Telima, Torunarigha and Temitope (2007) in a study to investigate the senior secondary school physics curriculum and time allotted for syllable coverage complaint that the time is not adequate for physics

teachers to adequately cover the contents of the subject before certificate examinations.

The term ‘physics’ comes from the Greek word, ‘Physis’ which means nature. It is a physical science that involves the study of matter, energy, forces and their relationships. Physics, as outlined in National Policy on Education (FGN, 2013;16) is one of the group A subjects taken as a single dose together with other science subjects by every senior secondary school students (majored in science).

Physics is perceived to be a difficult subject because of its abstract nature (Ogundipe, Olaijide & Ogunrinade 2013; Adeyemo, 2010b; and Omorinola & Gbenga, 2014). Physics is basic for understanding the complexities of modern technology, and essential for technological advancement of a nation. This aspect of science is making significant contribution to many of the invention that are shaping modern day, and helped to explain many of the events being encountered in everyday life (Erinosho, 2013). By definition, Agommuoh (2015) sees physics as a branch of science that deals with energy and matter together with their interactions.

2.3 Theoretical Framework

Various efforts were made by scholars in the 20^{th} and 21^{st} centuries to define teaching and learning. These definitions became theories of teaching and learning created to try and clarify the meaning of both. Learning theories provide us with conceptual frameworks of interpretation for the act of learning, and show us where to look for solutions to practical problems.

2.3.1 Implications of Learning Theories on Computer Usage

Teaching methods are in the main based on theories of learning. Alharbi (2014) opined that the most important learning theories are Behaviorism and Constructivism. These two approaches are based on two main schools of psychology that have influenced learning theory. They have different perspectives on learning, different perspectives on teaching styles, and different approaches to pedagogy and evaluation.

Constructivist learning theory has been used to study the effect of Computer on teaching and learning. This learning theory contributes to understanding both the construction of and relationship between curricula and events. It also provides direction for research and implementation. Because of the influence of the constructivist learning movement, the theory of constructive learning emphasizes the teachers' central role in academic curricula and suggests improvement according to the teachers' needs and interests (Gredler, 2000; Woolfolk, 2006). This theory supports the individual's growth and enables the students to explore their learning potential.

Despite the theorists' different definitions of learning, majority agreed that learning happens when experience leads to a constant change in the individual's knowledge or manner (Weiten, 2002). What is meant by 'experience' in this definition is 'the interaction of the person with his or her environment' (Woolfolk, 2006: 196).

Constructivist Principles

Founders and followers of constructivism include Vygotsky, Piaget, Dewey, Vico, Rorty, and Bruner. Learning theories based on mannerist and knowledge theories dominated the 20th century. Their principles have contributed to the enhancement of organized teaching practice through which the teacher transmits information and knowledge to students through methods similar to lecturing. Alharbi (2014) contributed that mannerist and knowledge directions placed little emphasis on students' input and their contributions in the teaching and learning process. Accordingly, students could be deemed by these theories to be passive participants in the learning process (Woolfolk, 2006). In contrast to knowledge and mannerist theories which emphasized the important role played by the teacher and the organized transfer of content, the constructionist theory emphasized the students' central role in the learning process and acknowledged the students' ability to construct meaning through their learning (Kanuka & Anderson, 1999).

Despite the policy of implementing constructionist practices in the second half of the past century, the theories that formed student-centered learning were simplified. Constructionism has been influenced as a learning theory by the writings and thoughts of Biajeh and Vijeotski (Woolfolk, 2006). The organization of constructionist learning environments is done such that students are asked to construct meaning from the context and actively participate in the process of problem solving. Constructionism supports interaction between students and their teachers, and this contributes to the creation of an environment in which all students and teachers participate in the learning process. Learning construction

happens through the constructionist environment at different times. Accordingly, constructionist theory implies that there are no specific goals and frameworks to be followed (Gance, 2002). Generally, the following principles are drawn from the constructionist approach (Brooks & Brooks, 1999; Kanuka & Anderson, 1999):

1. Learning is an active process through which the learner constructs meaning.
2. There must be previous experience and knowledge for learning new things.
3. Individuals learn for the sake of learning - learning constitutes the meaning and its systems.
4. Motivation is regarded essential for learning.
5. Learning practice is considered important for active learning. Practical training activities have to be emphasized.
6. Learning represents a social activity, as our interaction with others is extremely important.
7. Language is an important component of the learning process.
8. Language is regarded as context-bound. Our learning is tied to what we know and believe in. It is also tied to our previous judgments and fears.
9. Learning is not instant. It occurs over a period of time.

Constructive Classrooms

Constructivist theory emphasizes the importance of experience and learning based on experiments. Students play a pivotal role in the learning process. The teacher's role appears in directing and supporting students to construct meaning and understand situations.

Practitioners and scientists have claimed that constructionism cannot be implemented in a traditional knowledge environment. They suppose that constructionism goes beyond formal learning which relates to students' previous experiences. Howe and Berv (2000) acknowledged the 'pointlessness' of avoiding direct teaching, especially when teaching children, with the conclusion that it is ineffective to depend solely on constructionist teaching patterns.

Constructionism differs from other educational practices in that most other types of learning emphasize the importance of acquisition of knowledge and information. The essence of constructionism appears in the individual's personal experience of learning and reflection (Jonassen, Peck & Wilson, 1999; Kafai and Resnick, 1996). During the learning process, students' activities are considered important and basic for constructing knowledge. Meaningful learning occurs when there is collaboration among learners, teachers, and specialists in this domain. Activities are not organized officially inside constructionist classrooms through timetables or plans that students are required to follow. Students actively help in planning and organizing the activities within the classroom. This contributes to stimulating and encouraging them to think. The methods of

teaching and learning are characterized by flexibility and comprehending students' viewpoints and thoughts (Jonassen, Peck & Wilson, 1999).

Criticisms of Constructionist Theory

Alharbi (2014) challenged that despite its progressive ideas about the nature of learning, constructionism evokes a number of criticisms. Fears surrounding its principles and applications are centered on the following (Roblyer & Edwards, 2000: 68):

A. Selecting the most effective teaching – it is difficult for students to choose for themselves the methods through which they will learn to solve problems.
B. Specifying suitable topics for constructionist methods – sometimes tension occurs when choosing appropriate topics for a particular event and when covering one topic deeply is preferred to talking in elaboration on many topics.
C. Skill transfer to practical situations – fears also arise over the ease of transferring problem solving skills that were learnt in practical situations inside the school to problems which students have to solve in real life.

As in the case of any change, constructionist' directions in learning pose risks for students, parents, teachers and administrators (Jonassen, Peck & Wilson, 1999). Some may suppose that constructionism burdens students and exempts teachers from the responsibility of their teaching capabilities. Nevertheless, contrary to this conception, teachers in the constructivist learning environment do not give up

their responsibility, but play different roles as facilitators for students' learning (Brooks & Brooks, 1999).

2.3.2 Application of Computer in a Constructivist Approach

Constructivism argues that learning is interactive and argues for the autonomy and active participation of the student. The learner is an information constructor and actively builds his/her own subjective representations of reality. New information is related to previous knowledge in terms of schema development. Followers of constructivism include such names as Vygotsky, Piaget, Dewey, Vico, Rorty, and Bruner (Learning Theories Knowledgebase, 2009).

Constructivism as a term covers a huge theoretical area. Constructivist learning theorists range from the individual cognitive and personal constructivism of Piaget, to the social constructivism of Vygotsky. There are many other types of constructivism but there are certain ideas that all constructivists have in common. Taber (2006) describes them as being:

1. The active construction of knowledge by the learner - knowledge is not passively received from the outside. Here the theory is vastly different from behaviourism, which defines learning as an externally modified behaviour. Learning according to constructivists is therefore something the learner does, not something that the learner is compelled to do.

2. Learners have prior knowledge so they come to the learning situation with ideas about many things. These ideas are called schemas and teachers have to

take them into consideration and make teaching relevant to these conceptual structures.

3. Learners have their own individual ideas about reality and generate their own meaning structures to cope with everyday living.

4. Their ideas often contradict or clash with accepted scientific ideas or with school curricula and are culturally or socially conditioned.

5. Knowledge is described by these theorists as conceptual structures in the brain and it is possible to describe and to model them.

6. Instructional Design and teaching has to take the learner's prior knowledge into account if the educators want to achieve their educational aims and objectives.

7. Knowledge is both personal and individual and at the same time has a social dimension. Learners construct their conceptual schemas by interacting with the social world, in social settings and within cultural and linguistic contexts.

Computer and Constructionist Theory

The use of Computer enables opportunities for learning environments and practices that require interaction among individuals, co-operation with chances of experiencing learning, and the principles which constructionism supports. Many educational establishments, especially at a post-secondary school level, work on supporting integrating technology into teaching and learning. Kanuka and Anderson (1999) provide an example of the use of the internet for learning, as learners use the internet and explore it in different ways and explore it in different

directions. Their research used small group discussions and their presentations after the research produced various interpretations of the subject matter.

2.4 Academic Performance of Students in Physics

The ambition of most countries of the world today is to attain sustainable development. This level of development can only be attained through proper understanding and utilization of science (especially physics) concepts, (Nwankwo & Okafor, 2015).

Physics is a science subject that deals with matter, energy and forces that govern the inter-conversion of matter and energy from one form to another. However, the importance of physics for economic development of all nations is clear. Physics according Morenzi (2006), is a cross cutting discipline that has application in many sectors of economic development, including health, agriculture, water, and energy and information technology.

Unfortunately, in spite of our awareness of the roles physics can play to sustainable economic development, Nigerian schools consistently kept on producing poor results in external physics examinations such as WASCE, NABTEB and NECO. Studies conducted by researchers NERDC (2005) and NERDC (2008) revealed a poor and declining performance of students in physics at senior secondary schools external examinations. To support the above findings, Erinosho (2013) noted that low level of performance of students on the average, slightly over 30% of the students who sat for physics passed at the credit level compared to well over 40% in Biology and Chemistry. Moreover, in 2012

Nov/Dec NECO out of 35,057 candidates that took exams only 0.26% had credit in physics (Wole, 2013).

However, one of the reasons among many other ones for such discouraging performance as stated by Olailejo, Olosunde, Ojebisi and Ishola (2011) is teaching strategy. The problem is, can the use of Computer Instructional strategy improve physics students' academic performance**?** In recent decades literatures showed the close and direct relationship between ICT usage and students' academic performance.

2.5 Computer/ ICT in Nigerian Education System

Many attempts and programs are made by Nigerian government to uplift standard of the education at all levels of schooling via the provision of policies and Computer facilities. At secondary schools level, governments vow to provide necessary infrastructure and training for the use of computer in the school system in recognition of the role of ICT for education initiatives in Nigeria (FGN, 2013: 16). Abba (2011) reported that these initiatives are either being undertaking by government, civil society or a private sector. To asserting this observation, in 1988, the Nigerian government billed a policy on computer education. The plan was to establish pilot schools and spread computer education innovation first to all secondary schools later down to primary schools. Unfortunately, the project did not really take off beyond the distribution and installation of personal computers, noted Okebukola as cited by Aduwa-Oglegbean and Iyamu (2005). Reference to secondary schools level, Evoh (2007) stated that improved secondary education is essential to the creation of effective human capital in any

country. There are developments in Nigerian education sector which indicate some level of ICT use in the secondary schools.

In 2003 , at the African Summit of the World Economic Forum held in Durban the new partnership for African Development (NEPAD) launched the e-schools initiative, intended to equip all African high schools with ICT equipment including computers, radio and television sets , phones and fax machines communication equipments, scanners, digital cameras, and copiers, among other things (Aginam , 2006). In a similar effort, in 2004 the federal ministry of education launched an ICT-driven project known as school Net (Adomi, 2005; FGN, 2006) which intended to equip all schools in Nigeria with computers and communication gadgets. Also, the Nigeria federal government has commissioned a mobile internet unit (MIU) operated by the Nigerian National Information Technology Development Agency (NITDA). The MIU is a locally made that has been converted into mobile training and cyber centre equipped with ICT tools such as VSAT internet service, printers, electric generators and many more facilities. The target was to take internet service to various schools, explained (Ajayi, 2003).

Other efforts made by the Nigerian federal government included the introduction of the National Computer Education Curriculum (NCEC) in 2002 developed by Nigerian Educational Research and Development Council (NERDC). Adomi and Kpangban (2010) reported that, efforts have been made to ensure that ICTs are available and used in Nigerian secondary schools, although the level of uptake is

still low. However, most schools as observed by Goshit (2006) do not offer ICT training programmes.

Generally, ICT expands access to quality education and improves teaching patterns, emphasized Trucano in Abba (2011). Unfortunately, some Nigerian school teachers have remained practically stiffed to their conventional method of curriculum delivery which reveals doubts in their effort to gain the benefit of ICTs in education thereby improving the performance of students in physics.

2.5.1 Computer as an Instructional Method

Although, Computer is not a teaching method but its application in teaching and learning is what educationists like Agommouh (2015), Aina (2013) considered as a strategy and/ or tools that can influence academic performance of students. Computers are being used in developed world for instructional functions. Stressing on the role of Computer as an instructional method, Gbadebo, Abimbola, Adeyemi and Odupe (2013) opined that the modern philosophy of education can be achieved largely through Computer Assisted Instruction (CAI) and Computer Assisted Learning (CAL) which provides the environment for individualized learning which is the major characteristic of the new paradigm.

Despite the application of several methods, the academic performance and particularly that of physics students is disappointing hence science educators are looking for ways to teach science concepts in order to improve their students' academic performances. This can be achieved according to Wanbugu and Changeiro (2008) through changing the appropriate teaching method that is

central to a successful learning in physics. The reason behind the changing of teaching method is that the prevailing method according to John and Sarkin–Fada (2015) does not allow active students participation in science lesson. Therefore, physics teachers can effectively deliver their lesson by using active learning strategies such as ICT tools in the teaching and learning. On the benefit of integrating ICTs in curriculum delivery, Agommouh (2015) reported that ICT teaching strategy will get the students involve in learning activities that will enable them develop the needed process skills. ICT incorporate a wide range of learning through the simultaneous use of audio, text, multicolor images, graphics, motion, etc. therefore, Nigerian physics teachers cannot and should not afford to lag behind in use of ICT as a strategy in order to improve the academic performance and to raise the intellectual and creative resources of their students.

2.5.2 Integration of Computer in Physics Class

Computer can be useful in all works of life ranging from medicine, academics, engineering, transport and so forth. However, teaching/learning is the most privileged of all fields to have found ICT applicable in solving problems (Adepoju, 2013). A great deal of research has confirmed the benefits to the quality of education, said Al-Ansari (2006). In their research on effort of ICT on education Adigun, Ajayi and Bamisile (2013) opined that there is an emerging broad contentious worldwide about the benefits that can be brought to learning institution through the appropriate use of ICTs which includes the internet, wireless network, cell phones and other communication medium. Pearson and Naylor (2006) reported that the windows of opportunity that ICT offers for the

development of knowledge, economy and societies are also for education. Although, empirical research on the level of ICT utilization among teachers, Onasanya, Shehu, Ogunlade and Adefuye (2011); Stephene (2013); and Olokobo, Abdullahi and Omosidi (2014) have it that the level of ICT tools usage by the secondary school teachers was very low. On contrary, Adeuji, Balogun and Kupolati (2013) saw that the level of ICT utilization among secondary school teachers was high.

On the other application of ICT in education, Agommouh (2015) explained that ICT in education is the teaching and learning with ICT. She added that ICT in education has a multiplier effect throughout education system, by:

1. enhancing learning and provide students with new sets of skills
2. enhancing access to education
3. facilitating and improving the training of teachers.
4. minimizing costs associated with delivery of traditional instruction; and
5. improving the administration of school in order to enhance the quality and efficiency of service delivery.

This therefore stands to reason that the provision, access and use of ICT in teaching, learning and research would improve the academic performance of students.

On the roles ICT can play in science education (in particular) Onasanya, Shehu, Ogunlade and Adefuye (2011) summarized as follows, ICTs:

1. foster students interest and motivation

2. promote students commitment to learning
3. make students to do science effectively and conduct experiment as viewed on screen.

The role of ICT in classroom is becoming prominent (Hong & Songan, 2011). In physics class setting, ICT can be interpreted under four main categories as stated by Oldham (2003) as follows:

1. Finding more current discoveries about physics using internet, email, CD – ROM, Database and video coverage.
2. Collecting, handling and interpreting/analyzing data involved in physics using software example spread sheet and graphics.
3. Aiding understanding / explanation of physics concepts by using models, simulation games, digital video and multimedia adventures; and
4. Communicating ideas through the use of presentation software such as power point, digital video, desktop publishing etc.

Moreover, if all the necessary variables are put in place, ICT utilization in teaching physics would improve the academic performance of secondary school students in the subject.

2.6 Benefits of Integrating Computer in Physics Education

The benefits of Computer to physics are numerous therefore cannot be explained here. Some of the benefits are:

1. Improving physics students participation in classroom activities
2. Promoting hard work for both physics teachers and students

3. Helping both physics teachers and students sustain and update their knowledge in physics education.
4. Helping physics students to understand abstract and very difficult concepts in physics (Kola, 2013).

In addition, Yusuf and Yusuf (2009) contributed that the application of ICT in physics education had the potential for enhancing the tools and environment for physics learning since it allows materials to be presented in multiple media.

No doubt if the listed benefits are properly achieved, the academic performance of physics students would be improved and encouraged.

2.7 Obstacles/Challenges to Computer Integration in Nigerian Secondary Schools

Problems militating against the proper full – scale integration of ICT in secondary schools teaching and learning in Nigeria are many, therefore cannot be briefly explained. Some of the problems include poor policies, inadequate funding, training and re-training, lack of maintenance culture, interrupted power, inadequate supply of ICT tools and corruption among others. Furthermore, in his research on integration of ICT in fostering entrepreneurship skills acquisition into secondary schools curriculum for national development, Zubairu (2012) stated the following as independent to the successful use of ICT in Nigeria secondary schools:

1. Cost of ICT equipment
2. Weak infrastructure

3. Lack of qualified ICT personnel, literate teachers and ICT experts that would support the internet connectivity
4. Lack of relevant software, and
5. Limited access to the internet as a direct result of inconsistent electric power supply in most part of the country.

2.8 Review of Related Empirical Studies

All over the world, many researchers, educators and scientists have conducted ample of researches on the use, impact, effect, application or role of Computer and ICT (as a tool or teaching strategy) on academic performance or achievement of secondary school students. Some of the relevant literatures are:

Nwanne and Agommuoh (2017), determined the effect of Computer Assisted Instruction (CAI) on students' interest and achievement in physics in Imo state, Nigeria. Two research questions were posed and two hypotheses were formulated and tested. A quasi experimental design, specifically the non-randomized control group design involving two intact classes was used. The sample of the study consist of 97 senior secondary school two (SSII) physics students from two government owned secondary schools drawn using purposive sampling techniques from 63 government schools that offer physics in Imo State. One of the two schools used was assigned to experimental group (CAI) and the other one to the control group (LM). Two instruments, the Physics Achievement Test (PAT) and the physics Interest Inventory (PII) were developed and validated. An internal consistency of PAT was computed and found to be 0.82 using Kuder –Richardson formula 20 (KR 20). Before treatment commenced, the PAT was administered as

pre-test to the two groups. Means and standard deviations were used to answer the research questions. Hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance. The result of the analysis indicated that CAI had significant effects on students' interest and achievement in physics, where students in the CAI group achieved more. Thus, it is recommended among others, that State Governments, Ministries of Education and professional associations should organize workshops, seminars and conferences to train teachers on the use of CAI techniques.

Chado and Okwori (2015), identified the effects of using Computer-Assisted Instructional (CAl) package for teaching Metalwork Technology (MWT) at the Nigerian Certificate in Education (Technical) level in Niger state, Nigeria. Two research questions and two research hypotheses were formulated to guide the study at 0.05 level of significance. The study used post- test only type of quasi experimental research design. Two hundred and eighty students of 200 level NCE (Technical) programme were used as respondents in the study from seven institutions in the North-central geo-political zone of Nigeria. One hundred and forty students each were assigned to the control and experimental groups respectively. Both the control and the experimental groups were taught MWT using the lecture and CAI package methods respectively and administered with Metalwork Technology Achievement Test (MWTAT) in a post-test. The data from the post-test were analyzed using the mean and standard deviation to answer the two research questions and t-test statistics was used to test the two hypotheses

in the study. The study found that the subjects in the experimental group performed better than their counterparts in the control group in the post- test.

Michael, Omiola, Awoyemi and Mohammed (2014), conducted a study to determine the effect of Computer Assisted- Instructional Strategies on the performance of students in Mathematics in Ilorin metropolis. The pretest, posttest control group design was used for the study. Eighty (80) students were randomly selected (40 males and 40 females) from two secondary schools that took part in the study. The students were randomly assigned to the experimental and control groups respectively. The subjects in the experimental group were taught using computer assisted instructional package (CAI) on quadratic equation while the control group were taught using conventional method. The treatment for the study was the CAI package used and the main instrument used was Computer Assisted Mathematics Achievement Test (CAMAT). Both the instrument and the treatment were subjected to content and face validation. A 25-item Computer Assisted Mathematics Achievement test was administered to the students as pretest and posttest. Two hypotheses were postulated and tested at 0.05 level of significance. From the analysis, the following findings were reached. There was a significant difference between the achievement scores of students taught mathematics with CAI package and those taught using conventional method, and there was no significant difference between the mean achievement scores of male and female students taught Mathematics with CAI package.

Dantani, Yusha'u and Hassan (2013), investigated the effects of computer assisted instruction package in Nupe Language on primary school pupils in Bida local

government area of Niger State. Two research questions and two hypotheses were formulated for the study. The design adopted for the study was quasi experimental. The population of the study was 202 primary school pupils from four selected schools in Bida local government area were used as research sample. The experimental group was exposed to computer assisted instruction package in Nupe language while the control group was taught the same topics with conventional method in English Language. A 40 item Primary School Mathematics Achievement Test (PSMAT) with a reliability coefficient of 0.80 was used to collect data for the study. The data were analyzed using Analysis Of Variance (ANOVA). The hypotheses were tested at 0.05 level of significance. The findings of the study showed that Pupils taught mathematics with computer assisted instruction package in Nupe language performed better than those taught with conventional teaching method and gender has effect on their mathematics achievement scores.

Ada, Chinyelu, Faith, and Victoria (2012), investigated the effect of computer-assisted instruction (CAI) package on the performance of Senior Secondary Students in Mathematics (Algebra) in Awka, Anambra State, Nigeria. The sample consisted of 40 senior secondary school students drawn from two secondary schools. Stratified random sampling was used to select 40 students (20 males and 20 females). Three research questions and three hypotheses were formulated, and tested at 0.05 level significance. The Algebra Achievement Test (AAT) was made of 50 items of multiple-choice objective type, developed and validated for data collection and was administered to students as pre-test and post-test. The results

of students were analyzed using t-test statistics. The result indicated that students taught using (CAI) package performed significantly better than their counterparts taught using the conventional method of instruction. Students taught using CAI performed better than the control group in retention test. Also there was no significant difference in the post-test performance scores of male and female students taught using CAI package. Based on the findings it was recommended that Computer-Assistant Program should be encouraged for teaching and learning of mathematics.

Yusuf and Afolabi (2010), investigated the effect of computer assisted instruction (CAI) on secondary school students' performance in Biology Oyo state, Nigeria. The study also assessed the influence of gender on performance of students exposed to computer (ICT).The research adopted a quasi – experimental involving a 3×2 factional design. The sample for the study comprised 120 first year senior secondary school students (SS 1) sampled from private secondary schools in Oyo state, Nigeria. The study used two instruments namely biology performance test (BIOPET) and computer assisted instructional package (CAIP) on biology to determine difference in the performance of students in biology when exposed to CAI and also to determine the influence of gender on students performance when exposed to CAI respectively. The students' pre –test and post –test scores were analyzed using ANCOVA. The findings of the study revealed that the performances of the students exposed to CAI were better that their counterpart exposed to conventional classroom instruction. However, no significant difference existed in the performance of male and female students

exposed to CAI. Based on the findings, recommendations were made on the need to develop relevant CAI package for teaching biology in Nigerian secondary schools.

Adeyemo (2010a), investigated the impact of information and communication technology (ICT) on teaching and learning of physics in Lagos state, Nigeria. The study used a population of one hundred and fifty seven (157) physics students and two physics teachers drawn randomly from five educational districts out of the six with two senior secondary schools from each district of Lagos state. The study postulated and tested hypotheses at 0.05 level of significant. The study used Information and communication technology impact on teaching and learning questionnaire (ICTITLQ) as the research instrument for data collection, and analysis of the data was simple percentage and chi –square. The research findings indicated that ICT have great impact on teaching and learning of physics. Also the introduction of ICT makes learning of physics so interesting for the students.

Mbugna, Kioss and Tanwi (2015), investigated the influence of integration of ICT in teaching on students' academic performance in public secondary schools in Nakuru County, Kenya. The study adopted a survey research designed to investigate the purpose. The population of the study was 274 public secondary schools in Nakuru County with a total teachers' population of 1644. The data collection instruments (questionnaire, interview guide and observation guide) were used to collect data for the study. The instruments were presented using a sample of 10% (167) teachers of the 1644 teacher population. The findings

showed that integration of ICT in teaching does not depend on gender. Both male and female equally integrate ICT in teaching with similar outcome.

Stephene (2013) investigated the availability, accessibility and utilization of ICT in physics teaching in AkwaIbom state, Nigeria. For the purpose of this study 378 physics teachers were randomly sampled from eight Education Zones in the state. A structured questionnaire was constructed and used by the researcher for collection of data. The result of the study revealed that 80% of the teachers are computer literate, it also revealed that there is 90.8% availability of ICT to physics teachers for teaching… the study also revealed a very low response of 29% of the 378 respondents used for study were aware of 4 computer software programs provided. The findings lastly revealed that none of selected computer software packages was used by the teachers, indicating poor level of ICT utilization in physics curriculum delivery.

Bello and Hassan (2015) studied the effect of ICT simulation on teaching Basic science and mathematics on upper basic education students' achievement in Sokoto metropolis, Nigeria. Experimental research design was adopted for the study. A total of 250 students were randomly selected from ten junior secondary schools within the metropolis. Two teaching strategies were adopted: ICT simulation and conventional method. The result of the study revealed that there is no significant difference between the pre –test of the experimental and control group. It also revealed that there is no significant difference in the mean achievement of students taught using ICT simulation and those taught using lecture method.

Solomon, Onyemaechu and Ogbenyealu (2011), examined Information and Communication Technology (ICT) and students' academic performance in Business studies in junior secondary schools in Aroehukwu LGA of Abia state, Nigeria. In the study students achievement in business studies taught with ICT and those taught without was investigated. Also, it investigated the effect of ICT on male and female students taught with ICT. The population of the study is made up 140 students offering business studies in four public secondary schools in the area. The sample for the study is 30 business studies students that were randomly selected from each of the four secondary schools. Two research questions and null hypotheses were used for the study. The hypotheses were tested at 0.05 level of significant. However, mean, standard deviation and t-test were employed in analyzing the pre-test and post test data. The results of finding showed that there was a significant difference between achievement scores of business students taught with ICT instructional packages and those taught with conventional method on the post – test. On the issue of gender, the result revealed that there is no significant difference between the mean achievement scores of male and female students taught business studies with computer aided learning software.

Oseghale and John (2014), carried out a study on impact of computer literacy on students' academic performance is senior secondary schools in Esan west local government area of Edo state, Nigeria. The research is a descriptive survey and data were collected with the use of questionnaire distributed to 120 out 1,200 final year students that were randomly used from the 14 existing secondary schools in the local government area. The finding showed that computer literate students

perform better than non computer literate; it also revealed that computer literate female students perform better than male students who are also computer literate. Based on the findings of this study, it is true that computer literacy enhances academic performance of secondary school students generally.

Gulbahar and Guven (2008) carried a research survey on ICT usage and the perception of Social studies teachers in Turkey. A survey was completed with 326 teachers who teach fourth and fifth grade at primary level. The result showed that although teachers are willing to use ICT resources, they are facing problems in relation to accessibility to ICT resources and lack of in - service training opportunities. The method employed by the researcher is convenience sampling to reach participants in the study. On the question of the relationship between teachers' use of computer related tools in the classroom and level of expertise, correlation analysis was conducted to evaluate the relationship between the level of expertise and computer related tools usage of social studies in the classroom. The result suggests that the use of ICT under the right circumstances improves educational outcomes (i.e. performances) in social studies at primary schools in Turkey.

Olokoba, Adullahi and Omosidi (2014), investigated the impact of ICT on the management and performance of secondary school teachers in Kwara state, Nigeria. 300 teachers were sampled from three senatorial zones in the state. Questionnaire was distributed to the sampled teachers and mean score were used to test the hypotheses. The results showed that the level of ICT utilization by teachers is very low (i.e. Teachers do not use ICT tools in their instructional

activities). It also revealed that ICT training(s) teachers received do not have desired impact on instructional usage.

Adeuji, Balogun and Kupolati (2013), investigated the utilization of ICT among trainee science teachers in Lagos state, Nigeria. The sample of the study made up 300 trainee science teachers and 100 students. Questionnaire on ICT utilization was designed and administered. Data collected were analyzed at 0.05 level of significance, the result of the study revealed that the level of ICT utilization among science teachers trainee was high, there is a positive multiple correlation among the four independent variables being measured i.e. age, gender, course and institution.

Onasanya, Shehu, Ogunlade, and Adefuye (2011), assessed the teachers' awareness and extent of utilization of ICT for effective science and health education in Nigeria. The research subjects were 240 science and health education teachers drawn from 40 secondary schools, randomly selected from 10 local government areas of Oyo state. Two instruments were designed by the researchers and used for the study. There are 40 items computer literacy test with reliability coefficient of 0.77 and the 20 item questionnaire on teachers' level of utilization of ICTs with Cronbach alpha measured of 0.82. Data were analyzed using weighed means scores, standard deviation and t-test. The analyses revealed that the level of computer literacy of the science teachers is low. The level of utilization of ICT resources was also found to be very low. The result of the study also showed that there was significant difference between the mean scores for male and female science teachers in their level of computer literacy and

communication, and utilization of ICTs. It indicated that the males outperformed their female counterpart in both instances, although their level is very low.

Tella, Tella, Toyobo, Adika and Adeyinka (2007), assessed the secondary school teachers' uses of ICT's: Implications for further development of ICTs use in Nigeria secondary schools. The study through census had drawn 700 teachers from twenty five purposefully selected private secondary schools in Ibadan, Oyo state, Nigeria. This comprised 430 males and 270 females. A modified instrument tagged teachers ICT use survey adapted from ICT survey indicator for teachers and staff by UNESCO 2004 and ICT teachers survey by New Zealand ministry of education were used for the collection of data. The result shows that teachers perceived ICT as being easier and very useful in teaching and learning. It also…

Gbadebo, Abimbola, Adeyemi and Odupe (2013), examined the extent of teachers' awareness, gender and utilization of ICT tools for effective teaching of mathematics in Epe LGA of Lagos state, Nigeria. The study sampled fifty 50 mathematics teachers drawn from twenty – five secondary schools randomly selected from the LGA (Inclusive 7 Eredo and Ejinrin the local council development areas). Two instruments were designed by the researchers and used for the study. Data was collected and analyzed using weight mean scores, standard deviation and t-test. The analysis showed that the level of computer literacy of most of the mathematic teachers is low. The level of utilization of ICT tools is also found to be very low. On the gender, it revealed that the male mathematics teachers performed better than their female counter parts.

Relevant literatures were also reviewed on the effect of Demonstration teaching method (DTM) on academic performance of students. Some of which are: Mwanahamisi (2014), examined the Effect of Teaching Methods on Students' Performance in Tanzanian Education Institutions: A Case study of Public Secondary Schools in Nyamagana District – Mwanza, Tanzania. The study applied descriptive research designed that incorporated qualitative and quantitative approach. The sample of 78 teachers, 129 students and 9 Inspectors was surveyed using in-depth interview and questionnaire. Qualitative data was analyzed descriptively using SPSS while thematic analysis was used to analyzed qualitative data. The study findings revealed that most effective teaching methods were demonstration followed by question and answers and then brainstorming, teachers should know the value and impact of different teaching methods and regular training/workshop should be conducted on teaching methods. The study recommended that traditional methods like lecture should not be used.

Ja'afar-Furo, Abdullahi, and Badgal (2014), examined the effect of demonstration and lecture methods of teaching Apiculture on performance of Agriculture Students in Adamawa State University (ADSU), Mubi, Nigeria. Two sets of 400 level students were purposely selected for the study. The Data was collected by observation of students' scores, and personal verification of records/files to obtain information on age, gender and qualification at admission of both sets of students. Descriptive statistics, computed cost components and correlation analyses were employed in the analyses of the data. Results revealed that in spite of the fact that Lecture Method (LM) had lower cost implication, it was found to be more

efficient as a method of instruction among the students than a combined Demonstration and Lecture Methods (DLM). The male students slightly (0.456) performed better than their female (0.246) counterparts, with both coefficients significant at $P<0.05$. However, it concluded that the application of LM of instruction was slightly more efficient than a combined DLM among the Agriculture students of ADSU. Also, the male students were found to perform slightly better than the females. While the DLM could be more appropriate at primary and secondary schools, the LM is being recommended at tertiary level based on the findings of this study.

Obunadike and Omeye (2014), compared the influence of lecture method and demonstration method on the teaching of Agricultural science. One research question and one null hypothesis guided the study. The design of the study was descriptive survey design. 266 senior secondary school students from 6 schools in Bende Local Government Area formed the sample. A questionnaire structured by the researchers on 4 point response scale was used for data collection. The reliability of the instrument was calculated to be 0.60 using Cronbach alpha. Mean ratings were used in answering the research question while correlation was used to analyse the null hypothesis at $P<0.05$ level of significance. The findings revealed that demonstration is one of the best methods used in the teaching of Agricultural science in senior secondary schools. The findings equally revealed that demonstration method exposes students more to all the practical in Agriculture and equally enhances understanding.

Muhammad, Bala, and Ladu, (2016), investigated the Effectiveness of demonstration and lecture methods in learning concepts in Economics among Secondary School Students in Borno state, Nigeria. Quasi-experimental Design was used. It was carried out in a classroom setting where classes were intact. The sample population used was SS1 students who were selected for the two groups in two schools, fifty-two students for each school; twenty-six students for each group that was thirteen males and thirteen females. Topics were selected from SS1 senior secondary school syllabus prepared by West African Examination Council (WAEC) which was considered as standardized test and was used for the treatment. Twenty-five achievement test objective was conducted, pre-test, post-test were collected and test were given for the groups, before and after treatments. After treatment results were collected and analysed by descriptive statistic of mean, standard deviation and inferential statistics of t-test. The results of the study revealed that demonstration and lecture methods in learning concepts in economics among secondary school students in Borno state were effective. When the two methods were compared, demonstration method was more effective than lecture method in learning concepts in economics among secondary school students in Borno state. Demonstration group results were significantly higher than lecture group method. It was recommended that economics teachers should maximize the use of demonstration method while teaching and learning certain economics concepts.

2.9 Summary and Uniqueness of the Study

Computer and ICTs have affected the modern man's ways of thinking, acting, workings, learning and sending and receiving information. Computer had and is continue to penetrate into all the boundaries, fences, and buildings and has turned the whole world into a small village. Education and research has affected the most.

This chapter critically looked at the contributions and conclusions of various researchers' and educators' studies relevant to this research work. Specifically, the chapter dealt with under conceptual frame work the concepts of Information and Communication Technology, Physics, Secondary Education and that of Academic Performance. It also looked at the academic performance of secondary school students in physics, the position of ICT in Nigerian education system, the Computer as an instructional method, the integration of Computer in Physics class and then the benefits of ICTs to physics education. Lastly, the chapter looked at the obstacles to Computer usage in secondary school in Nigeria; moreover, related empirical studies were also reviewed.

The findings of this study agree with earlier findings of Phillips and Moss (1993) and the findings of Jegede, Okebukola and Ajewole (1992) on Biology. Similarly, the findings agree with the studies of Egunjobi, (2002) in geography, (Udousoro, 2000) in mathematics, and Okoro, and Etukudo, (2001) in chemistry conducted in Nigeria which confirmed that CAI has been effective in enhancing students' performance in other subjects than the conventional classroom instruction. The finding is also supported by the findings of Karper, Robinson, and Casado-Kehoe

(2005) on counseling education. It was however, not in same conclusion of Okoro, and Etukudo, (2001) who revealed that CAI was found to be effective in classroom for fact based learning, but not as effective for topics requiring critical thinking or mathematical problem solving. In addition, the time required for by learners to use CAI was higher overall than conventional classroom instruction. Students taught using traditional instruction combined with the use of computer performed significantly better than students taught using traditional instruction in a college setting (Akour, 2006).

The result of this study is also consistent with previous findings of Nwanne and Agommuoh (2017); Chado and Okwori (2015); Michael, Omiola, Awoyemi and Mohammed (2014); Dantani, Yusha'u and Hassan (2013) and Ada, Chinyelu, Faith, and Victoria (2012) who found that CAI has effect on students performance. Similarly, college students taught statistics using lecture-plus-CAI obtained higher averages on midterm and final exams than students taught using lecture method only (Basturk, 2005). Based on a review of several studies and shortcoming on studies comparing CAI with conventional instruction, CAI can be considered as effective as traditional instruction. Furthermore, how CAI is delivered can affect its effectiveness, and that new studies are needed to clarify the effect of CAI in contemporary student environment (Jenks& Springer, 2002). Thus, empirical findings on the use of CAI have been mixed.

Literatures on effects of Computer- Assisted Instructional Strategies and ICT as a teaching strategy on gender related issues were also reviewed. Analysis of the study results based on gender shows that male and female students performed significantly almost the same on their post-test. The findings of the current study confirmed those of Yusuf and Afolabi (2010); Solomon, Onyemaechu and Ogbenyealu (2011); and Mbugna, Kioss and Tanwi (2015) found and concluded that CAIP tools utilization does not depends on gender that is both male and female students performed equally the same on post-test. However, this finding is at variance with the result of previous studies conducted in Nigeria specifically, it contradicts those reported by Gbadebo, Abimbola, Adeyemi and Odupe (2013) and Dantani, Yusha'u and Hassan (2013) that Computer utilization has influence upon gender as male students performed better than their female counter part. In an opposite result, Oseghale and John (2014) agreed that ICT tools in teaching have effect on gender as female students in their study performed better than their male counterpart.

Other issues discussed in this chapter included the effect of Demonstration method over other teaching methods on students' performance. For instance, Mwanahamisi (2014); Ja'afar-Furo, Abdullahi, and Badgal (2014); Obunadike, and Omeye (2014) and Muhammad, Bala, and Ladu (2016) investigated and compared the effectiveness of demonstration teaching method over other methods such as lecture method. The results of their findings indicated that demonstration method exposes students more to learning; enhances understanding and most

effective teaching method. Also, demonstration method could be more appropriate at primary and secondary schools.

Conclusively, this research work to the best knowledge of the researcher is the only study carried out to have encapsulated the concepts of Effect, Demonstration method, Computer Assisted- Instructional Strategies (CAIS), Academic Performance and Secondary Schools in Kebbi State. Furthermore, the researcher believed that this study is the only one that investigated the effect of Demonstration method and use of CAIS on students' performance, hence a reason to stand unique among many other studies.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this study was to investigate effects of Demonstration and Computer- Assisted Instructional Strategies (CAIS) on Academic Performance among Secondary School Physics Students in Bunza, Kebbi State, Nigeria**.**

This chapter was designed to give a description of the method and the procedures used in carrying out this research; the chapter explains the research design, population of the study, sample and sampling techniques, research instruments, validity and reliability of the research instruments, methods of data collection, and method of data analysis.

3.2 Research Design

This study adopted quasi - experimental design of the pre-test, post-test, non-randomized control group type. This paradigm represents two levels of treatment: the use of Computer Assisted Instructional Strategies (experimental group) and demonstration method (control group); and two levels of gender (male and female). This design provided the researcher the opportunity to examine difference in academic performance of students taught Physics with CAIS and those taught with demonstration method of teaching.

However, before proceeding to the field for the administration of the instruments to the respondents in various schools in Kebbi State, a letter of Introduction was

collected from the Faculty of Education and Extension Service, Usmanu Danfodiyo University, Sokoto (Appendix A).

3.3 Population of the Study

The population of this research was the entire twenty six (26) public senior secondary schools under the supervision of Secondary School Management Board (SSMB) in Bunza Education Zone, Kebbi State (see Table 3.1).

Table 3.1: Distribution of Schools in Bunza Education Zone

S/N	Name of School	School Type	Student
1.	Government Day Secondary School, Lolo	Mixed	82
2.	Government Day Secondary School, Kende	Girls	90
3.	Government Girls Secondary School, Zagga	Girls	71
4.	Government Secondary School, Bagudo	Boys	105
5.	Government Day Secondary School, Bani	Boys	80
6.	Government Secondary School, Ka'oje	Boys	91
7.	Government Girls Secondary School, Bagudo	Girls	95
8.	Government Day Secondary School, Zagga	Boys	97
9.	Government Day Secondary School, Gwamba	Boys	97
10.	Government Secondary School, Illo	Boys	101
11.	Government Day Secondary School, Tsamiya	Boys	79
12.	Government Day Secondary School, Bahindi	Boys	79
13.	Government Day Secondary School, Kyangakwai	Boys	78
14.	Government Secondary School, Kamba	Boys	113
15.	Government Day Secondary School, Dolikaina	Boys	92
16.	Government Day Secondary School, Fana	Boys	111
17.	Nana Asmau Government Girls College, Kamba	Girls	99
18.	Government Day Secondary School, Maidahini	Mixed	68
19.	Government Day Secondary School, Raha	Mixed	92
20.	Government Secondary School, Tilli	Boys	91
21.	Government Girls Secondary School, Bunza	Girls	70
22.	Government Day Secondary School, T/Dannufe	Mixed	73
23.	Government Day Secondary School, Bakoshi	Boys	66
24.	Government Day Secondary School, Aljannare	Boys	78
25.	Government Secondary school, Bunza	Boys	115
26.	Government Secondary School, Zogirma	Boys	67
Total			**2,280**

Source: Secondary Schools Management Board, (SSMB), Kebbi state (2017).

The zone has the enrollment of 2,280 SSII students comprising of both male and female students across four local government areas of Bagudo, Bunza, Dandi and Suru.

Although, Kebbi State has a total of one hundred and sixty five (165) senior secondary schools under the supervision of Secondary Schools Management Board and is divided into six Education Zones with 13,729 SSII students(Appendix B).

3.4 Sample and Sampling Techniques

The sample of the study was 377 students drawn from four purposively selected senior secondary schools in Bunza Education Zone. The schools were selected because Adeyemo (2010a) strongly advised that research on ICT should necessarily be conducted in schools where ICT facilities are available and where the users are computer literate.

Table 3.2: Sample Size of the Study

S/N	Name of School	School Type	Classes		Total
			A	B	
1.	Government Day Secondary School, Kende	Girls	37	53	90
2.	Government Secondary School, Bagudo	Boys	49	55	104
3.	Government Girls Secondary School, Bunza	Girls	29	41	70
4.	Government Secondary School, Kamba	Boys	63	50	113
Total			**178**	**199**	**377**

Source: Secondary Schools Management Board, (SSMB), Kebbi State. (2017).

However, from each sampled schools, two intact SS II classes of A and B were randomly selected and classified as experimental and control group for the study.

3.5 Instrumentation

To carry out this study, two instruments (for treatment and test) were developed and administered by the researcher to students for data collection. These are:

I. Computer Assisted- Instructional Strategies (CAIS) for teaching SHM in Physics

This was the researcher made instrument (for treatment) using a Microsoft office PowerPoint version 2007. It was a self-instructional package containing three lessons structured into modules. The structure of the package contains pictures, audios and motion photos. The topic covered in the package was Simple Harmonic Motion (SHM). In the development of the package, some procedural stages were strictly followed that included design, implementation and validation. At the design stage, storyboards, scripts, frameworks and other aspects of the software were defined. At the implementation stage, the development was based on user-centered design, where the opinion, interests, needs, emotions, thoughts, and so on of users became key factors taken into consideration (Play CAIS CD-plate). This instrument was used to teach students in experimental groups. The administration was also done by the researcher with the help of research assistant in experimental groups while the control groups were taught using Demonstration method.

II. Students' Performance Test in Physics (SPTP)

This instrument was designed and administered by the researcher to students in two intact classes of SSII as experimental and control group to determine the effect of CAIS on their academic performance. It consists of twenty (20) multiple choice questions and was administered twice to students in both groups at an interval of three weeks as Pre-test and Post-test for data collection. Each item is followed by four options letter A - D out of which only "one" was correct and students were instructed to select only one option as answer for each item using conventional way of answering questions using paper and pencil method. The questions were according to Physics syllabus and every correct answer attracts 1 point. Then, correct and wrong, 1 and 0 are numerical values assigned to responses on SPTP. The chosen topic was Simple Harmonic Motion (SHM).

3.5.1 Validity of the Instruments

To validate the instrument means to determine the extent to which the instrument measures its purpose. Two instruments (CAIS and SPTP) were used for this study. The instruments were submitted to experts for validation mostly on face validity in the Departments of Physics and Computer Federal Government College, Sokoto and Department of Technology Education, Kebbi State University of Science and Technology, Aleiro (Appendices C, D & E).

The Validation was done for the purpose of reviewing the items of the instrument in terms of their clarity, appropriateness of the language used, relatedness to research purposes, questions and hypotheses and relevance to research topic. The items in the instrument were later re-adjusted based on their corrections and

criticisms. Hence, the experts reported that all the instruments can measure what they supposed to measure.

3.5.2 Reliability of the Instruments

Reliability refers to consistency of the instrument to measure what it aims to measure. A reliable instrument gives consistent result. These instruments were subjected to pilot testing upon their approval by the project supervisors.

Students' Performance Test in Physics (SPTP)

The SPTP was pilot tested using test - retest method to students in two intact classes in GSS Rafin-tsaka in Kebbi State at an interval of two weeks. After the analysis the Pearson Product Moment Correlation Coefficient (PPMCC) of 0.82 was obtained which indicated the reliability of the instrument (Appendix F).

3.6 Method of Data Collection

The procedure for data collection was through personal administration of the two instruments. The researcher affected all the necessary corrections pointed out by the supervisors and experts on the instruments.

Students' Performance Test in Physics (SPTP)

Both students in control and experimental group were tested using SPTP (Appendix G) and their scores were collected as pre-test. Three weeks treatment followed immediately, students in experimental group were exposed to Computer Assisted- Instructional Strategies (CAIS) played on computer sets displayed on projector, while those in control group were taught using Demonstration method of teaching using chalk and board. A self designed CAIS, SPTP and Marking

schemes (Appendix H) were used to collect data.Also, Lesson plans were developed on different sub-topics in SHM. The researcher used the different lesson plans to teach both the experimental and control groups(Appendces I, J, K & L). However, the same test was given to both control and experimental groups after treatment as post- test. The students' performance scores (Appendix M) from the pre-test and post-test were collected as data for answering research questions and testing the hypotheses.

3.7 Method of Data Analysis

The pre-test and post-test scores collected from the respondents were analyzed using Statistical Package for Social Science (SPSS) version 20.00 and these included means, standard deviation, and t-test. All the three stated research questions were answered using descriptive statistics of mean score and standard deviation. All the three stated null hypotheses were tested using Inferential Statistics of t-test at 0.05 levels of significance.

The null hypotheses are:

H_{01}. There is no significant difference on academic performance of students taught Physics using CAIS and those taught using Demonstration method in senior secondary schools in Bunza Education Zone, Kebbi State. This null hypothesis was tested using t-test at 0.05 levels of significance.

H_{02}. There is no significant gender difference on academic performance of students taught Physics using CAIS in senior secondary schools in Bunza

Education Zone, Kebbi State. This null hypothesis was tested using t-test at 0.05 levels of significance.

H_{03}. There is no significant gender difference on academic performance of students taught Physics using Demonstration method in senior secondary schools in Bunza Education Zone, Kebbi State. This null hypothesis was tested using t-test at 0.05 levels of significance.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

The purpose of this study was to investigate effects of Demonstration and Computer- Assisted Instructional Strategies (CAIS) on Academic Performance among Secondary School Physics Students in Bunza, Kebbi State, Nigeria

This chapter deals with data analysis to answer the research questions and to test the stated null hypotheses. Others included Summary of the Major Findings and Discussion of Findings.

4.2 Presentation of Data and Analysis

The data collected for the study were presented and analyzed in the form of descriptive statistics that is, mean and standard deviation and inferential statistics that is, t-test.

4.3 Answering the Research Questions

Three research questions were raised and answered in the form of descriptive statistics and therefore presented in the tables 4.1, 4.2 and 4.3.

Research Question One: Is there any difference in performance of students taught Physics with CAIS and those taught using Demonstration method?

To answer this research question, data collected with the SPTP were subjected to descriptive statistics mean and standard deviation was computed.

Table 4.1: Performance of Students taught Physics using Two Different Methods.

Groups	**Post-test**			
	Sample	Mean	Mean Diff.	Std. Dev.
CAIS (Experimental)	178	17.26	3.77	1.84
Demonstration (Control)	199	13.49		2.41

Source: Field work (2018)

Table 4.1; presents the data in the difference in performance of students taught Physics with CAIS and those taught using demonstration method. Results showed that both group performed the same on pre-test (the mean difference is 0.00) no group was better than the other which means the test items suit them equally (Appendix N). On post-test results, the mean of CAIS group was 17.26 and standard deviation of 1.84, while the mean of demonstration group was 13.49 and standard deviation of 2.41. Their mean difference was 3.77. CAIS group performed achieved higher than demonstration group on post-test which means there was difference in performance of students taught Physics with CAIS and those taught using Demonstration method in favour of the CAIS group.

Research Question Two: What is the effect of CAIS on the academic performance of male and female students taught physics in Bunza Education Zone?

To answer this research question, data collected with the SPTP were subjected to descriptive statistics mean and standard deviation was computed.

Table 4.2: Gender Difference in the Post-test Performance Scores of Students in the Experimental Group (CAIS)

CAIS	**Post-test**			
	Sample	Mean	Mean Diff.	Std. Dev.
Male	112	17.08		2.09
			-0.01	
Female	66	17.09		2.19

Source: Field work (2018)

Table 4.2 revealed that male and female students' performance on post-test have the mean scores of 17.08 and 17.09 respectively. The mean difference on post-test was -0.01. The standard deviations were 2.09 and 2.19 for male and female students in order. This adequately answered the research question and it is concluded that there was no gender difference in performance of students taught Physics with CAIS. This means both sexes performed almost equally in their post-test. (Appendix O).

Research Question Three: Is there gender difference between performances of students taught physics using Demonstration method?

To answer this research question data collected with the SPTP were subjected to descriptive statistics mean and standard deviation were computed.

Table 4.3: Gender Difference in the Post-test Performance Scores of Students in the Control Group (Demonstration)

Demonstration			**Post-test**	
	Sample	Mean	Mean Diff.	Std. Dev.
Male	105	13.62		2.54
			0.17	
Female	94	13.44		2.31

Source: Field work (2018)

Table 4.3 revealed that male and female students' performance on post-test have the mean scores of 13.62 (SD=2.54) and 13.44 (SD=2.31) respectively. The mean difference on post test was 0.17. This adequately answered the research question and it is concluded that there was no gender difference in performance of students taught Physics using Demonstration method. This means both sexes performed almost equally in their post-test (Appendix P).

4.4 Testing the Null Hypotheses

The data collected using the instrument SPTP were further subjected to hypotheses testing using inferential statistics t-test at 0.05 level of significance.

Null Hypothesis One: There is no significant difference on academic Performance of students taught Physics using CAIS and those taught using Demonstration method.

The null hypothesis one was tested using t- test as shown in the Table 4.4

Table 4.4: Summary of T-test Analysis of Post Test Scores of Students Exposed to CAIS and Demonstration Method

Groups	Sample	Mean	Std. Dev.	Df	*T-cal*	P-value	Decision
CAIS	178	17.26	1.84	375	17.16	0.00	H_{O1} Rejected
Demonstration	199	13.49	1.41				

$P < 0.05$ **Source:** Field work (2018)

Data on Table 4.4 showed that there exists significant difference on the post- test performance of students taught Physics with CAIS (experimental) and those taught using demonstration method (control). The difference showed that P-value (0.00) is less than Alpha value (0.05) level of significance. CAIS group performed

better result than demonstration group on post-test. This means the significant difference existed in favour of CAIS group. Therefore, the null Hypothesis which stated that there is no significant difference in the performance of students taught Physics with CAIS and those taught using Demonstration method is rejected. (See Appendix N).

Null Hypothesis Two: There is no significant difference on academic performance of male and female students exposed to CAIS in Physics.

The null Hypothesis two was tested using t- test as shown in the Table 4.5.

Table 4.5: Summary of T-test Analysis of Post-Test Scores of Male and Female Students Exposed to CAIS

CAIS	Sample	Mean	Std. Dev.	Df	*T-cal*	P-value	Decision
Male	112	17.08	2.08	176	-0.05	0.99	H_{O2}
Female	66	17.09	2.19				Accepted

P > 0.05 **Source:** Field work (2018)

The null Hypothesis that guided the Table 4.5 was accepted because the p-value (0.99) was greater than the Alpha-value (0.05) level of significance. Thus, there was no statistically significant difference between the academic performance of male and female students exposed to CAIS in Physics. Any difference observed may have arisen from sampling errors (See Appendix O).

Null Hypothesis Three: There is no significant difference on Academic Performance of Male and Female students exposed to Demonstration method in Physics.

The null Hypothesis three was tested using t- test as shown in the Table 4.6.

Table 4.6: Summary of T-test Analysis of Post-Test Scores of Male and Female Students Exposed to Demonstration Method.

Demonstration	Sample	Mean	Std. Dev.	Df	*T-cal*	P-value	Decision
Male	105	13.62	2.54	197	-0.53	0.59	H_{O3}
Female	94	13.44	2.31				Accepted

P > 0.05 **Source:** Field work (2018)

The null Hypothesis that guided the Table 4.6 was accepted because the p-value (0.59) was greater than the Alpha-value (0.05) level of significance. Thus, there was no statistically significant difference between academic performance of male and female students exposed to demonstration method in Physics. Differences observed were as a result of sampling errors (See Appendix P).

4.5 Summary of Major Findings

The purpose of the research was to provide satisfactory answers to the research questions raised in chapter one as well as to meet the objective of the study. In this section, the major findings with respect to research questions and hypotheses are interpreted; the following were the major findings of the study:

1. Computer Assisted- Instructional Strategies (CAIS) has positive effect than Demonstration method on Academic Performance among senior Secondary School Physics Students in Bunza Education Zone, Kebbi State. The null hypothesis was rejected because *P-value* (0.00) was less than the *Alpha value* (0.05) level of significance. CAIS group performed better result than Demonstration group on post-test.
2. There was no significant gender difference in Academic Performance among Secondary School Physics Students exposed to CAIS in Bunza

Education Zone, Kebbi State. The null hypothesis was accepted because the *p-value* (0.99) was greater than the *Alpha-value* (0.05) level of significance.

3. There was no significant gender difference in Academic Performance among Secondary School Physics Students exposed to Demonstration Method in Bunza Education Zone, Kebbi State. The null hypothesis was accepted because the *p-value* (0.59) was greater than the *Alpha-value* (0.05) level of significance.

4.6 Discussion of Findings

This study investigated effects of Computer- Assisted Instructional Strategies (CAIS) and Demonstration Method on Academic Performance among Secondary School Physics Students in Bunza Education Zone, Kebbi State, Nigeria**.**

The purpose of this section was to interpret the results and places it in the context of the research questions, hypotheses and literature review. The study came up with the following findings and discussed.

This study revealed that Computer- Assisted Instructional Strategies (CAIS) has positive effect than Demonstration Method and influences Academic Performance of Secondary School Physics Students. This outcome is in line with those of Nwanne and Agommuoh (2017); Chado and Okwori (2015); Michael, Omiola, Awoyemi and Mohammed (2014); Dantani, Yusha'u and Hassan (2013); Ada, Chinyelu, Faith, and Victoria (2012) and Adeyemo (2010a) who investigated the impact of Computer Assisted Instruction (CAI) on teaching and learning of

Physics and other subjects in different part of the world and reported that ICT is highly effective and have a great impact on teaching and learning and influence students' performance. In a similar study, Oseghale and John (2014), reported that computer literacy enhances academic performance of secondary schools students. Study conducted by Gulbahar and Guven (2008), is also in resemblance with this study because it revealed that the use of ICT in teaching and learning improves educational outcomes in Social studies in Turkey. Although, Bello and Hassan (2015) reported that using ICT simulation in teaching Basic science and Mathematics does not influence achievement of students in learning, therefore not in conformity with this research.

Furthermore, this study is in same direction with the study carried by Yusuf and Afolabi (2010), who found that introduction of ICT in teaching makes learning of Biology more effective and interesting for students. In a similar study, Solomon, Onyemaechu and Ogbenyealu (2011), found that students that were taught with ICT instructional packages performed better than those taught using conventional method. However, in a contrary result, Mwanahamisi (2014); Ja'afar-Furo, Abdullahi, and Badgal (2014); Obunadike, and Omeye (2014) and Muhammad, Bala, and Ladu (2016), found that Demonstration method is more effective over other methods such as lecture method. The results of their findings indicated that Demonstration method exposes students more to learning; enhances understanding and most effective teaching method. Also, demonstration method could be more appropriate at primary and secondary schools.

This study also found that there was no difference between the academic performance of male and female students exposed to CAIS in learning Physics among secondary school students in Kebbi State. This is in conformity with the findings of Yusuf and Afolabi (2010); Solomon, Onyemaechu and Ogbenyealu (2011); and Mbugna, Kioss and Tanwi (2015), who concluded that ICT tools utilization does not depends on gender that is both male and female performed equally the same. However, Gbadebo, Abimbola, Adeyemi and Odupe (2013), reported that, ICT utilization has influence upon gender as male students performed better than their female counter part. But, Oseghale and John (2014) agreed that ICT tools in teaching have effect on gender as female students in their study performed better than their male counterpart.

This study also found that there was no difference between the academic performance of male and female students exposed to Demonstration method in learning Physics among secondary school students in Kebbi State. This is not in conformity with the finding of Ja'afar-Furo, Abdullahi, and Badgal (2014), who revealed that gender has influence as male students were found to perform slightly better than their female counterpart.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study was to investigate effects of Demonstration and Computer- Assisted Instructional Strategies on Academic Performance among Secondary School Physics Students in Bunza, Kebbi State, Nigeria.

This chapter presents the summary of the research work, conclusion drawn from the research, some recommendations and suggestions for further studies.

5.2 Summary of the Study

Chapter one of the study presented the background to the study, three research objectives and questions were raised and three null hypotheses tested in the study. The significance of the study, scope and delimitation as well as operational definition of terms were also discussed.

Chapter two of the study focused on the review of related literature, which presented an overview of literatures that were relevant to the study, with view of different authors on the variables studied in this work.

Chapter three of the research work focused on the research methodology, it explained that quasi - experimental design of the pre-test, post-test, control group type was adopted, the sample of the study were three hundred and seventy seven (377) students purposively selected from the population of 2,280 secondary schools students in Bunza Education Zone, Kebbi State, two instruments (SPTP

and CAIS) developed by the researcher were used to collect data from respondents. The collected data were analyzed using the statistical package for social science (20.0) to determine the mean and standard deviation in order to answer the stated research questions under study. T-test was used to test and interpret the three null hypotheses formulated for this study at 0.05 level of significant.

Chapter four of the study focused on data presentation and analysis, answers to research questions were provided and null hypotheses were also tested, the results of the study revealed that CAIS was effective and has effect on performance of secondary schools students in Physics in Bunza Education Zone, Kebbi State. It also found that CAIS was more effective than Demonstration method in learning Physics among secondary school students in Bunza Education Zone, Kebbi State. Other findings are, there was no difference between the academic performance of male and female students exposed to CAIS in learning Physics among secondary school students in Bunza Education Zone, Kebbi State, and there was no difference between the academic performance of male and female students exposed to demonstration method in learning Physics among secondary school students in Bunza Education Zone, Kebbi State.

Lastly, Chapter five of the study presented the Summary, Conclusion that included Implication of the study, Limitation of the study, suggestions for further studies and some recommendations were also given.

5.3 Conclusion

This study concluded that, Computer has changed the way teaching and learning takes place. Therefore, it affected the academic performance of secondary schools students positively. The findings of this study have conclusively indicated that introduction of CAIS as teaching strategies have significant positive effect on secondary school students' performance in Physics than Demonstration method in Kebbi State.

5.4 Implications of the Study

The findings of this study showed that the academic performance of students taught Physics using CAIS was better than those taught with Demonstration method. That is, incorporation of CAIS technology in teaching and learning processes enhances students' performance. By implication, performance of students that not exposed to CAIS is hindered and affected negatively.

5.5 Recommendations

Computer has become a commonplace entity in all aspects of life. The use of ICT has changed the way business and institutions are governed. Therefore, ICT application in teaching in secondary school education cannot be overemphasized. The major focus of the study was actually to investigate the effect of CAIS strategy and Demonstration method on performance of senior secondary schools students in physics in Bunza Education Zone, Kebbi State. Based on this investigation, it is considered very important to make the following recommendations:

1. Physics teachers should be encouraged to incorporate CAIS for teaching related concepts in Physics since it guarantees improvement and enhances students' performance in the subject.
2. Both male and female students benefit equally when taught Physics using CAIS. Therefore, both sexes should be encouraged to strongly practice most of the physics based courses like Engineering.
3. Conferences, seminars and workshops and relevant programmes should be organized by professionals of ICT to teach physics teachers on modern technology and its application in teaching.

5.6 Limitations of the Study

The limitations of the Study include:

1. The three weeks treatment period was inadequate.
2. Only one topic (SHM) was used for the treatment.

5.7 Suggestion for Further Studies

The study identified areas for further research. These include:

1. Effect of CAIS on students' performance in other topics and subjects can be investigated.
2. Effect of CAIS on students' performance in Private, Technical, Islamic and Arabic secondary schools in Kebbi State can be investigated because the learning conditions in those schools are different.

3. This research concentrated on public schools in one Education Zone in Kebbi State. However, before generalization can be made, extensive researches in other Education Zones need to be carried.
4. The study should be replicated at elementary and tertiary levels

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APPENDICES

Appendix A: Introduction Letter

USMANU DANFODIYO UNIVERSITY, SOKOTO
FACULTY OF EDUCATION AND EXTENSION SERVICES
(Office of the Dean)

15th February, 2017

UDUS/FEES/SM/01

TO WHOM IT MAY CONCERN

INTRODUCTION LETTER IN RESPECT OF: Dauda Sufiyanu ADM NO. 14210415003

I write to introduce the above named Postgraduate student of Department of Science and Vocational Education Faculty of Education and Extension Services, Usmanu Danfodiyo University, Sokoto.

He is undergoing research with topic titled: **"Effect of Demonstration Method and Use of Computer Assisted Instructional package (CAIP) on Secondary School Students' Academic Performance in Physics in Bunza Educational Zone, Kebbi State, Nigeria."**

You may kindly wish to accord him all the necessary assistance he may require.

Thank you

Alh. Sule Gusau
Faculty Officer
For: Dean

Appendix B: Secondary Schools in Six Education Zones in Kebbi State

S/N	Name of Education Zone	No. of Schools	No. of students
1.	Argungu Education Zone	23	1,496
2.	Birnin- Kebbi Education Zone	31	3,486
3.	**Bunza Education Zone**	**26**	**2,280**
4.	Jega Education Zone	21	1,312
5.	Yauri Education Zone	25	2,215
6.	Zuru Education Zone	39	2,940
	TOTAL	**165**	**13729**

Appendix C: Validation Report Form I for CAIS

USMANU DANFODIYO UNIVERSITY, SOKOTO

Faculty of Education and Extension Services

Department of Science and Vocational Education

Validates Assessment Form

This is to certify that I Kamaludeen Sanusi of the department of Department of Technology Education (name of school or establishment) KSUSTA face validated the attached instrument titled Computer Assisted Instructional Package (CAIP) for SHS in Physics and made observations as follows:

i- "MS-Word" in item no 1 should be written in full "Microsoft word"

ii- Item NO 15 should be written as "Start Powerpoint and Click on new slide to add 5 slides"

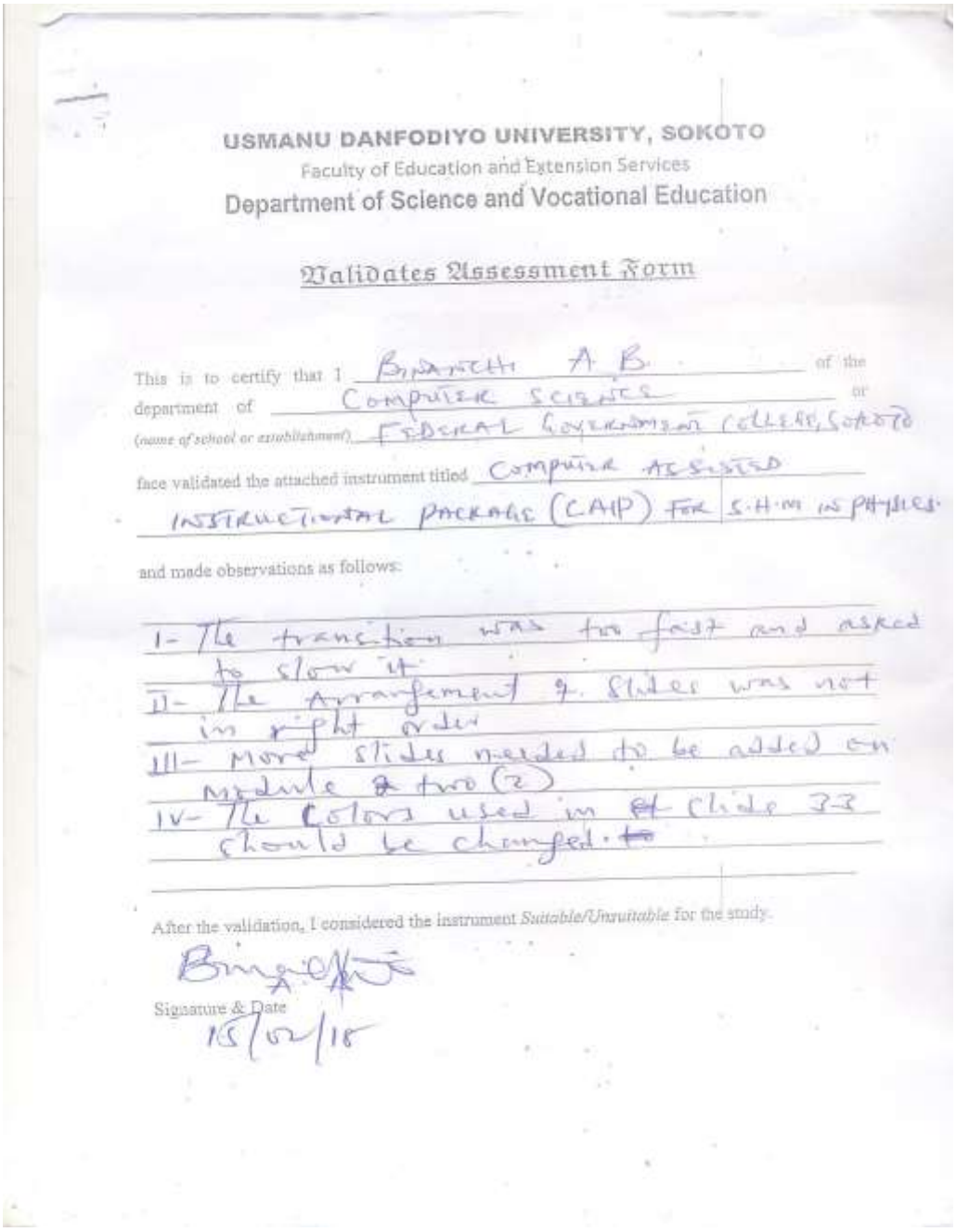
iii- Item no 25 should be written as "Send the whole work to this email: daudasufyan@gmail.com

After the validation, I considered the instrument *Suitable/Unsuitable* for the study.

Kamaludeen Sanusi 09/09/2017

Signature & Date

Appendix D: Validation Report Form II for CAIS



USMANU DANFODIYO UNIVERSITY, SOKOTO

Faculty of Education and Extension Services

Department of Science and Vocational Education

Validates Assessment Form

This is to certify that I BASHEER A. B. of the department of COMPUTER SCIENCE of (name of school or establishment) FEDERAL GOVERNMENT COLLEGE, SOKOTO face validated the attached instrument titled COMPUTER ASSISTED INSTRUCTIONAL PACKAGE (CAIP) FOR S.H.S IN PHYSICS and made observations as follows:

I- The transition was too fast and asked to slow it

II- The Arrangement of Slides was not in right order

III- More slides needed to be added on Module 2 two (2)

IV- The Colors used in Slide 33 should be changed.

After the validation, I considered the instrument *Suitable/Unsuitable* for the study.

Signature & Date

15/02/18

Appendix E: Validation Report Form for SPTP

USMANU DANFODIYO UNIVERSITY, SOKOTO

Faculty of Education and Extension Services

Department of Science and Vocational Education

Validates Assessment Form

This is to certify that I HAMZA MAKAMI Y. of the department of PHYSICS of (name of school or establishment) FEDERAL GOVERNMENT COLLEGE SOKOTO face validated the attached instrument titled STUDENT PERFORMANCE TEST IN PHYSICS (SPTP)

and made observations as follows:

i- The options are ambiguous (Repeating some options).
ii - The units of some questions were not clear.
iii - Question No. 3 is incomplete as it does not give the full parameter needed to calculate the unknown.

After the validation, I considered the instrument *Suitable/Unsuitable* for the study.

09/07/18

Signature & Date

Appendix F: Reliability Index of the Instrument (SPTP)

RELIABILITY

/VARIABLES=VAR00001 VAR00002 VAR00003 VAR00004 VAR00005 VAR00006 VAR00007 VAR00008 VAR00009 VAR00010 VAR00011 VAR00012 VAR00013 VAR00014 VAR00015 VAR00016 VAR00017 VAR00018 VAR00019 VAR00020

/SCALE('ALL VARIABLES') ALL

/MODEL=ALPHA.

Reliability

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	19	95.0
	Excluded[a]	1	5.0
	Total	20	100.0

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

Reliability Statistics

Correlation's Alpha	No of Items
.816	20

Appendix G: Students' Performance Test in Physics (SPTP) SS II

INSTRUCTIONS: Attempt all questions as honestly and carefully as you can, make sure you circle the correct answer.

Time: 45 mins

1. The maximum total energy in the spring is given by

(a) ½ KA^2 (b) ½ KY^2 (c) ½ MV^2 (d) ½ Ke^2

2. The principle of conservation of energy state that the total energy is

(a) Constant (b) Balance (c) equal (d) negative

3. Newton's third law of motion states that "to every action, there is an equal and opposite

(a) Reaction (b) force (c) total action (d) Newton

4. Momentum is the product of body's

(a) Velocity and acceleration (b) mass and velocity (c) mass and acceleration (d) velocity and momentum

5. A particle in circular motion perform 30 oscillations in 6 seconds, its angular speed is

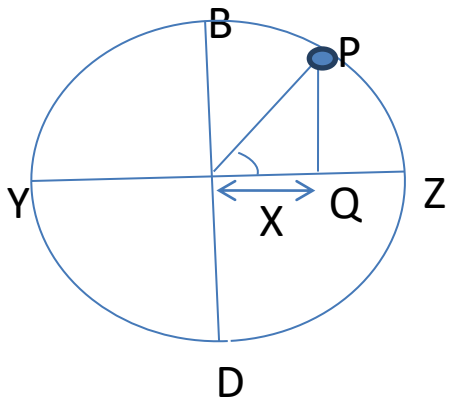
(a) 6 $rads^{-1}$ (b) 10 $rads^{-1}$ (c) 180 $rads^{-1}$ (d) 10 π $rads^{-1}$

6. Which of the following principles is applied in the working of the jet plane? Conservation of

(a) Momentum (b) mass (c) energy (d) charge

7. Mechanical energy is

(a) Kinetic and electric (b) potential and kinetic (c) chemical and potential (d) electric and heat



Use the diagram above to answer questions 8 and 9 in relation to S.H.M

8. The horizontal distance, x of an object, 0 is

(a) X = A sin θ (b) A cos θ (c) AC cos θ (d) A tan θ

9. The uniform speed, v of an object, P moving round the circle is

(a) V = Sr (b) V = ωA (C) ω = θ/t (d) V = r θ

10. Which one of these is not correct?

(a) Ke = ½ mv^2 (b) a = $\omega^2 x$ (c) p.e = mgh (d) w = $m^2 x$

11. Which of the following pair of quantities does not have the same unit?

(a) Acceleration and retardation (b) velocity and speed (c) displacement and distance (d) energy and power

12. The unit of Angular acceleration is

(a) Kms^{-1} (b) $rads^{-1}$ (c) $grads^{-1}$ (d) $rads^{-2}$

13. Motion which repeats itself at regular interval is

(a) Linear motion (b) vibration motion (c) circular motion (d) random motion

14. The maximum displacement of a body performing simple harmonic motion from its central position is

(a) Period (b) amplitude (c) frequency (d) wavelength

15. Which of these best describe the relationship between angular acceleration and linear acceleration

(a) $\theta = wt$ (b) $v = \omega r$ (c) $a = dr$ (d) $v = \omega f$

16. A simple pendulum with a period of 2 sec has its length doubled, its new period is

(a) 1.00 sec (b) 1.41 sec (c) 2.83 sec (d) 4.00 sec

17. The maximum horizontal range is attained when the angle is

(a) 360^0 (b) 90^0 (c) 60^0 (d) 30^0

18. Which of the following does not describes Newton's seconds law of motion

(a) $f = mv - \frac{mu}{t}$ (b) m = f x d (c) f = ma (d) a = mv

19. Two cars moving in the same direction have speed of 100km/h and 130 km/h. what is the velocity of the fastest car?

(a) 130 km/h (b) 230 km/h (c) 200 km/h (d) 30 km/h

20. A particle of Angular speed of $8\pi rads^{-1}$ moves in a circular path of radius 2m. Calculate the magnitude of its acceleration.

(a) $4^2\ \pi ms^{-2}$ (b) $16\ \pi^2 ms^2$ (c)$128\ \pi^2 ms^{-2}$ (d) $32\pi^2 ms^{-2}$

Culled from:

- SS 2 Physics past questions from examinations department of Secondary school Management board (SSMB) Kebbi state.
- New school Physics for Ssenior Secondary School, authored by M. W. Anyakoha.
- Comprehensive Physics for Senior Secondary Schools, authored by G. N. Ezeburo

Appendix H: Marking Scheme for SPTP SS 2

1	D	11	D
2	A	12	D
3	A	13	B
4	D	14	B
5	B	15	B
6	A	16	B
7	B	17	B
8	B	18	D
9	A	19	A
10	D		

Appendix I: Lesson Plan I for Control Group

Name of Teacher:	Dauda Sufyanu
School:	GSS Kamba
Class:	SS2
Subject:	Physics
Topic:	Simple Harmonic motion (SHM)
Duration:	40 minutes
Gender:	Boys
Age	14-16 years
Reference Book:	New School Physics for Senior Secondary Schools by Anyakoha
Previous knowledge:	Students are familiar with motion and its type
Behavioral objectives: to:	By the end of the lesson students should be able

- Define Simple Harmonic Motion
- State examples of Simple Harmonic Motion
- Define Restoring force

Introduction:	The teacher introduces the lesson by defining motion as change of body's position caused by external force
Presentation:	The teacher presents the lesson through the following steps:
Step I	The teacher will define and explain the term S.H.M as the to and fro movement of the objects

	whose acceleration is always directed towards a fixed point and proportional to the displacement from that point
Step II	The teacher states example of bodies that under go SHM, such as, Guitar thread, simple pendulum, etc
Step III	The teacher define Restoring force as the force that acts in the direction opposite to the displacement of the oscillating body
Evaluation:	The teacher evaluates the lesson by asking students to mention some examples of SHM
Conclusion	The teacher concludes the lesson by summarizing the key points such as, the reason why body returns back to resting position is restoring forces

Appendix J: Lesson Plan II for Control Group

Name of Teacher:	Dauda Sufyanu
School:	GSS Kamba
Class:	SS2
Subject:	Physics
Topic:	Simple Harmonic motion (SHM)
Duration:	40 minutes
Gender:	Boys
Age	14-16 years
Reference Book:	New School Physics for Senior Secondary Schools by Anyakoha
Previous knowledge:	Students are familiar with motion and its type
Behavioral objectives:	By the end of the lesson students should be able to: - Define terms associated to Simple Harmonic Motion - Define circular motion and Simple Harmonic Motion - Define period of a mass on a string
Introduction:	The teacher introduces the lesson by revising the previous knowledge
Presentation:	The teacher presents the lesson through the following steps:
Step I	The teacher will define and explain the terms such as

- **AMPLITUDE (A):** Is the maximum displacement of an object performing SHM from its equilibrium or central position. The unit is meter (m)
- **PERIOD (T):** Is the total time taken by a vibrating body to make one complete oscillation or revolution or vibration. T=t/n. The unit is second (s)
- **FREQUENCY (f):** is the number of complete oscillation performed in one second. F=1/T or F=n/t. The unit is Hertz
- **ANGULAR VELOCITY (w):** is the change of angle per second. i.e. **= θ/t or 2πf.** The unit is rad/s

Step II	The teacher explain the relationship between circular motion and SHM through the reference circule
Step III	The teacher explainsthat as the mass increases, the period too increases. Also as the spring stiffness increases the period too increases
Evaluation:	The teacher evaluates the lesson by asking students to define some terms
Conclusion	The teacher concludes the lesson by summarizing the key points such as, the more the mass the period increases

Appendix K: Lesson Plan I for Experimental Group

Name of Teacher:	Dauda Sufyanu
School:	Government Day Girls College, Kende
Class:	SS2
Subject:	Physics
Topic:	Simple Harmonic motion (SHM)
Duration:	40 minutes
Gender:	Girls
Age	14-16 years
Reference Book:	New School Physics for Senior Secondary Schools by Anyakoha
Previous knowledge:	Students are familiar with motion and its type
Behavioral objectives:	By the end of the lesson students should be able to: - Define Simple Harmonic motion (SHM) - State examples of Simple Harmonic motion (SHM) - Define Restoring force
Teaching Aid:	Computer, projector, CAIS
Introduction:	The teacher introduces the lesson by defining the term Motion
Presentation:	The teacher presents the lesson through the following steps:
Step I	The teacher willplay the CAIS on the computer set displayed on projector for student seeing and interaction
Step II	The teacher will be explaining to the students the content while the power point displaying the note and pictures on the screen

Step III	The teacher will be changing the slides and interacting with the students continuously
Evaluation:	The teacher evaluates the lesson by asking students to mention examples of SHM
Conclusion	The teacher concludes the lesson by summarizing the key points such as, the reason why body returns back to resting position in restoring forces

Appendix L: Lesson Plan II for Experimental Group

Name of Teacher:	Dauda Sufyanu
School:	GSS Kamba
Class:	SS2
Subject:	Physics
Topic:	Simple Harmonic motion (SHM)
Duration:	40 minutes
Gender:	Boys
Age	14-16 years
Reference Book:	New School Physics for Senior Secondary Schools by Anyakoha
Previous knowledge:	Students are familiar with motion and its type
Teaching Aid:	Computer, projector, CAIS
Behavioral objectives: to:	By the end of the lesson students should be able

- Define terms associated to Simple Harmonic Motion
- Define circular motion and Simple Harmonic Motion
- Define period of a mass on a string

Introduction:	The teacher introduces the lesson by revising the previous knowledge
Presentation:	The teacher presents the lesson through the following steps:

Step I	The teacher will define and explain the terms such as • **AMPLITUDE (A):** Is the maximum displacement of an object performing SHM from its equilibrium or central position. The unit is meter (m) • **PERIOD (T):** Is the total time taken by a vibrating body to make one complete oscillation or revolution or vibration. T=t/n. The unit is second (s) • **FREQUENCY (f):** is the number of complete oscillation performed in one second. F=1/T or F=n/t. The unit is Hertz • **ANGULAR VELOCITY (w):** is the change of angle per second. i.e. **= θ/t or 2πf.** The unit is rad/s
Step II	The teacher explain the relationship between circular motion and SHM through the reference circule
Step III	The teacher explainsthat as the mass increases, the period too increases. Also as the spring stiffness increases the period too increases
Evaluation:	The teacher evaluates the lesson by asking students to define some terms

Conclusion	The teacher concludes the lesson by summarizing the key points such as, the more the mass the period increases

Appendix M: Students' Performance Scores

	STUDENTS' SCORES OF GDSS KENDE (GIRLS)				STUDENTS' SCORES OF GSS BAGUDO (BOYS)			
	CAIS GROUP (EXP.)		DEM. GROUP		CAIS GROUP (EXP.)		DEM. GROUP	
S/N	PRETEST	POSTEST	PRETEST	POSTEST	PRETEST	POSTEST	PRETEST	POSTEST
1	12	14	9	14	14	17	11	14
2	11	19	11	16	10	18	12	15
3	10	17	7	13	11	19	10	10
4	11	20	8	14	12	17	13	10
5	10	17	8	17	13	15	8	13
6	12	18	9	15	13	18	9	10
7	10	19	9	18	11	12	12	15
8	9	18	11	12	10	13	10	14
9	10	19	10	11	10	16	12	12
10	13	18	15	14	14	14	9	11
11	10	19	11	12	12	15	11	14
12	9	20	10	14	14	18	12	14
13	9	17	11	12	13	18	10	13
14	10	18	12	14	14	16	13	17
15	12	17	11	16	17	17	8	15
16	9	18	10	12	15	19	9	18
17	11	19	11	10	12	18	9	12
18	7	19	11	12	10	19	9	13
19	9	20	12	14	9	18	11	14
20	8	15	10	17	12	19	9	10
21	10	17	9	14	13	20	11	10
22	14	18	12	17	14	17	7	10
23	10	15	13	12	9	18	10	11
24	11	15	4	18	8	17	11	13
25	10	16	9	12	7	18	14	15
26	11	14	10	11	7	19	13	17
27	11	19	10	14	6	19	11	12
28	12	17	12	13	11	20	7	14
29	10	17	15	14	7	15	8	13
30	9	18	11	12	8	17	10	17
31	12	17	7	15	8	18	12	10
32	8	20	8	15	9	15	9	15
33	9	13	8	12	11	15	11	14
34	2	14	9	13	13	16	12	14
35	10	17	14	14	13	16	10	13
36	12	16	13	17	12	19	13	17
37	13	15	13	15	11	17	8	15
38			12	18	3	14	9	14

39	11	12	11	18	9	12
40	11	11	14	17	9	13
41	11	14	10	13	11	14
42	11	14	15	14	7	10
43	12	13	14	14	10	10
44	10	17	18	10	11	10
45	9	15	4	18	14	14
46	12	10	13	18	13	14
47	13	12	14	16	11	13
48	14	13	17	17	8	15
49	9	14	15	19	10	14
50	10	10			12	12
51	10	10			9	13
52	12	10			11	14
53	14	17			13	13
54					12	10
55					7	9

	STUDENTS' SCORES OF GGSS BUNZA (GIRLS)				STUDENTS' SCORES OF GSS KAMBA (BOYS)			
	CAIS GROUP (EXP.)		DEM. GROUP		CAIS GROUP (EXP.)		DEM. GROUP	
S/N	PRETEST	POSTEST	PRETEST	POSTEST	PRETEST	POSTEST	PRETEST	POSTEST
1	13	15	11	10	12	17	10	13
2	14	15	9	10	11	18	12	15
3	17	16	10	10	8	17	9	17
4	15	17	14	11	11	17	11	12
5	12	18	12	13	14	15	12	14
6	10	17	12	15	11	14	9	10
7	9	17	9	17	12	19	12	11
8	12	15	11	12	10	20	10	13
9	13	17	12	14	13	16	12	15
10	14	19	10	13	8	17	9	17
11	9	20	13	17	9	19	11	12
12	8	16	8	10	12	18	12	14
13	7	17	9	15	10	18	10	13
14	7	19	9	14	12	18	13	17
15	6	18	9	14	9	19	8	10
16	11	18	11	13	11	20	9	15
17	7	18	7	17	12	17	14	12
18	8	19	10	15	10	18	11	13
19	8	20	11	14	13	17	12	14
20	9	17	14	12	8	18	10	10
21	11	18	13	13	9	19	13	10
22	13	17	11	14	9	19	8	10
23	7	18	7	10	9	20	9	10
24	12	19	8	16	11	15	12	11
25	11	19	10	17	9	17	10	13
26	7	20	12	19	11	18	12	15
27	14	17	11	11	7	16	9	17
28	12	15	12	18	10	15	11	12
29	10	15	10	14	11	16	12	14
30			13	13	14	14	10	13
31			14	14	11	19	13	17
32			17	12	7	17	8	10
33			15	17	8	18	9	15
34			12	18	10	15	12	11
35			10	19	11	17	10	13
36			9	19	9	18	12	15

37	12	20	10	17	9	17
38	13	10	14	17	11	12
39	14	10	12	15	12	14
40	9	10	9	17	10	13
41	8	11	9	19	13	17
42			11	20	8	10
43			12	16	9	14
44			10	17	9	14
45			13	19	11	13
46			8	18	8	10
47			10	16	9	15
48			11	14	12	11
49			12	19	10	13
50			10	20	12	15
51			13	16		
52			8	17		
53			9	19		
54			12	18		
55			10	18		
56			12	18		
57			11	20		
58			12	17		
59			10	18		
60			13	17		
61			8	18		
62			9	19		
63			9	20		

Appendix N: SPSS T-Test Analysis of Students' Performance taught Physics with CAIS and those taught with Demonstration Method

Group Statistics

	Students taught with CAIS and those taught with Demonstration method	N	Mean	Std. Deviation	Std. Error Mean
PRETEST	CAI STRATEGY	178	10.6685	2.50586	.18782
	DEMONSTRATION METHOD	199	10.6683	1.96961	.13962
POSTTEST	CAI STRATEGY	178	17.2584	1.83517	.13755
	DEMONSTRATION METHOD	199	13.4925	2.41182	.17097

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	T	Df
PRETEST	Equal variances assumed	6.183	.013	.001	375
	Equal variances not assumed			.001	335.175
POSTTEST	Equal variances assumed	14.864	.000	16.909	375
	Equal variances not assumed			17.162	365.825

Independent Samples Test

		t-test for Equality of Means			
		Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
					Lower
PRETEST	Equal variances assumed	.999	.00020	.23096	-.45395
	Equal variances not assumed	.999	.00020	.23403	-.46016
POSTTEST	Equal variances assumed	.000	3.76596	.22273	3.32802
	Equal variances not assumed	.000	3.76596	.21943	3.33446

Independent Samples Test

		t-test for Equality of Means
		95% Confidence Interval of the Difference
		Upper
PRETEST	Equal variances assumed	.45435
	Equal variances not assumed	.46056
POSTTEST	Equal variances assumed	4.20391
	Equal variances not assumed	4.19747

Appendix O: SPSS T-TEST Analysis of Male and Female Students' Performance taught Physics with CAIS

Group Statistics

	GENDER	N	Mean	Std. Deviation	Std. Error Mean
PRETEST	MALE	112	10.9821	2.45310	.23180
	FEMALE	66	11.1970	2.34173	.28825
POSTTEST	MALE	112	17.0893	2.08622	.19713
	FEMALE	66	17.0909	2.19599	.27031

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	T	df
PRETEST	Equal variances assumed	.040	.842	-.574	176
	Equal variances not assumed			-.581	141.579
POSTTEST	Equal variances assumed	.002	.967	-.005	176
	Equal variances not assumed			-.005	130.852

Independent Samples Test

	t-test for Equality of Means			
	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
				Lower

PRETEST	Equal variances assumed	.567	-.21483	.37438	-.95367
	Equal variances not assumed	.562	-.21483	.36989	-.94604
POSTTEST	Equal variances assumed	.996	-.00162	.33013	-.65314
	Equal variances not assumed	.996	-.00162	.33455	-.66346

Independent Samples Test

		t-test for Equality of Means
		95% Confidence Interval of the Difference
		Upper
PRETEST	Equal variances assumed	.52402
	Equal variances not assumed	.51639
POSTTEST	Equal variances assumed	.64990
	Equal variances not assumed	.66021

Appendix P: SPSS T-TEST Analysis of Male and Female Students' Performance taught Physics with Demonstration Method

Group Statistics

	GENDER	N	Mean	Std. Deviation	Std. Error Mean
PRETEST	MALE	105	10.4190	2.15184	.21000
	FEMALE	94	10.6277	2.03720	.21012
POSTTEST	MALE	105	13.6190	2.53961	.24784
	FEMALE	94	13.4362	2.31200	.23846

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	T	df
PRETEST	Equal variances assumed	.424	.516	-.700	197
	Equal variances not assumed			-.702	196.373
POSTTEST	Equal variances assumed	.642	.424	.529	197
	Equal variances not assumed			.532	196.941

Independent Samples Test

	t-test for Equality of Means			
	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference

					Lower
PRETEST	Equal variances assumed	.485	-.20861	.29797	-.79624
	Equal variances not assumed	.483	-.20861	.29707	-.79447
POSTTEST	Equal variances assumed	.597	.18288	.34573	-.49892
	Equal variances not assumed	.596	.18288	.34393	-.49539

Independent Samples Test

		t-test for Equality of Means
		95% Confidence Interval of the Difference
		Upper
PRETEST	Equal variances assumed	.37901
	Equal variances not assumed	.37724
POSTTEST	Equal variances assumed	.86468
	Equal variances not assumed	.86114