EFFECT OF COMPUTER ASSISTED INSTRUCTION ON PERFORMANCE OF SENIOR SECONDARY SCHOOL STUDENTS IN AGRICULTURAL SCIENCE IN KADUNA STATE, NIGERIA

BY

Sa'adu, Zailani ABUBAKAR
B.Sc Ed (A.B.U, Zaria) 2009.
(M.SC/EDUC/12828/2010-2011)

A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA. IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN AGRICULTURAL EDUCATION.
DEPARTMENT OF VOCATIONAL AND TECHNICAL EDUCATION,
FACULTY OF EDUCATION
AHMADU BELLO UNIVERSITY, ZARIA - NIGERIA

SEPTEMBER, 2015

DECLARATION

I hereby declare that this Dissertation has been carried out by me under the supervision of Prof. B. M. Ndomi and Dr. D. O. Oni. It has not been presented in any previous application for a higher degree. All the sources of information are specifically acknowledged and included in the reference.

_____ _____

Sa'adu, Zailani ABUBAKAR Signature/Date
(M.Sc/Educ/12828/2010-11)

CERTIFICATION

This Dissertation titled "Effect of Computer Assisted Instruction on Performance of Senior Secondary School Students in Agricultural Science in Kaduna State, Nigeria" by Sa'adu Abubakar Zailani meets the regulations governing the award of Master of Science in Agricultural Education of Ahmadu Bello University, Zaria and is approved for its contribution to knowledge and literary presentation.

_____ _____

Prof. B. M. Ndomi — Date
Chairman, Supervisory Committee

_____ _____

Dr. D. O. Oni — Date
Member, Supervisory Committee

_____ _____

Prof. A. A. Udoh — Date
Head of Department
(Vocational and Technical Education)

_____ _____

Prof. K. Bala — Date
Dean, School of Postgraduate Studies

DEDICATION

This Dissertation is dedicated to the following people:

a. Hajiya Madinatu Aliyu - Mother
b. Alh. Abubakar S. Zailani - Father
c. Mal. Mustapha Abubakar - Brother
d. Mal. Abdulkadir A. Zailani - Brother
e. Aisha Isah Tukur - Wife
f. Mus'ab Sa'adu Abubakar - Son
g. Safiyya Sa'adu Abubakar - Daughter

ACKNOWLEDGEMENTS

The researcher is most grateful to Almighty Allah, the Most High and the Beneficent, for helping him towards the successful completion of this work. The researcher specifically acknowledges, the contributions of some individuals. His special and sincere appreciation goes to his supervisors, in the persons of Prof. B. M. Ndomi and Dr. D. O. Oni for their untiring efforts, constructive criticisms, patience, love and objectivity throughout the period of this thesis. The researcher would also like to acknowledge the contribution of the Internal Examiners, Dr. (Mrs) M. F. Ahuwan and Prof. (Mrs) T. O. Ojo for their valuable contributions to the work. The same gesture is extended to Prof. A. A. Udoh, the Head of the Department of Vocational and Technical Education and all other members of the Postgraduate Committee in the Department. The researcher's appreciation also goes to Dr. Sani Ibrahim, the Postgraduate Studies Coordinator of the Department of Vocational and Technical Education, Ahmadu Bello University, for his assistance.

The researcher acknowledges the assistance and encouragement of Dr. Adamu Ibrahim and Mal. Lawal Abubakar of the Department of Vocational and Technical Education and Mal. Jamilu Abdullahi of the National Agricultural Extension Research and Liasion Services ABU, Zaria. The researcher is grateful to Mal. Kasimu Ibrahim of the Demonstration Secondary School, ABU, Zaria who analysed the data and Mal. Buhari Abdulraheem of the Department of Vocational and Technical Education Ahmadu Bello University, Zaria. His appreciation goes to all course mates, particularly Gambo Aliyu, Yahaya Musa, Bello Jatau Daniel, Tanko Hassan, Abaji Akumave for their contributions to the success of this work. The researcher's acknowledgment is extended to all members of his family for their encouragement during the period of this study. In this regard, special appreciation goes to his loving wife, Aisha and the children.

TABLE OF CONTENTS

Title Page		i
Declaration		ii
Certification		iii
Dedication		iv
Acknowledgement		v
Table of Contents		vi
List of Tables		viii
List of Appendices		ix
List of Abbreviation		x
Operational Definition of Terms		xi
Abstract		xii
CHAPTER ONE: INTRODUCTION		
1.1 Background to the Study		1
1.2 Statement of the Problem		3
1.3 Objectives of the Study		3
1.4 Research Questions		4
1.5 Research Hypotheses		4
1.6 Significance of the Study		5
1.7 Basic Assumptions of the Study		6
1.8 Delimitation of the Study		6
CHAPTER TWO: REVIEW OF RELATED LITERATURE		
2.1	Theoretical Framework	7
2.2.	Concept of Computer Assisted Instruction	8
2.2.1	Models of Computer Assisted Instruction	12
2.2.2	Types and Characteristics of Computer Assisted Instruction	13
2.3	Benefit of Computer Assisted Instruction	15
2.4	Problems Associated with Computer Assisted Instruction	17
2.5	Concept of Academic Performance	19
2.6	Traditional Methods of Teaching Agricultural Science in Senior Secondary Schools	20
2.7	Related Empirical Studies	30
2.8	Summary of Literature Reviewed	34

CHAPTER THREE: RESEARCH METHODOLOGY

3.1	Research Design	35
3.2	Population of the Study	36
3.3	Sample Size and Sampling Procedure	36
3.4	Instrument for Data Collection	37
3.4.1	Validation of the Instrument	37
3.4.2	Pilot Study	38
3.4.3	Reliability of the Instrument	38
3.5	Procedure for Data Collection	38
3.6	Procedure for Data Analysis	39

CHAPTER FOUR: PRESENTATION AND ANALYSIS OF DATA

4.1	Answers to the Research Questions	40
4.2	Test of Null Hypotheses	43
4.3	Summary of the Major Findings	48
4.4	Discussion of the Major Findings	49

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1	Summary	53
5.2	Conclusion	54
5.3	Recommendations	55
5.4	Suggestions for Further Studies	55
REFERENCES		56
APPENDICES		64

LIST OF TABLES

3.1:	Population for the Study	36
3.2:	Sample Size for the Study	37
4.1:	Mean of the test scores on the effect of using CAI and conventional method on the performance of students in objective test	40
4.2:	Mean of the test scores on the effect of using CAI and conventional method on the performance of students in essay test	41
4.3:	Mean scores on the performance of students on experimental and control group within the three zones in Kaduna state	42
4.4:	Mean scores on the performance of students on experimental and control group across the three zones in Kaduna state	43
4.5:	ANOVA test of differences in performance in objective test of senior secondary school students in Kaduna state using CAI and conventional method	44
4.6:	ANOVA test of differences in performance in essay tests of senior secondary school students in Kaduna state using CAI and conventional method	45
4.7:	ANOVA test of differences in performance between students with CAI and those with conventional method in objectives and essay test	46
4.8:	ANOVA test of differences in performance of students between the three senatorial zone in Kaduna state	47

LIST OF APPENDICES

A:	Letter of Introduction	64
B:	Lesson Plan	65
C:	Student Achievement Test	69
D:	Answer to Student Achievement Test	72
E:	The Print out of Data Analyses	74

LIST OF ABBREVIATIONS

ANOVA:	Analysis of Variance
ASAT:	Agricultural Science Achievement Test
CAI:	Computer Assisted Instruction
CAL:	Computer Aided/Assisted Learning
CBI:	Computer Based Instruction
CEI:	Computer Enriched Instruction
CMI:	Computer Managed Instruction
CSILE:	Computer Supported International Learning Environment
ESC:	Education System Corporation
FME:	Federal Ministry of Education
HMD:	Hypermedia Design
ILS:	Integrated Learning System
ISD:	Instructional System Design
MBL:	Micro Computer Based Laboratories
NECO:	National Examinations Council
NERDC:	Nigerian Educational Research and Development Council
SME:	State Ministry of Education
SPSS:	Statistical package for Social Sciences
SSS:	Senior Secondary School
UBEB:	Universal Basic Education Board
VLE:	Visual Learning Environment
WAEC:	West African Examination Council
WASSCE:	West African Senior School Certificate Examination

OPERATIONAL DEFINITION OF TERMS

Academic Performance: This refers to the numerical scores of a pupil's knowledge which measures the degree of a pupil's adaptation to school work and to the educational system.

Computer Assisted Instruction: Is an instructional technology designed for a course and used for the purpose of teaching and learning, both within and outside the classroom setting.

Information and Communication Technology: It is the technology used for assessing, gathering, manipulating, processing, storing, presenting and communicating information.

Traditional Method of Teaching: These are conventional teaching methods used in teaching and learning process. Example are; lecture, demonstration and discussion methods of teaching. It is also called conventional method of teaching.

ABSTRACT

The study established the Effect of Computer Assisted Instruction on Performance of Senior Secondary School Students in Agricultural Science in Kaduna State, Nigeria. Four specific objectives and four research questions were stated, while four null hypotheses were formulated and tested for the study. The objectives included; to determine the effect of using CAI and conventional method for teaching Agricultural Science and to determine the effect of using CAI and conventional method for teaching Agricultural Science on performance in objective test in senior secondary schools in Kaduna state. The research design adopted for the study was quasi pre-test and post-test experiment. The population of the study was 1,521 first year senior secondary school students of the nine senior secondary schools that have computer laboratories in Kaduna state, offering agricultural science. Ninety senior secondary students from three selected schools in the three senatorial zones in Kaduna state were used as the sample. The experimental group was exposed to Computer Assisted Instruction package, while the control group was taught the same topic using conventional method. Twenty multiple choice questions and two essay questions in the Agricultural Science Achievement Test. Instrument with a reliability coefficient of 0.89 was used to collect data. Data were analyzed using mean, and standard deviation to answer the research questions and Analysis of Variance (ANOVA) was used to test the null hypotheses. Null hypotheses were tested at 0.05 level of significance. The findings of the study showed that, there was a significant difference between the pre-test and post-test result in the objective test. Similarly, the study revealed that there was a significant different between the pre-test and port-test result of the essay test for agricultural science students. There was a significant difference in the post-test experimental group in zone II compared with zone 1 and zone III. It was concluded that Computer Assisted Instruction significantly enhanced the performance of students in Agricultural Science because those students taught using CAI performed significantly better than those taught using conventional teaching method in agricultural science. Among the four recommendations made was that agricultural science teachers should be trained in the use of computer packages in teaching agricultural sciences through workshops, seminars and induction courses to be organized by the Ministry of Education.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The way things are done in homes, work places and in schools are constantly changing all over the world. The e-mail, e-learning and other uses of computers are definitely influencing lives, and can enhance the learning process in the schools. The recognition of the value of computers in the teaching-learning process in the contemporary world introduced computer education into the Nigerian school curriculum in 1989 (Achuonye, 2011). This in effect means that students can proceed at their own time, following a path through the curriculum suited for their interest and talent. According to Yusuf and Afolabi (2010), the use of computer assisted instruction (CAI) as a supplement to conventional method produced higher achievements by the learners than using conventional method alone. computer assisted instruction is a user friendly learning technique, usually involving interaction of students with programmed instructional materials. The use of CAI is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. Computer Assisted Instruction uses a combination of text, graphics, sounds and video in enhancing the learning process. It also refers to the use of computer as a tool to facilitate and improve instructions. It uses tutorials, drills and practice, simulation and problem solving approaches in the teaching and learning process. (Patrick, 2003). computer assisted instruction according to Bamidele (2001) and Akinola and Adodo (2002) is a process by which students learn and know on their own field of study or a topic broken into bits according to level and ability. The purpose of CAI for students is to make them progress and provide solution to the problems of teaching and learning process.

Computer provides immediate feedback, for students to know whether their answer is correct or not. It also offers different types of activities and a change of pace from teacher to group instructions. The function of CAI are captured and listed by Osuwa (2002) as follows:

1. Assessing students capabilities with a pre-test
2. Presenting educational materials in navigable form.
3. Providing repetitive drills to improve the student's command of knowledge.
4. Providing game based drills to increase activities.
5. Assessing students progress in a post-test.
6. Routing students through a series of course of instructional programme.

Academic performance refers to what students' achieve in their studies and how the cope with or accomplish different learning experiences given to them by their teachers. Flegm (2005) reports that in educational institutions, success is measured by academic performance, or how well the students meet the standard set out by the institution. Teaching method is described as a combination of several teaching behaviors and the way they are put together to bring about positive change in learners (Nzewi, 1999). Meanwhile, teaching behavior is a deliberately and actively made by a teacher to help a pupil to learn. It involves the teacher initiating a number of activities such as writing, speaking and use of number of non-verbal signals such as nodding of the head and use of hands to indicate directions and the use of nearly all visible aspects of the body to communicate the content, form, concepts, and principles of what is to be learned. On the other hand, Universal Basic Education Board (UBEB) (2008) sees teaching method as ability for a purpose of understanding. The further describes it as supporting device which a teacher uses to emphasize ideas, point, beliefs etc through communication and manipulation of resources. Teaching method

can also be described as the way a teacher organizes teaching process. Teaching methods is also a process of imparting knowledge, ideas and beliefs on a person or group. This means generally a guideline for promoting teaching and learning which involves various ways of manipulating instructional resources and communication to make the learner receive the teacher's message clearly. Teaching method can therefore be said to be the most fundamental aspects of education and it is a central issue in teaching. There are many senior secondary schools in the study area that use conventional methods of teaching students but the use of CAI as a method of teaching is very scarce and other researches like Yusuf (2010) show that CAI has effect on the performance of senior secondary school students in biology. Therefore, it is important to use this method of teaching for better performance of the students.

1.2 Statement of the Problem

Despite the initiatives, mandates, recommendations by different government organizations, policies, and the ever-increasing use of technology worldwide, it has been observed that computers are not being used effectively by the teachers (other than computer science teachers) teaching various subjects like agricultural science. Computers are not sufficiently integrated across the curriculum. Computers are not being used sufficiently and properly by the school teachers. The world is changing with the use of technology and CAI has been adjudged as potent technique for effective teaching and learning. The use of CAI in teaching and learning of agricultural science in Kaduna State was discourage and this none and poor usage of CAI in teaching and learning led to poor teaching by agricultural science teachers. The resulted effect was poor understanding of the subject and many failures in agricultural science external examination such as WAEC and NECO.

1.3 Objective of the Study

The main objective of the study was to establish the effect of CAI on performance of senior secondary school students in agricultural science in Kaduna State, Nigeria. The specific objectives of the study were to:

1. determine the effect of using CAI and conventional method for teaching agricultural science on performance in objective test in senior secondary school students in Kaduna state.
2. determine the effect of using CAI and conventional method for teaching agricultural science on performance in essay test of senior secondary school students in Kaduna state.
3. compare the performance of students who were taught agricultural science using CAI and those taught using conventional method in the senatorial zones.
4. compare the performance of students who were taught agricultural science using CAI and those taught using conventional method between the senatorial zones.

1.4 Research Questions

The following research questions were asked to guide the study:

1. What is the effect of using CAI and conventional method for teaching agricultural science on the performance in objective tests of senior secondary school students in Kaduna state?
2. What is the effects of using CAI and conventional method for teaching agricultural science on the performance in essay test of senior secondary school students in Kaduna state?
3. What is the performance of students who were taught agricultural science using CAI and those taught using conventional method in the senatorial zones?

4. What is the performance of students who were taught agricultural science using CAI and those taught using conventional method between the senatorial zones?

1.5 Research Hypotheses

The following null-hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the performance of senior secondary school students in objective test when taught with CAI and conventional method of teaching in Kaduna state.
2. There is no significant difference between the performance of senior secondary school students in essay test when taught with CAI and conventional method of teaching in Kaduna state.
3. There is no significant difference between the performance of students taught agricultural science using CAI and those taught without it in the senatorial zones.
4. There is no significant difference between the performance of students taught agricultural science using CAI and those taught without it between the senatorial zones.

1.6 Significance of the Study

The findings of this study would be useful to curriculum developers and planners in the educational sector, implementers of the curriculum, agricultural science teachers, students of agricultural science, parents, and in other perspectives.

The result would assist the curriculum developers and planners in educational sectors which is Nigerian Educational Research and Development Council (NERDC) that are responsible for developing curriculum in secondary schools in Nigeria through some modifications. It would be great assistance to implementers of the curriculum who are the general teachers in the secondary school education.

Through publications and seminars, the result of the study would be made available to agricultural science teachers to give more attention and efforts by the use of CAI in the teaching and learning processes. It would also be significant to students of agricultural science in their study since their time were effectively utilized in acquiring the subject matter. Parent would definitely benefit from the result of the study, which would be brought to their knowledge of the performance of their children and know how to plan ahead in their career choices and job security.

The study would also be significant in assisting policy makers in the Federal Ministry of Education (FME) and State Ministry of Education (SME) in domesticating the curriculum across all schools under their management and ensure that the curriculum is aligned with the prescribed content standard among other useful applications. The findings of this study would bring about improvement in the performance of students in external examination like; West African Senior School Certificate Examination (WASSCE) and National Examination Council (NECO).

1.7 Basic Assumptions of the Study

In this study, the following assumptions were made that:

1. teaching students with Computer Assisted Instruction (CAI) method will make high performance than teaching without CAI.
2. the students have little knowledge of computer despite the fact that they have completed their junior secondary schools.
3. most of the schools have unqualified Agricultural Science teachers and computer laboratories.

1.8 Delimitation of the Study

The study was delimited to senior secondary school agricultural science students of Barewa College Zaria, Capital School Kaduna and Government Secondary school

Godogodo. These schools were chosen because they had electricity supply, Computers and offer Agricultural Science up to SSCE level. It was also delimited to SSS 1 students of Agricultural Science.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

The related literatures were reviewed under the following sub-headings:

2.1 Theoretical Framework

2.2. Concept of Computer Assisted Instruction

2.2.1 Models of Computer Assisted Instruction

2.2.2 Types and Characteristics of Computer Assisted Instruction

2.3 Benefit of Computer Assisted Instruction

2.4 Problems Associated with CAI

2.5 Concept of Academic Performance

2.6 Traditional Methods of Teaching Agricultural Science in Senior Secondary Schools

2.7 Empirical Studies

2.8 Summary of Literature Reviewed

2.1 Theoretical Framework

The theoretical basis of the study, derived from the operant conditioning by Skinner as described by Owusu et al. (2010). Operant conditioning is a type conditioning in which a learner achieves some outcome by producing an action, which is called the operant. If the operant is followed by something pleasant, the outcome is positively reinforced but if it is followed by the removal of something unpleasant, the outcome is negatively reinforced. The theory was influential during the day of the Audio Lingual method which lost favour in 1960's, and revived after the introduction of the use of computers into education. Skinner's reinforcement theory is central to computerized learning; especially drill and practice and tutorial learning (Owusu et al., 2010). In this, computer facilitates learning, students' behaviors are reinforced by

being to proceed to the next frame when they get the right answer (Bigge & Sharmis, 2004). According to Owusu et al. (2010) "the use of computer assisted instruction especially in tutorials, which are supported mostly by the behaviorist view of learning. This is due to the principle of practice and reinforcement. Therefore, the developers of tutorials mostly incorporate this theory of learning in their programme".

This study makes use of the operant conditioning deriving from the practices of Skinner's behaviorism. The materials and activities are presented in graded steps. Learners have the opportunity to be active in the learning process and receive immediate feedback and work at their own pace.

2.2 Concept of Computer Assisted Instruction (CAI)

Computers are already in use in banks, large firms, schools, transport companies, the armed forces and other related disciplines. The Ministry of Education is involved in decision making by using computer in education, training teachers and development in educational technology. (Aubineau, 1996). Instructional materials are among the materials which teachers use to make instruction more effective, lasting and enjoyable. Computers are used in organizations and companies for different activities and also used in the classroom. It is used both as a material, method and instructional medium that is effective for making students concentrate on, understanding of synthesizing and approving positive attitude towards teaching and learning process.

As a result of instructional programme that are supported by a variety of sound, image and animations, it is observed that teaching and learning will become more lasting, enjoyable and effective. For these reasons, the development of a software that is supported by visual and audio instructional material such as CAI will draw the attention of students, promote their interest, motivate, interact as well as provide improvement in the teaching and learning process.

The present day, students are maturing with visual devices like television, video, computer and internet. It is not possible to draw these students interest by using traditional method that were used in the past. As a result of technological developments that appeared in the last quarter of the 20th century, a big difference occurred between the ways of introduction of knowledge at schools and the ways of getting knowledge in the society. Students get a lot of information by visually enriched resources like computers and televisions that are mostly used in our daily life. The way of gaining knowledge of students through various audio devices are many and so it becomes difficult to teach them with traditional methods (Cepni et al 2004). These days, it is clear that visual materials are used in every field of studies and students.

As a result of supporting instructional materials with sound, image and animation, more lasting, enjoyable, motivating and effective instruction occurs (Demirel, 2004). Students are affected more by visual stimulus than auditory ones (Halis, 2002). Developments in technology bring new educational and instructional opportunities together. Frenzel (1980) as the process by which written and visual information is presented in a logical sequence to a student by a computer. The computer serves as an audiovisual device. The students learn by reading the text material presented or by observing the graphic information displayed. The primary advantage of the computer over other audio-visual devices is the automatic interaction and feedback that the computer can provide. Multiple paths through the course material can be taken, depending upon the individual student's progress. Locates and Atkinson (1984) described CAI as a mode of instruction that involves student interaction with the computer directly.

Typically, students access programme presented in segments, with each segment including information and questions or problems for student's response. The correctness of each response is indicated immediately and remedial or new information is presented. Sometimes students also have the option of requesting help or skipping ahead. Although this tutorial (information-practice-feedback) form of CAI is most typical, there are other forms such as drill and practice exercise, simulations and games. Stelberg (1991) defined CAI as computer presented instruction that is individualized, interactive and guide. He is of the view that CAI is not a method of instruction. Many methods are implemented in it, including direct and exploratory lessons, drills, games and simulations. According to Munden (1996) CAI is an educational medium in which instructional content or activities are delivered by a computer. Students learn by interaction with the computer and appropriate feedback is provided. Roblyer and Edwards (2000) defined CAI as a software designed to help technological information and or skills related to a topic; also known as courseware. Oyedele (2002) defined CAI as the use of computers in teaching. CAI is a system of individualized instruction that uses a program presented by computers as the learning medium. All the definitions of CAI presented agreed that computer plays a role of tutor and imparts instructions either through tutorials or simulations or any other mode of presentation. Computer hardware and specifically designed software development needs a teacher equipped with best teaching skills and a broad vision. There are varieties of terms used to describe the Computer in education and each has a slightly different meaning.

1. Computer Based Instruction (CBI). The broadest terms and can refer to virtually any kind of computer used in educational settings, including drill and practice, tutorials, simulation, instructional management, supplementary exercise, programming, databased development, writing using word

processor and other applications. This term may refer to computer activities which reinforce material introduced and taught by teachers.

2. Computer Managed Instruction (CMI). These can refer either to the use of computer by school staff to organize students data and make instruction decision to activities, by which compute, evaluate students test performance, guide them to appropriate instructional resources, and keep record of their progress.
3. Computer Enriched Instruction (CEI). These is defined as learning activities in which computer (1) generate data at the students request to illustrate relationship in models of social or physical reality, (2) execute programmes developed by the students, (3) provide general enrichment in relatively unstructured exercise designed to stimulate and motivate students.
4. Computer Assisted/Aided learning (CAL) and Computer Assisted Aided Instruction (CAI). Computer in teaching and learning process are often referred to as computer Assisted/Aided learning/Instruction (CAL/CAI). CAI is concerned with the use of computers to mediate in the flow of information in the learning processes. This information is stored in the computer and is made available to the learner rapidly and readily (Poole, 1997,Roblyer and Edward, 2000).
5. Computer Aided/Assisted Language Learning (CALL). This is relatively new and rapidly evolving academic field of computer delivered instruction. It explores the role of information and communication technologies in language learning and teaching, CALL activities exploit improve technology to produce highly interactive learning environment, providing effective support for the acquisition of listening, speaking, reading and writing skills. (Fourie, 1999). The CALL programme can be developed for the various areas of language learning, like grammar, listening, pronunciation, reading, comprehension, vocabulary and writing of any language (Levy, 1997).

Computer Assisted Instruction (CAI) learning uses a combination of text, graphics sound and video in the learning process. It is especially useful in distance learning situation. The explosion of the Internet as well as the demand for distance learning has generated great interest and expansion of computer-Assisted Instruction. The

computer has many purposes in the classroom, and it can be utilized to help in student in all areas of the curriculum. CAI refers to the use of the computer as a tool to facilitate and improve Instruction. CAI program use tutorials, drills and practice, simulation and problem solving approaches to present topics and they test the students understanding these programs and students progress at their own pace, assisting them in learning the material, the subject matter taught through CAI can range from basic facts to more complex concepts in mathematic, history, science, social studies and language arts (Sharp, 1996). However, the computer is bringing some exciting innovations to education. The following are the areas in which computers are helping the educators;

1. Computer takes over the most of the drudgery of schooling like classifying children according to abilities, preparing timetables, schedules etc.
2. Computers allocate learning resources to individuals and groups.
3. Computers maintain progress cards and preserve them confidentially.
4. They provide easy access to files of information for reference and guidance.
5. They provide direct interaction between students and the subject matter to be learned.
6. They engage the students in tutorial interaction and dialogue. (U.S Congress, 1998).

2.2.1 Models of Computer Assisted Instruction

There are two models for designing interactive educational programmes.

1. Instructional System design (ISD)
2. Hypermedia Design (HMD)

There are many design models for CAI available in developed countries. One model, developed by Fourier in 1999 consisted of seven phases.

1. Determination of the need and situation analysis.
2. Formulation of aims and performance objectives and development of items for evaluation.
3. and media selection and integration (Eg the inclusion of sound and video).

4. Development and preparation of programme.
5. Implementation and use.
6. Assessment of students' progress.

2.2.2 Types and Characteristics of Computer-Assisted Instruction

There are many types of CAI Programme. Each of the CAI programme is appropriate under different instructional circumstances and therefore takes a different pedagogical approach. The beginning of CAI such as; tutorials, drill and practice and games were oriented to behaviorist theories of learning. But now no type of CAI is solely associated with a specific learning theory, as sophistication of computer languages has allowed modifying each type of CAI according to any theoretical framework. Cox (1995), Geisert and Futrell (1995), Poole (1997), Maddux, Johnson and Wills (1997), and Bitter and Pierson (1999) have mentioned and explained the following types of CAI software:

i. Drill and practice
ii. Tutorials
iii. Simulations
iv. Instructional games
v. Problem solving
vi. Integrated learning
vii. Microcomputer based laboratories (MBL)
viii. Reference software

Characteristics of Computer Assisted Instruction

Computer-assisted programs can be characterized by many attributes suitable to enhance learning. Some of the special characterized of CAI according to Roblyer and Edwards (2000) includes:

i. **Individualization:** A computer program can provide multiple instructional paths, tailored to individualized needs (Stelberg, 1991). Students find multiple paths to proceed; every students finds and option to proceed according to his needs i.e according to his previous knowledge of the subject, ability, interest and

intellectual capacity. Game format can add motivation and fantasy and maintain learner's attention. Concept can be presented in tutorials with the aid of illustrative animation, dynamically creating illustrations and interspacing verbal explanations. Simulations can provide new insights into relationship, the experiences that would otherwise not be possible.

ii. **Flexibility:** Flexibility means access to teaching materials at a wide range of time or locations. Computers after great flexibility in the type of resources available to a students as well as increasing flexibility of access to information. Greater flexible in education is one strategy for dealing with increased number and diversity of students. Computer programme can allow the user to choose from a variety of instructional treatments. A student who doest not learn with a particular approach can be presented with material using an entirely different and unique approach. Instructional programme may use a variety of prompts and cues to produce correct students' responses. (Sloane et al, 1989; Maler et al. 1998).

iii. **Self Pacing:** Self-pacing lest students proceed at a pace appropriate for their individual learning levels. Students using self-pacing can control the time allowed to solve problem as well as the rate of presentation they can spend several weeks with remedial material they chose the testing cycle. Self-pacing can help to individualize instruction for those students who have used the program before or have prior knowledge of the subject. Self-facing can be combined with self placement testing which directs the student to an a appropriate beginning point and to an optimal instruction rate.

iv. **Remediation Options:** The computer adapt to individual differences after analyzing students responses. Records of the students past performance determine the sequence of instruction. In one type of remedial program, the instructor uses computer program to diagnose the student's learning capabilities achievement level and cognitive style. On the basis of the diagnosis, the instructor chooses material that is geared to the student. Computer Assisted Instruction programs may easily provide remedial treatments by complying branching strategy and/or through incorporating hyperlinks to present text, graphics or any type of material for remediation.

v. **Graphics and Sound:** Graphic presentation plays an important role in instruction. In addition to pictures, computer graphics also include the use of screen formatting features such as arrows, boxes and illustrations to emphasize the concept. This nonverbal mode of instruction helps to build comprehension in areas that are difficult to teach by other instructional techniques. Sound in a program can prompt, focus, or reinforce students and thus enhance instruction. At a more sophisticated level, some CAI programme include speech synthesizers that produce words or sentences. Synthesizers are especially with software for the very young or handicapped users. Computer graphics and sound infuse movement and animation into a programme.

2.3 Benefits of Computer Assisted Instruction

Graverly and Fullerton (1998) pointed out that recent advances in computer technology offer several benefits which include:

- Access and quality
- Benefit for learners
- Benefit for educators
- Increases motivation and reinforcement
- Improves problem solving and critical thinking skills

Access and Quality

Computer assisted instruction increases the quality and standards of education systems and institutions (Mangena, 2002). Well-developed software eliminates the problem of poor lesson presentation, which often characterizes public presentation. Aspects such as fatigue boredom, and loss of attention could be minimized (Quinn, 2000).

Benefits for Learners

This enables the learners to exercise control over where and when to study, and it allows them to direct their own learning (Rouse, 1999). Also, it assists the learners to set their own pace of studying. The learners can switch the computer off and go for a walk to restore their concentration, even before a lesson has been completed (Quinn, 2000).

Computer assisted instruction increases the possibility of having enjoyable learning experiences. The individualised nature of computer assisted instruction leads to decreased experiences of peer pressure or pressure on the part of the educator. The learners experiences more freedom to learn from their mistakes, or to repeat sections, which they struggle to understand. This promotes learning retention. (Joose, 1996).

Benefits for Educators

Computer Assisted Instruction frees the educators from the repetitions aspects of teaching and enables them to become more of a facilitator of learning and communication, then a transmitter of information. It access their work hard and allows more time for course development (Schoolcrat and Novontny, 2000).

Increases Motivation and Reinforcement

It increases motivation and reinforcement. Interactive science games stimulate learning through fun competition by bringing science to video age in a format they respond to. It was noted that high school biology students that had interactive videodisk/computer lessons indicated an overall level satisfaction with the strategy.

The students frequently remarked that videodisc instruction gave them more efficient use of instructional time than the conventional mode (Ajewole, Jegede and Okebukola, 1990). They noted further that the computer appears to be a strong motivational device for students identified as educationally disadvantaged and it broadens the scope of the scientific content that can be included in the curriculum.

Improve problem solving and critical thinking skills

It improves problem solving and critical thinking skills. Studies by Beth (1988), showed that thoughtfully designed computer software can present multiple dynamically linked representations in ways that are impossible with static media such as books and chalk boards. Some of the most fruitful applications of computer technology derive their capacity to present educationally powerful, dynamic visual image particularly in physics and mathematics, different representation of complex idea emphasizes different aspects of the idea and afford different sorts of analysis (Beth, 1988). It reduces time and cost to tolerable level. This indicates that with CAI, it can take the results of real experiment difficult or costly to reproduce in teaching situation and make computer simulations.

2.4 Problems Associated With Computer Assisted Instruction

There are various problems that hamper the effective utilization of CAI.

Infrastructure Problems

Access to ICT may be hampered due to financial reasons and inadequate infrastructures. These tools are expensive to buy, so learners from a poor background cannot afford to buy, update and maintain expensive electronic equipment. In many developing countries frequent power failure, unreliable telephone connections, and high electricity and telephone costs hamper effective implementation of CAI. Inappropriate equipment and software, poor maintenance of equipment, poor technical support and out-dated systems are obstacles to effective computer assisted

instruction and computer-based learning. Furthermore, the educators may experience frustration due to slow equipment delivery and installation where well-equipped computer centers do not exist (Papo, 2001)

Problems Related to the Learners

Computer assisted instruction becomes problematic if learners are forced to participate in the teaching and learning strategy. Each and every learner has his/her preferred way of learning. Some learners prefer attending lectures and consulting books. Some may feel insecure, still preferring the presence of an educator in the teaching-learning situation. Many learners are not technologically minded. Fear of change and lack of self-confidence in utilising ICT are serious problems. Some learners may be very slow in developing the attitudes and skills required to effectively utilize these technologies. There is also a possibility that the learners will focus more on the hardware than on their learning outcomes (Quinn, 2000).

Problems Related to the Educators

Negative attitudes and poor educator commitment may exist. Technology means little unless the educators and learners are committed to using it in a class-room setting as a teaching and learning tool (Mangena, 2002). There may be reluctance on the part of educators to use ICT as a way of improving the teaching and learning processes (Papo, 2001). This reluctance may be a result of outdated views on education, opposition to change, lack of training, or inappropriate equipment and software. The result may be that educators do not utilise Information Technology equipment optimally and effectively.

Problems Related to the Schools

Computer assisted instruction requires a significant investment on the part of the educational institutions, educators and learners. Adequate resources must be available

for the educators to ensure the successful introduction and development of computer assisted-instruction. There are high cost involved in establishing and maintaining the facilities supporting CAI.

Hardware, educational software, support services, and training require investments on an ongoing basis in order to remain current. Often where relevant training and technical support are lacking, a cycle of misuse, broken equipment, disruptions and high costs of repair ensue. Furthermore broken equipment under repair, and equipment being upgraded can cause distraction in delivering the educational programme if planning is not properly done (Joos et al, 1996)

2.5 Concept of Academic Performance

The main product of universities is students. Upon graduation, they may either continue their studies into the post-graduate program or become the manpower for government and the private sector. Thus students' academic performances are critical in ensuring that the supply chain is maintained. Academic performance as explained by Rothstein (2000), refers to a successful accomplishment or performance in particular subject area. It is indicated by grades, marks and score of descriptive commentaries. Academic performance, continue Rothstein also refers to how students deal with their studies and how they cope with or accomplish different tasks given to them by their teachers in a fixed time or academic year. Performance of students' has for long generated a lot of interest among educators, researchers, government officials, presents, and the students themselves.

Many studies have examined the factors that affect students' performance in primary and secondary education as well as at the level, with purpose of enhancing learning at these stages and reducing drop-out. Performance of students' according to Gouch (2000), can, generally, be referred to as the way and manner students deal with their studies and how they cope with or accomplish different tasks given to them by their

teachers. In other words, it is students' ability to study and remember facts and being able to communicate knowledge verbally. Kobaland and Musek (2001) define academic performance as performance on task with measures including comprehension, quality and accuracy of answers of tests, quality and accuracy problem solving, frequency and quantity of desired outcome, time or rate to solution, time on task, level reasoning and critical thinking creativity, recall and retention and transfer of tasks.

Lafer and Markert (2009) explained that there are broad groups of definitions of academic performance. The first one refers to numerical scores of a pupil's knowledge, which measure the degree of a pupil's adaptation to school work and to the educational system. The second group is a more subjective one, as its determination of academic success is reliant upon the student's attitude towards his academic achievement and himself, as well as by the attitudes of significant others towards his/her success and him/herself.

2.6 Traditional Methods of Teaching Agricultural Science in Senior Secondary Schools

Teaching methods are seen as various format employed by the teacher to pass this instruction so as to bring about positive changes that are relatively permanent in nature in the learner(s). It was defined as the basic mode of study employed by an investigator of the theoretical approached used by teacher in selecting and implementing a curriculum (Harron, 1973). It was defined by Makama (2005) as an orderly procedure in which teachers used to direct learners in the development of knowledge, skills attitudes and habit. Universal Basic Education Board (2008) considered teaching methods as guidelines or processes for promoting teaching learning. It is the approach used by the teacher to stimulate the interest of the learner(s) in the instruction.

Yusuf (2010) opined that they are various approaches used by the teacher in ensuring that the learner acquired the knowledge or skills pre-determined by the teacher. Teaching method deal with way or procedure in which the way or procedure in which information is presented to students. Teaching method was seen as a process of directing and controlling the experiences of learners, helping such individual or group of individuals to discover and develop potentialities for the happiness and social welfare (Farrant, 1986 in UBEB, 2008). There are numerous teaching methods, but for the purpose of this study, the researcher will concentrate on those methods used in teachings Agricultural Science in Senior Secondary Schools which includes:

Field Trip

This method which is otherwise known as excursion and/or observation method is described according to Imarhiagbe (2003) as an effective method of studying modern industrial and business practice and processes which are not possible in the school environment. The purpose of field trip is for students to experience firsthand, the practical sides of what has been taught in theory and also to present the students with opportunities to see, touch, fee, smell and even taste sample where applicable. It is rightly believed that field trip under the careful guidance of a teacher proves very effective in the process of learning facts. Skills and behavior because they are retained for longer period. Field trip has three phases for it be successful; the planning stage, the trip itself and evaluation stage. The planning stage includes taking permission from the institution, informing the establishment to be visited for feasible date as well as sensitizing the students about the visit so as to arouse their interest.

The trip itself is the journey out of the institution to the establishment and observation of the necessary areas of interest to the students especially in relation to the course curriculum. The evaluation stage encompasses the discussion after the visit of various aspects of the trip, to emphasize the concepts taught the visit and writing of report as

well as appreciation letter to be establishment for making their facilities available during the visit.

Demonstration Method

This is a method of teaching in which sight rather than hearing is the major means of communication even though, the two are often combined (Olaitan and Agusiobo, 1981). Aliyu (2000) described demonstration method as that which the teacher's primary responsibility is showing the students how various response patterns are made. Meanwhile student's responsibility lies in imitating the response pattern of the teacher. The teacher demonstrates while the students imitates hence such team work leading into skill development. Demonstration method is described as a means of instruction presentation in which the teacher conduct a production or repair process operation before the class of individual students or group, and explaining what he is doing as he proceeds (Imarhiagbe, 2003) it is a teaching technique that combines oral explanation and "ding" to communication processes, concepts and facts. It is particularly effective in teaching a skill that can be observed.

In the opinion of Makama (2005) demonstration is defined as a process in a manner that students will be able to understand the principle or phenomenon being taught. It involves showing and telling of how to do/perform an operation, process or observed and as such can easily imitate the performance. On the other hand, UBEB (2008) defined demonstration method as displaying method which involves showing, by offering examples of how some works or the steps involved in a process. It involves displaying something or phenomenon that the learners can observe, read and write. Meanwhile, demonstration implied the presentation of a pre-arranged series of events or equipment to a group of students for their observation (Aggarwal, 2009). This is accompanied by explanatory remarks either as the event unfold or before it so as to

guide the students appropriately. In most cases demonstrations are carried out by the classroom teachers while the learners watch or observe.

Also there are cases where few students especially the brilliant ones are allowed to demonstrate after the teacher must have finished. This should be encouraged since taking that will improve their enthusiasm in the instruction and make them retain the acquired skills. Demonstration method is effective because most students more easily do not remember what they hear or read. At times it may involves showing only an actual object, model, picture, or a diagram of a phenomenon. It is however usually involves a process in which the learners have to follow a number of steps, stages after the other to reach their conclusion. It is realistic and imperative and is a true learning experience where learners are presented actual models or apparatus to manipulate to get result. It usually involves the use of almost all the sense organ in the processes of carrying out demonstration.

Demonstration usually requires time, skill some expenses of its effective organization. However, it is effectiveness may be hampered by large class, insufficient apparatus to go round the students and lack of adequate preparation on the side of the teacher. According to Olatain and Agusiobo (1981) demonstration is of two major types which are method demonstration and result demonstration, the method demonstration teachers how the event or phenomenon are carried out while the demonstration teachers the outcome of doing something in a certain way. Meanwhile both process and result demonstration scan be used at all stages. Demonstration step gives learners the opportunity to see and hear the details related to the skill being tough. Those details include the background knowledge, the steps or procedure, the nomenclature, the nomenclature and the safety precautions. The repetition of steps helps the average

and slow learners and gives the trainee and additional opportunity to see and hear the skill being taught. Hence gives opportunity to become proficient in such skills.

Quality of Demonstration Method

Using demonstration methods teachers should ensure learners observe correct procedures the first time they are trying a new task. The most effective learning results when trainees use a skill immediately after they are taught, hence teachers should teach the students to practice the skill thereafter. It also essential to teach learners the safety precaution just before teaching the point in your demonstration where its applicable. Teacher should state the reason for the precaution so that the trainee will understand the need for compliance. It is also essential that all participants must be well prepared before the instruction. As a teacher, using demonstration requires ones being patient. This is because the learners are not all operating at the same levels. There are slow learners and fast learners in the class, then carrying everybody along make demonstration method one of the regularly adopted methods in teaching skill. It involves taking every tasks step by step using exact physical procedure if possible. It is also essential to plan the demonstration so as to ensure that step is in proper sequence and to include all steps.

It is also essential to ensure all learners are carried along. Incase they did not understand a certain step; it becomes imperative that the teacher must repeat the step. Meanwhile it is always good to summarize the lesson on completion to emphasize steps and main points so as to remind reinforce the learners. According to Aliyu (2000) demonstration methods should be short and preferably taken step-by-step or in a series of closely related tasks. Students should be given easy access to seeing the learning demonstration being carried out. He further stated that tasks that are complex should be broken dawn into bits and should be performed slowly and if need be

should be repeated. Emphasis on correct from should proceed emphasis in speed or accuracy. The procedure should be made meaningful and interesting to the students so as to encourage them to repeat the task if possible outside the class.

Procedure of Demonstration Method

The first step in demonstration method according to Makama (2005) is to establish the instructional need and develop the objective(s). The next step is to plan all the activities relating to demonstration in great detail as well as preparing the students, the environment and the equipments. Ensure illustration, equipment and other relevant materials are ready and are functional before the demonstration begins (Aggarwal, 2009). The next step includes explaining briefly what new skill or motor control is to be taught, proceeding with the demonstration slowly so that all the students will grasp the details. Give suitable verbal explanations for heightening the interest of the students. Ascertain after every step whether the students have grasped the meaning, contents and explanations. Repeat any step if they have followed it. Wherever possible, involve student in carrying out tasks within demonstration.

Lastly, encourage learners to analyzed, record and tabulate the result of their observation. Evaluate the level of achievement of the lesson objective by the students. Modify and correct the students if there is any mistake in the process of performing the tasks and give assignment on demonstration to take the learners through all the steps involved in demonstration (Barry and King, 1997, Aliyu, 2000, Makama, 2005 and Aggarwal, 2009).

Advantages of Demonstration Method

It stimulates learners thinking and formation of concepts and generalization research. It helps in fixing facts, ideas, knowledge, principles and skills as well as fostering creative thinking in the learners. It is very effective as an instructional technique in

introduction of skills learning. This is because it commands and retains learner's attention through out the period of instruction especially when its organization is sequential and orderly. The goals of the learners become clearer to them by use of demonstration method. The students know what they are expected to study, hence their learning become easier since attention are focused in the right direction. Both poor and the good students feel the impact of this method. It enables student to acquired knowledge in the first-hand from. It is also presented at the rate at which everybody in the class is carried along.

Repetition of the tasks by learners normally reiterated their learning. Learners gain confidence in the teacher. This is because they have preference for teachers who practice they preach. This method brings about a close relationship between theory and practical. It provides a sound basis for students to apply what they have learned. More so that it trains learners to be good observer. Hence students gains are made rapidly if they get the benefit of the right beginning. The method adopted of various senses; hearing, touching and as aid retention.

It implies any age level when the content is capable of being understood. This method is closely related to students and the subject matter which are the two factors in learning.

Disadvantages of Demonstration Method

The use of demonstration method concentrates activities around the teachers hence it provides less opportunity for the learners to discover ideas and solve problems on their own. It makes student a passive learner when no activity is given to them. It reduces active participation of the learners. If complex tasks are involved, it becomes more difficult to such skill on the students.

It is difficult to evidence the student understanding. This is so more especially since it addresses psychomotor more than cognitive domain. If attention is not given to verbal explanation of the underlying principles it may make learning become more difficult.

Experimental Method

Experimental method is defined by Aliyu, (2000) as one which provides for learning activity through the evaluation of evidence collected in the process of problems. It is an approach to education that focuses on "learning by doing" on the participant's subjective experience. This method combines several methods such as the lecture, discussion, demonstration etc. Calton (2006) saw experimental method as a means of trying to overcome problem having control over situation hence he described it as the cornerstone of psychology. It is described as a study of cause and effect it involves the deliberate manipulation of one variable while trying to keep all the others variable constant. It is a method in which learners discover and find things for themselves and are placed in the position of discovers or inventors.

This method may be used in the laboratory or in the field it is made up of three types which are laboratory experiment, field experiment and natural experiment. In experimental method, there are usually variables and try to keep all aspects of the situation constant except one; this is the one that is being investigated. The aspect that is manipulated is called the independent variables while the other variable not manipulated is called the dependent variable. All other variables which might affect the result and therefore, give a false set of results are called confounding variables, also known as random variables. In experimental method, laboratory work was compulsory for every student where he could discover instead of being told. Teachers provide instruction concerning the problem and the students were expected to take observation and conduct the experiments according to those instruction. From the

observation made by the students, they were expected to draw their own interference (Aggarwal, 2009).

Qualities of Experimental Method

One of the most important qualities of experimental method of teaching is that it develops in learners more exact, more truthful, observant, thoughtful and dexterous to lay solid foundation for further self-education and to encourage the growth of a spirit of research. It also provides opportunity for student to learn by doing. Experimental method processes involves very little activities by the teachers while most of the activities are carried out by the learners. It allows the learners to acquire knowledge through their own efforts from books or using some apparatus or carrying out experiment. Knowledge is obtained as a result of observation and critical investigation (Watkins, 1984). It is usually taken to be the most scientific of all methods (Anonymous, 2011).

The same problem may be given to the entire class to work on and each learner made responsible for finding out something for himself. The students are not restricted in terms of sharing ideas or movement within the class or laboratory. Meanwhile students need active guidance of their teacher as they cannot discover fasts all alone. This method can be used in various subjects such as science, geography, history and languages. It can be used in subjects where inductive or deductive approach has to be followed.

Roles of Learners in Experimental Method

On the roles of learners in experimental method of teaching Aliyu (2000) opined that learners should be engaged in the following:

1. Listening to the teacher explanation of the problem clearly in their mind as well as restating the problem in their own words. They are to formulate the objective of the problem themselves in their own words. They can formulate the objective of the tasks as to guide their work.
2. After hearing the teacher describes that plans that will be used in solving the problem. Identify the steps to be followed in order not to deviate from the planned problem. The next activity is to either watch the teacher solve the problem of the students solving it themselves as described by the teacher while the teacher guide and supervise them..
3. Then learners observe results, collect data and weighting the evidences. Recording their observations or results so as to enable them draw inference(s) from the observation and now generalize their results. Lastly, the generalization is then applied to other problems which are similar.

2.7 Related Empirical Studies

There are closely related studies in areas of this research. However, the following findings were found related to the study:

Khirwadkar (2001), carried out a research study whose purpose was to develop CAI package in chemistry for standard six science students using Government Science and Technology Board (GSTB) Syllabus. Pre - test, post-test designed were followed. The sample consisted of sixty (60) students selected randomly. Out of 60 students, 30 students were in experimental group and 30 students in control group. Data were analyzed using of analysis variance (ANOVA), content analysis and percentages. The research findings showed that, the software package developed for teaching three units of standard 6 chemistry textbook of GSTB was effective in terms of student's achievement and time.

The present study is similar to the work of Khirwadkar (2001), the present study used 60 students as sample, 30 students for experiment and 30 students as control group, while the previous research study did the same thing in the number of samples. The previous research focused on chemistry while the present research used agricultural science to develop the software. The previous research used GSTB syllabus to study and develop the software while the present study used WAEC syllabus for the study. The previous study used ANOVA statistic to analyze data, while the present study used t-test statistic to analyze the data.

In another study that was carried out by Patrick (2003) on the effect of computer assisted instruction in different learners, the sample population was 161 students of various program types. A completed instructional computer program called Cornerstone was used as CAI program. Two null hypotheses were stated. Data were analyzed using ANCOVA and dependant t-test statistic.

The present study is different from the past study based on the fact that; both research problems focused on CAI. In addition CAI, teaching and learning of general agricultural science development in Nigeria were the focus of the present research.

Muhammad, (2004), carried out a research study whose purpose was to determine the effect of CAI on student achievement in general science as compared with traditional method of instruction. The study had population of 70 students and samples of 20 students were randomly selected. Eleven null hypotheses were tested by analyzing the data with a paired t-test statistic at 0.05 level of significance. The result revealed that the experimental group performed better than the control group in all the achievement areas.

The present study is similar to that of Muhammad (2004), in the effect of CAI software and paired t-test was used at 0.05 level of significance. The differences

between the past and the present study is utilization of CAI in teaching agricultural science. The previous study had 70 students as a population and a sample of 20 students were randomly selected, eleven null hypotheses were tested to analyze the data, but the present study had 300 students and 60 students were randomly selected as a sample in the zones selected.

Dadhania (2004) carried out a research study whose objective was to develop a CAI programme for teaching the unit pressure in physics at standard 8. The research was of experimental type. The sample of the students was sixty one. Data were collected by teacher made unit tests and opinionnaire. Mann-Whitney U-test and Chi-square statistics were used to analyze. There was no significant difference between the scores of the two groups. So, both CAI programme and traditional method of teaching were equally effective with reference to the achievements of the students.

The present study is similar to the work of Dadhania, (2004) in the effect of CAI and both were experimental type, but differed in their objectives and procedure of data analysis. The previous study was tested using Mann-Whitney U-test and chi-square statistics, while the present study used t-test statistic to analyze the data. The previous study were used of sample of 90 students, the present research study was used 60 students as a sample.

Badiyani (2005), carried out a research study whose purpose was to develop a CALL package to teach action verbs in English language. The research was of experimental type. The sample selected was two schools of Rajkot City of which one was selected for experiment and the other was for replication. During the experiment three groups of 29 students each and during the replication three groups of 28 students each were formed from grade 8. Data were analyzed using one way analysis of variance (ANOVA), Turkeys test, and Chi square. The finding showed that, the CALL package

proved to be more effective in terms of the achievement scores of students of grade 8 for learning 'Action Verbs' of English grammar.

The present study is different from the work of Badiyani (2005) in the aspect of development of Computer Assisted Instruction. The previous study was concerned with the development of Computer Aided Language Learning. The present study will used 60 students as sample, while the previous research used 57 students as a samples for the study. The previous research used ANOVA, Turkey test and chi-square statistics to analyze the data, but the present study used t-test statistic to analyze the data.

Hussain (2010) carried out a research on "Traditional versus computer-mediated approaches of teaching educational measurement in Colleges of Education (COE) at Sultan Qaboos University (SQU) in Oman." The population of the study was 51 undergraduate teacher education majors in the COE SQU. There were two groups in the study which included experimental group (n=2x) taught using computer mediated instruction and control group using conventional method. The tools used to analyzed data was the t-test statistic, mean and standard deviation. The findings from the study showed that all the group members in the computer mediated instruction and class actively frequently participated in the group and class forums, and all the questions were answered.

The finding served as insight to the present because of the relevance of computer mediated instruction and CAI. The present study is similar to the past study because both dealt with CAI in teaching and learning of a particular subject.

Yusuf and Afolabi (2010), conducted a study on the effects of CAI on secondary school students performance in biology in Oyo State, Nigeria. The main objective study was to investigate the effect of on performance CAI on the secondary school

students in biology. Data for the were collected from a sample of one hundred and twenty (120) first year Senior Secondary School students (SSS1) from three private Secondary School, who were randomly selected from a population of three hundred and thirty five (335) students. The research design quasi pre-test experience researcher analyzed data using analysis of covariance (ANCOVA) and answered five (5) research questions and also tested four null hypotheses.

The result of the study showed that the performance of students exposed to CAI either individually or cooperatively were better than their counterparts exposed to the conventional classroom instruction. However, no significant difference existed in the performance of male and female students exposed to CAI in either research findings. Recommendation were made on the need to develop relevant CAI packages for teaching biology in Nigerian secondary schools.

Muzammila, Akram, Athar and Ali (2011) carried out an experimental study of the effect of CAI in chemistry on students achievement at higher secondary level at Bahawalpur, Pakistan. The paper designed to find out the effect of CAI on the students' achievement in Chemistry and to compare the effectiveness of CAI with conventional instruction at higher secondary school level. The researcher selected 40 students out of a population of 200 students. The researchers tested four null hypothesis. Data were analyzed using statistical methods of mean score and t-test for independent samples.

The findings indicated that there was significant effect of CAI on the students' achievement in secondary school. However, CAI effect was found to be more significant in private schools than government schools Computer-assisted instruction in teaching chemistry proved better than the conventional instruction.

2.8 Summary of the Reviewed Literature

The literature review looked at the CAI theoretical framework, the model of CAI the types and characteristics of CAI. The review dwelled on the benefit of CAI and problems associated with Computer Assisted Instruction.

The literature reviewed the findings of different scholars about traditional method of teaching agricultural science in secondary school. Eight empirical studies relevant to the present study were reviewed. From the reviewed works, the researcher observed that none of them established whether the CAI had any significant effect on performance of senior secondary school students in agricultural science in Kaduna State. It is this identified gap in the literature that the results of this study helped to fill.

CHAPTER THREE

RESEARCH METHODOLOGY

This chapter presented the specific method and procedure used in the study. The chapter is organized under the following sub-headings:

3.1 Research Design

3.2 Population for the Study

3.3 Sample size and Sampling Procedure

3.4 Instrument for Data Collection

3.4.1 Validation of the Instrument

3.4.2 Pilot Study

3.4.3 Reliability of the Instrument

3.5 Procedure for Data Collection

3.6 Procedure for Data Analysis

3.1 Research Design

The study was a quasi-experimental pre-test/post-test control group design (PPGD). The pre-test/post-test control grouped existed in a mixed design, which is widely used. A mixed design is a factorial design widely used in social sciences, especially in education and psychology. The pre-test/post-test control group design as one of the mixed designs is one of the most widely used experimental designs. In PPGD, in order to determine the effectiveness of the experimental process whether the variation between two groups is significantly different was tested by means of the ‘t’ or ‘f’ test Buyukoztork (2010).

3.2 Population for the Study

The target population of the study was made up of 1,521 first year agricultural science students in senior secondary schools that have computer laboratories in Kaduna state. The distribution of the population is presented in Table 3.1.

Table 3.1: Population for the study

S/No	Name of Senatorial zone	Name of Schools	Number of students
1.	Northern Kaduna	1. Alhudahuda College, Zaria	220
	senatorial zone	2. Berewa College, Zaria	150
		3. G.S.S.S, Kaura	125
2.	Central Kaduna	1. Capital School Kaduna	143
	Senatorial Zone	2. G.S.S. Kakuri	185
		3. G.S.S, Kawo	122
3.	Southern Kaduna	1. G.S.S, Kagoro	165
	Senatorial zone	2. G.S.S Ladugga	210
		3. G.S.S Godogodo	201
	TOTAL		**1521**

Source: Department of Planning Research and Statistics, Ministry of Education, Kaduna State (2014)

3.3 Sample Size and Sampling Procedure

Three public schools were purposefully chosen from the three senatorial zones in Kaduna State. These were schools equipped with computer laboratories. Consequently, students were supposed to have previous experience in using software. The sample of the study consisted of (90) first senior secondary school students of the three school randomly selected in the three senatorial zones. Each schools selected 30 students i.e 15 for experimental group and 15 as control group.

$\therefore$ = Experimental group 15 students x 3 = 45 students

= Control group 15 students x 3 = 45 students

The experimental group was taught agricultural development in Nigeria using computer while the control groups were taught the same item using conventional method. This is represented in the Table 3.2.

Table 3.2: Sample Size for the Study

Senatorial zone	Schools	Experimental	Control	Total
Northern Kaduna Senatorial Zone	Barewa College, Zaria	15	15	30
Central Kaduna Zone	Capital School Kaduna	15	15	30
Southern Kaduna Senatorial Zone	GSS Godogodo, Jama'a	15	15	30
Total		45	45	90

3.4 Instrument for Data Collection

An achievement test instrument that consist of two sections A & B Section A comprised of 20 multiple choice items, section B which is the essay part covering the definition of agriculture, importance, branches and types of agriculture, all from the aspect of agricultural development in Nigeria agricultural science curriculum. The questions were drawn from the past WAEC and NECO agricultural science examination Paper II. In using the instrument practical aspect of teaching the concept was performed, while the visual multimedia facilities were used such as computer, CD-Rom and projectors for the teaching and learning.

3.4.1 Validation of the Instrument

The instrument was adopted from WAEC and NECO standard examination and the use of multimedia in teaching the topic, the test instruments and their marking scheme were forwarded to the supervisors in the Department of Vocational and Technical Education, ABU Zaria and other two research experts in the same Department so as to establish the face validity of the instrument. All observed corrections, observations and suggestions were dully incorporated before the test were administered to the sampled students to ensure face validity.

3.4.2 Pilot Study

A pilot study was conducted in G.S.S Funtua, Katsina State, which is outside the study area. A total number of 60 students were selected from the school, 30 students were selected from the same year group to serve as experimental group, while the other 30 students served as the control group. The pre-test was administered to the two groups on the same day.

After two weeks, the post-test was administered. Data were analyzed using T-test statistic. T-test statistics was employed to determine significant difference between two mean scores of the groups. All observed corrections and suggestions were duly incorporated.

3.4.3 Reliability of the Instrument

The test-retest method was used on 60 SSI students randomly selected in G.S.S Funtua, Katsina state. The reliability coefficient was performed and analyzed using split-half estimate Spearman-Brown prophecy formula method. The correlation coefficient obtained was 0.89.

3.5 Procedure for Data Collection

The test was designed by the researcher. It was used as both a pre-test and a post-test to find out the effect of Computer Assisted Instruction on students performance.

The test comprised 20 multiple choice items and 2 essay test questions. At the beginning of the test paper, the instructions of the test were introduced. The students were asked to choose the correct answer. The time allocated for the test was 40 minutes. Concerning the marking scheme there was one mark for each item. So the total scores were 40 marks (that is) 20 marks for the multiple choice items and 20 marks for the essay test.

The students' previous knowledge, the same pre-test was used at the end of the study as a post-test to assess the students' performance on the topic, the objective of the post-test was to assess the effect of both instructional methods (experimental and control) on students' performance.

3.6 Procedure for Data Analysis

The statistical tool that was employed for data analysis obtained from the pre-test and post-test was mean and standard deviation to answer the research questions. Analysis of Variance (ANOVA) was used to determine the differences among mean of the test scores in the 3 schools. This method was also affirmed by Huck (2004), who endorsed that ANOVA statistic can be used to gain an insight into how a group of means differ. If F-calculated value is greater than f-critical value, the null hypothesis was rejected, if F-calculated value is less than the f-critical value, then the null hypothesis was accepted. The null hypotheses were tested at 0.05 level of significance with the use of ANOVA statistic. The analysis were carried out by the use of Statistical Package for Social Sciences (SPSS).

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

This chapter presented the analyses of data in tabular forms under the following sub-headings.

4.1 Answers to the Research Questions

4.2 Test of Null Hypotheses

4.3 Summary of the Major Findings

4.4 Discussion of the Major Findings

4.1: Answer to the Research Questions

In order to answer research question one, mean and standard deviation were employed

Research Question One: *What is the effect of using CAI and conventional methods for teaching agricultural sciences on the performance in objective test of senior secondary school students in Kaduna State***?**

Data on Table 4.1 were used to answer research question two, as follows:

Table 4.1: Mean of the test scores on the effect of using CAI and Conventional Method on the performance of students in objective Test

VARIABLES	N	Mean	Std. Deviation	Std. Error Mean
Pre-test objectives control group	45	6.84	1.88	.28061
Pre-test objectives experimental group	45	6.86	1.80	.26893
Post-test objective control group	45	6.80	2.17	.32349
Post-test objectives experimental group	45	13.48	2.70	.40280

In Table 4.1, There was little difference in objective performance of pre-test control and experimental group. Similar cases was also observed between the standard deviation of the two groups. However, in the post-test objective scores the

experimental group had scored a higher mean of 13.489 than control group with the mean score of 6.80, signifying high performance in the post-test objectives by experimental group than post-test by the control group. It can be concluded that the performance of students in objective test increased with introduction of CAI for teaching agricultural science in senior secondary schools in Kaduna state.

Research Question Two: *What is the effect of using CAI and conventional methods for teaching agricultural sciences on the performance in essay test of senior Secondary School Students in Kaduna State*?

Data on Table 4.2 were used to answer research question three, as follows:

Table 4.2: Mean of the test scores on the effect of using CAI and conventional method on the performance of students in essay test

Variables	N	Mean	Std. Deviation	Std. Error Mean
Pre-test essay control group	45	7.60	2.20	.32937
Pre-test essay experimental group	45	7.57	1.91	.28513
Post-test essay control group	45	7.60	1.55	.23225
Post-Test essay experimental group	45	13.11	3.17	.47271

In Table 4.2, there was little difference in the performance of pre-test Essay control and experimental group. Similar case was also observed between the standard deviation of the two groups. Meanwhile, in the post-test essay scores the experimental group scored a higher mean of 13.11 than control group with the mean score of 7.60. This signifying high performance in the post-test essay by experimental group than post-test by the control group. It was concluded that the performance of students in essay test increased with the use of CAI for teaching agricultural science in senior secondary school in Kaduna State.

Research Question Three: *What is the performance of students who were taught agricultural sciences using CAI and those taught using conventional teaching method in the three senatorial zones in Kaduna State?*

Table 4.3: Mean scores of the performance of students on experimental and control group within the three zones in Kaduna State

zones		Pre-test control group	Pre-test experimental group	Post-test Control group	Post-test experimental group
zone1	Mean	15.40	14.80	14.80	28.67
	Std. Deviation	2.67	2.04	2.98	3.41
zone II	Mean	14.13	15.13	13.93	26.53
	Std. Deviation	2.85	1.81	3.33	3.39
zone III	Mean	13.81	13.40	14.47	24.60
	Std. Deviation	4.18	3.77	3.36	3.09

Table 4.3, showed little difference in the performance of pre-test control and pre-test experimental group in all the three zones. The same was observed between the standard deviation of the two groups. In the post-test control group of zone I post-test experimental group scored higher mean of 28.67 than control group with the mean score of 14.8. This signified high performance in the post-test experimental group than control group in zone I. Similarly the same trend occurred in Zone II and Zone III. Meanwhile the difference is more prevalent in Zone I, followed by zone II and lastly in zone III. It can be concluded that the performance of students who were taught agricultural sciences using CAI was better than those who were taught using conventional teaching method in the three senatorial zones in Kaduna State.

Research Question Four: *What is the performance of students who were taught agricultural sciences using CAI and those taught using conventional method between the three senatorial zones in Kaduna State?*

Data in Table 4.4 were used to answer research question five on the performance of students who were taught agricultural sciences using CAI and those taught using conventional method across the three senatorial zones in Kaduna State.

Table 4.4: Mean scores of the performance of students on experimental and control group across the three zones in Kaduna State

Zones		pretest control group	pretest experimental group	Posttest Objective Control group	Posttest experimental group
Total	Mean	14.44	14.44	14.40	26.60
	Std. Deviation	3.30	2.73	3.17	3.64

The Table 4.4 showed that there was no difference in the performance of pre-test control and pre-test experimental group in the three zones. Little difference was observed between the standard deviation of the two groups. The post-test experimental group scored higher mean of 26.6 than control group with the mean score of 14.4. This signifying high performance in the post-test by experimental group than by control group in the three zones. It can be concluded that the performance of students who were taught Agricultural Sciences with CAI increased when compared with those taught using conventional teaching method in the three senatorial zones in Kaduna State.

4.2 Test of Null Hypotheses

Four null hypotheses were tested using analysis of variance (ANOVA) as a statistical tools at 0.05 level of significance:

Null Hypothesis One: *There is no significant difference between the performance of senior secondary school Students in objective test when taught with CAI and conventional method of teaching in Kaduna State.*

Table 4.5: ANOVA Test of significant difference of performance in objective test of Senior Secondary School Students in Kaduna State using CAI and conventional method

Variable	Groups	**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
pretest objectives control group	Between Groups	16.18	2	8.09	2.43	0.100
	Within Groups	139.73	42	3.33		
	Total	**155.91**	**44**			
pretest objectives experimental group	Between Groups	6.93	2	3.47	1.07	0.353
	Within Groups	136.27	42	3.24		
	Total	**143.20**	**44**			
post test objective control group	Between Groups	7.60	2	3.80	0.80	0.456
	Within Groups	199.60	42	4.75		
	Total	**207.20**	**44**			
post test objectives experimental group	Between Groups	160.04	2	80.02	20.85	0.000
	Within Groups	161.20	42	3.84		
	Total	**321.24**	**44**			

*Significant at 0.05 level

Table 4.5 showed the difference between the post test objective control group of F value with 0.80 and post test objective experimental group with value of 20.85. This implied that there is significance difference between the group

Null Hypothesis Two: *There is no significant difference between the performance of Senior Secondary School Students in in essay test when taught with CAI and conventional method of teaching in Kaduna State.*

Table 4.6: ANOVA Test of significant difference of performance in essay test of Senior Secondary School Students in Kaduna State using CAI and conventional method

Variable	Groups	Sum of Squares	Df	Mean Square	F	Sig.
Pre-test essay control group	Between Groups	8.40	2	4.20	.85	.433
	Within Groups	206.40	42	4.91		
	Total	214.80	44			
Pre-test essay experimental group	Between Groups	8.58	2	4.29	1.18	.317
	Within Groups	152.40	42	3.63		
	Total	160.98	44			
Post-test essay control group	Between Groups	.533	2	.27	.11	.900
	Within Groups	106.27	42	2.53		
	Total	106.80	44			
Post-test essay experimental group	Between Groups	128.04	2	64.02	8.55	.001
	Within Groups	314.40	42	7.487		
	Total	442.44	44			

*Significant at 0.05 level

In table 4.6 The f value in the post test essay experimental group was greater than the F value of post test essay control group. This shows that there was significant difference between the groups.

Null Hypothesis Three: *There is no significant difference between the performance of senior secondary school students taught agricultural science with CAI and those taught without it in senatorial zones conventional method of teaching in Kaduna State.*

Table 4.7: ANOVA Test of differences in performance between students taught using CAI and those without it in senatorial zones .

Variables	Groups	Sum of Squares	Df	Mean Square	F	Sig.
pretest control group	Between Groups	21.39	2	10.69	0.981	0.383
	Within Groups	457.73	42	10.90		
	Total	479.11	44			
pre test experimental group	Between Groups	25.37	2	12.69	1.755	0.185
	Within Groups	303.73	42	7.23		
	Total	329.11	44			
Posttest Control group	Between Groups	5.73	2	2.87	.275	0.761
	Within Groups	437.07	42	10.41		
	Total	442.80	44			
Posttest experimental group	Between Groups	124.13	2	62.07	5.683	0.007
	Within Groups	458.67	42	10.92		
	Total	582.80	44			

*Significant at 0.05 level

Result in Table 4.7 Revealed that the f-value on post test experimental group was greater than the post test control group which showed significant difference between the groups.

Null Hypothesis Four: *There is no significant difference between performances of student taught Agricultural science using Computer-Assisted Instructions in and those taught using conventional method between the senatorial zones in Kaduna State.*

Table 4.8: ANOVA Test of significant difference of performance of students between the three senatorial zone s in Kaduna State

		ANOVA					
Zones	Variables		Sum of Squares	Df	Mean Square	F	Sig.
Zone I	pre test experimental group	Between Groups	24.07	8	3.01	.53	0.804
		Within Groups	34.33	6	5.72		
		Total	58.400	14			
	Post test Control group	Between Groups	69.23	8	8.65	.94	0.545
		Within Groups	55.17	6	9.19		
		Total	124.40	14			
	post test experimental group	Between Groups	87.77	8	10.97	4.10	0.033
		Within Groups	13.17	6	2.19		
		Total	100.93	14			
Zone II	pre test experimental group	Between Groups	31.82	8	3.98	1.71	0.264
		Within Groups	13.92	6	2.32		
		Total	45.73	14			
	Posttest Control group	Between Groups	100.27	8	12.53	1.38	0.359
		Within Groups	54.67	6	9.11		
		Total	154.93	14			
	Post test experimental group	Between Groups	102.32	8	12.79	6.72	0.016
		Within Groups	11.42	6	1.90		
		Total	113.73	14			
Zone III	Pre test experimental group	Between Groups	104.43	8	13.05	.82	0.612
		Within Groups	95.17	6	15.86		
		Total	199.60	14			
	Post-test Control group	Between Groups	113.23	8	14.15	1.91	0.223
		Within Groups	44.50	6	7.42		
		Total	157.73	14			
	Posttest experimental group	Between Groups	81.57	8	10.20	3.37	0.078
		Within Groups	18.17	6	3.03		
		Total	99.73	14			

*Significant at 0.05 level

Table 4.8 shows that computed F-value was 6.72 in the post-test experimental group in zone II which was greater than that of zone I with f-value of 4.109 followed by zone III with the f-value of 3.37. This implied that the use of CAI (experimental group) were significantly different compared with the conventional method in the three senatorial zones. This is because in zone II (that is) Kaduna Central zone students had more access with the use of computers than the other zones.

4.3 Summary of Major Findings

Based on the data analysed, the following findings are presented:

1. The performance of students in objective test increased with the introduction of CAI for teaching agricultural science in senior secondary schools in Kaduna State with a mean scores of 13.49 than conventional method with a mean of 6,80.
2. The performance of students in essay test increased with the introduction of CAI for teaching agricultural science in senior secondary schools in Kaduna State with a mean score of 13.11 than conventional method with a mean of 7.60.
3. There was no significant difference in the performance between pre-test (control) group and experimental group. This implied that CAI performed better with a mean of 26.60 as against the control group 14.4. This implied that CAI was better in teaching agricultural science students in Kaduna state.
4. Students taught agricultural science using CAI performed better than those taught using conventional method of teaching in the three senatorial zones with means scores of 28.67 in Zone I, while 26.53 in Zone II and 24.60 in Zone III in the post-test experimental group.

4.4 Discussion of the Major Findings

The study revealed that students taught with CAI (experimental method) performed better than those taught with conventional teaching method (control group) in agricultural science. This finding agrees with the earlier finding of Tabassum (2004) in Owusu (2010) who found that students who used CAI scored significantly higher in

mathematical concepts and computation than students who went through the traditional approach. This revealed that the students that were instructed through CAI performed better on the mathematical concepts as compared with those students who were instructed through teaching strategies such as lecture teaching method. The findings of Harrison (1993) in Owusu (2009) on CAI in basic arithmetics concept also corroborated with the findings of this study. The result reveals that students who received CAI showed greater increase in their performance scores in multiplication and subtraction than students who received traditional mathematical instructions.

The study also revealed that CAI is capable of improving students' performance. The findings of this study also verified the findings of Kausar, Choudhry and Gujjar (2008) who revealed that CAI proved to be significantly superior to classroom teaching in terms of performance in knowledge, analysis and synthesis of the Bloom's taxonomy when they conducted a comparative study to evaluate the effectiveness of computer-assisted instruction versus classroom lecture for computer science students. Data of Table 4.3 showed that the performances of students between the experimental and control groups within the three zones were significantly different. This finding supported the constructivist perspective which emphasized the active role of the learners in acquiring understanding, and making sense of information presented to them (Roblyer and Edwards 2000; Hsu Chen and Hung, 2000; Good and Brophy, 1990). This is so because the students taught by the CAI, through knowledge discovery and interaction with the CAI showed a significant difference in their performance. Furthermore, previous studies done by Kuchler (1998) explored the effectiveness of CAI in teaching science and mathematics. The study found that students who received instructions through CAI achieved more than those who studied in a conventional environment. It can therefore be concluded that student's in

objective test performance in agricultural sciences and other subject significantly improved due to the use of the CAI. Likewise while others with hypotheses were rejected. The findings of Al-Qomoul (2005) showed that there were statistically significant differences in the achievement mean scores of the subjects of the experimental group who studied the effect of CAI on English Language Function on the Basic Stage Students' Achievement. The figures also postulated that any gain in the academic performance in the field of the Agricultural Science could be attributed to the method employed. The total mean scores of the experimental groups in the post-test were mean 13.11, while it was 7.6 for the control groups. This means that the achievement in the post-test for both the experimental and control groups was attributed to the treatment. It can be easily noticed that the extra gain in the experimental group's mean scores is higher than the control group's mean scores.

This improvement is attributed to the method employed this means employed that the use of the software program has noticeably enhanced the abilities of the students of the experimental group regarding the passive voice. One possible explanation for the effect of using computers for teaching Agricultural Science is that computers enables each individual to work according to his/her own pace. The user may move freely from one component to another as he wishes and according to his needs. This characteristic makes CAI programs cater for individual differences and thus perform better in the post test.

Another possible explanation is the novelty of the experience which may have contributed to students eagerness to learn and consequently to perform better. In addition, the self-paced nature of the computerized activities and the superior visual representation of the material in the software motivated the students in the experimental group to perform significantly better in the post test. In addition, the

computerized method, unlike the traditional method, enables the learner to get feedback easily, which develops self-reliance skills. Using the computer gives the student the chance to use many senses during the learning process. The use of the computer screen which is accompanied by animation, video pictures, colors, music and sounds attract students' attention and empower faculties of retention to them. The researcher believes that students can learn more efficiently and effectively on their own with additional resources which technology makes available. Furthermore, using software programs applies "Learning by Doing" method, since learners use the keyboard and the mouse to click or to print their answers. Computer instructional programs are interactive. Learners can easily go forward or backward according to their needs and requirements.

When comparing the results of this study with the results of the previous related literature, the researcher found that this study is consistent with many practical studies which were conducted before. It is consistent with Nutta (2001) who proved experimentally that computer - based instruction can be an effective method of teaching the grammar of a second language. The findings are in agreement with Abu-Seileek (2004), Nagata (1996), and Pattern and Cadienno (1993) who said that the experimental group performed significantly better than the traditional group. The study is also consistent with Al-Qumoul (2005), Bataineh et al (2011), Christopher (1995) who emphasized that the computerized method was more beneficial for students than the traditional method. However, the results of the present study in this regard are inconsistent with McEnry, Baker & Wilson (1995) who found that the computer-based grammar instruction could be as effective as or more effective than traditional instruction. Perhaps the difference in these results is due to differences in the setting and the attitudes of the students who participated in these studies.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presented the summary of the research study, the conclusions drawn and the recommendations for the study under the following sub- headings:-

5.1 Summary

5.2 Conclusion

5.3 Recommendations

5.4 Suggestions for further studies

5.1 Summary

The study was conducted to determine the effect of computer assisted instruction on performance of senior secondary school students in agricultural science in Kaduna state, Nigeria. The study had five specific objectives, five research questions and four null hypotheses were formulated and tested at 0.05 level of significance. The study used a quasi-experimental design pre-test and post-test experimental and control groups design (PPGD). The population of the study was one thousand five hundred and twenty one (1521) SSS1 agricultural science students of the nine senior secondary schools in Kaduna state offering agricultural science. Ninety (90) students from three senior secondary schools namely Barewa College Zaria, Capital School Kaduna and Government Secondary School Godogodo were used as samples for the study.

A pre-test was administered on the students as experimental and control group. This was followed by two weeks of teaching in each school which centered on a topic "agricultural development in Nigeria". Post-test was administered after the two weeks of the lesson in each school of the samples of the study.

The sample size of the study was 90 students. Agricultural Science Achievement Test was the instrument used for collecting data for the study. The instrument had a pre-

test and post-test which were used in the process or collection of data for the study. The results of the pre-test and post-test served as primary data. The validity of the instrument was ascertained and a pilot study was carried out. The reliability of the instrument was also determined. The data collected were analysed using mean and standard deviation. In addition, the ANOVA statistic was used especially to test the four null hypotheses at the 0.05.level of significance CAI had significant difference on the students' performance in agricultural science. When the difference in the mean scores of students with pre-test objectives and post-test essay for both experimental and control groups were subjected to analysis, the mean scores of the post-test experimental group was 26.60 while the pre-test mean scores was 14.44 of the control group. The analysis revealed that there was no significant difference between the performances of students in teaching agricultural science taught with CAI.

5.2 Conclusion

Based on the findings of this study it was concluded that:

1. CAI significantly enhanced the performance of students in agricultural science because those students taught using CAI performed significantly better than those taught using conventional teaching method in agricultural science.
2. CAI is more effective in teaching agricultural science in senior secondary schools.

5.3 Recommendations

Based on the findings, it was recommended that:

1. Computer assisted instruction should be used to teach agricultural science students in the senior secondary schools in Kaduna State for better performance of students.

2. Emphasis should be given in the use of CAI in objective test for teaching agricultural science student in the senior secondary schools in Kaduna State.
3. Government should provide computers in the laboratories and projector to facilitate active learning in the essay test for teaching agricultural science in the senior secondary schools in the study area.
4. Students wrong perception of agricultural science as a difficult subject should be discouraged by teachers, guidance counselors and parents. This is because, the study revealed that CAI was better than conventional method of teaching in performance within the three senatorial Zones. The result revealed that CAI has a significant effect on performance of students.

5.4 Suggestion for Further Study

The following suggestion were made for further studies:

The computer assisted instruction should be used in preparation of examination questions especially in the objective tests to ascertain the performance of students in agricultural sciences in the senior secondary schools by NECO and WAEC and also in the Ministry of Education in the neigbouring state.

REFERENCES

Abu – Seileek, A., (2004). *Designing a computer assisted language learning (CALL) program and testing its effectiveness on students' writing ability in English*. PhD. Thesis, Amman Arab University for Graduate studies, Amman – Jordan.

Achuonye K.A. (2011). Using computer in science class; The interactive effect of gender. *Journal of African Studies and Development* , Vol. 3(7), pp. 131-134.

Aggarwal, J.C (2009). *Principles, Methods and Techniques of Teaching. Second Revised Edition.* Vikas Publishing House PVT New Delhi, China, PP. 35-245

Ajewole, G. Jegede, O. J. & Okebukolu, P.A (1990). Attitude to the use of Computer for learning Biological concepts and achievement of students in an environment documented by indigenous technology: *Paper presented at the 63rd Annual meeting of the National Association for research in science Teaching. Atlanta, GA.*

Akinola A.A. & Adodo S.O. (2002) Effect of two types of remediation on students performance in integrated science *Journal of Research in Education, UNAD, Ekiti State, Nigeria*, Vol 4, (2): 81-85.

Akpinar, E., Aktamis, H & Ergin, O. (2005) The students' view on the use of educational technology in science course. The *Turkish Online Journal of Educational Technology*. 4(1), 12-18.

Al – Qumoul, M. (2005). *The effect of using an instructional software program of English Language functions on the basic stage students' achievements.* Unpublished PhD. Thesis. Amman Arab University for Graduate Studies, Amman. Jordan.

Aliyu, M.M (2000). *Subject Method for Business Teachers.* More Hope (Nig) Enterprises. Iloring, Nigeria PP. 37-47.

Allesi, S.M. & Trollip, S.R. (1991). *Computer Based Instruction Methods and Development* England Cliffs: New Jersey.

Anderson, D. (1986) *The Computer in Education: A force for change*? Blacker, F, and Osborne, D. (Eds), Information Technology and people Designing for the future Lateworth, England British Psychological Society.

Anonymous, F. (2011). The experimental method, Retrieved July 6, 2014. from http://www.holah.karoo.net/experimental-methodhtml

Aubineau M. (1996). Using a Computer Laboratory as a spring high board for transforming a Traditional Lecture Course: *Paper presented at the 9th Annual Conference on Teaching of Psychology, March 22-24 Ellenville New York, U.S.A.*

Badiyani, I.M. (2005). Development and try out of Computer Aided Language Learning (CALL) Package for Teaching the Action Verbs in English Language. Retrieved March, 15, 2013, from http//www.badiyani.com.

Bain, A. & Smith, D. (2000). Technology Enabling School Reform, *Journal of Technological Horizons inn Education*, 28 (3), 90.

Bamidele S.O. (2001): Computer Science education of tertiary institution. Niyi commercial printing venture Ibadan. Nigeria.

Barry, K. & King L. (1997). *Beginning Teaching (*second edition*)* Social Science Press. Australia, PP. 136-139.

Bataineh, R & Bani Hani , N (2011). *The effect of A Call Program ON Jordanian Sixth- Grade Students' Achievement.* Teaching English with Technology, 11(3), 3-24.

Bello, R. & Ajayi O. S. (2000). *Research Methods and Statistical Analysis.* Haytee Press and Publishing Company ltd. Ilorin, Nigeria PP. 21.

Best, R. & Kahn J.V (2006) *Research in Education 9th Edition,* Darling Kinderstey Pvt Ltd. India, PP. 173-433.

Best, R. & Kahn J.V (2006). *Research in Education 10th Edition,* Pearson Allyn and Bacon Boston & New York, PP. 395.

Beth, W. (1988), Making sense of the future. *A position paper on the role of technology and computing education*. Retrieved March, 18 2013 from http://members.Aol.com/esecollier/compter-assisted-instruction.htm.

Bigge, M. & Sharmis, T. (2004). *Learning Theories for Teachers.* Boston: Pearson Education Inc.

Bitter, G.G. & Pierson, M.E. (1999). *Using Technology in the Classroom, 4th edition*. Boston: Allyn and Bacon Publishers.

Brophy, A. K. (1999). *Is Computer Assisted Instruction Effective in the Science Classroom?* Unpublished master's Thesis California State University, Dominguez Hills.

Buyokoztork, S. (2010). *A Booklet on Data Analysis for Social Sciences.* Ankara: Pegem A Publishing.

Bybee, R.W, Poewll. J.C. & Trowbridge, L.W. (2008). *Teaching Secondary School: Strategies for developing Scientific literacy*: Pearson Prentice Hall.

Calton, D. (2006). Using Experimental Teaching Methods. Retrieved July 6, 2014 from Davidcarltoncarlton@bacrian.org

Cepni, S., Ozsevgec, T. & Saydkan, F. E. (2004). Comparison of Achievement Levels of Science Teaching Program Students at Two Universities. *International Science and Mathematics Education Congress Report*, 2(1) 1241-1246.

Chambers, A. & Sprecher, D. (1983). Computer Games; Environment for Developing Spatial Cognition? *Journal of Educational computing Research* Vol3 No 1

Christopher, K.(1995). The effect of time on computer assisted instruction for risk students. *Journal of Research on Technology in Education*, 28 (1), 85 – 98.

Condr, J. & Chambers, J. (2008). Intrinsic Motivation and the Process of Learning. *In The Hidden Costs of Reward.* Lepper, M. R. and Greene, D. (Ed). New Jersey: Lawrence Erlbaum Associates.

Cox, M.J. (1995). Computer Assisted Learning. In Husen, T. S. Postlethwaite, T.N. (Eds). The *International Encyclopedia of Education (2nd Edition).* New York: Pergamom.

Dadhania, D.M. (2004). Development and Effectiveness of Computer Assisted Instruction Programme for Teaching the Unit "Pressure" (Gujarati) in Science of Standard Viii. Retrieved February 9, 2013, from http//www.

Damirel, O. (2004). *Planning and Evaluation in Instruction*: Art of Teaching. New York. U.S.A.

Dewald, J. (1999). *Computer Assisted Instruction North West Regional Educational Laboratories.* Retrieved August 13, 2014. From http:/www.borg.com/rparkany/ promoriginal/ETAO778/CAI.html.

Egun A.C. (2007) Reducing Teachers instructional Difficulties indentified Content Area of Agricultural Science Syllabus of senior secondary school for better understanding in Nigeria *Journal of Social Science*, 15 (2): 141-145

Eskey, R. K. & Falcy, R.H. (2002). Some Determinants of Students' Performance in the First University Level Financial Accounting Course. *The Accounting Review*, 103(2), 31 – 39.

Food Agricultural Organization, D.G. (2013). "Agriculture fight against Hunger". International Conference on Agriculture (forest) for Food Security and Nutrition in Rome. Daily Trust Wednesday, May, 15 2013. P. 26.

Fourier, M. (1994). *The Effects of Using Computer Manipulatives in Teaching Probability Concept*. Columbia University Teachers' College, New York. 29-34.

Fraenkel, J.R. & Wallen N.E (2000). How to Design and evaluate Research in Education (3rd Edition)Mc Graw Hall New York.

Frenzel, L.E. (1980). The Personal Computer Last Chance for Computer Assisted Instruction. Byte, 5(7). 86-96.

Geisert, P.G. & Futrell, M.K. (1995). Teachers Computers and Curriculum: Microcomputer in the Classroom. Boston: Allyn and Bacon. Publishers.

Good, T., & Brophy, J. (1995). *Contemporary Educational Psychology.* (5th ed.) New York: Harper Collins.

Gouch, D. (2009). Investigating Critical & Contemporary Issues in Education/Student Academic Performance. A Case Study of Senior Secondary Schools in the Kassena-Nankana District. *Journal of Social Sciences* 4 (4), 338 – 342.

Harrison, N. (1993). The effects of Drill-and-Practice Computer Instruction on Learning Basic mathematics. *Journal of Computing in Childhood Education* 3, 349-356

Harron, A. J (1973). *A Taxanomy of Psychomotor Domain.* David Mckay Company England, PP. 122-145

Hefzallah, J.M. (1999). The New Educational Technologies and Learning Empowering Teachers to Teach and Students to Learn in the Information Age. Springe field. Charles C. Thomas Publishers ltd.

Hergenhahn, B.R. & Olson, M.H. (1997). *An Introduction to Theories of Learning* (5th edition). New Jersey; Prentice Hall.

Hsu, J. J.F., Chen, B & Hung, D. (2000). Learning Theories and IT*: The Computer as a Tutor*. In Williams, M. D. (Ed) (2001). *Integrated Technology into Teaching and learning Concepts and Application.* (2nd Edition) Singapore, Prentice Hall Inc.

Huck, S.W. (2004). *Reading Statistics and Research* (4th ed). New York: Addison Wesley Longman.

Huffman, K.; Vernoy, K. & Vernor, J. (1995) Essentials of Psychology in Action, New York; John Willey and sons, Inc.

Hussain, A. (2010). Traditional Versus Computer Mediated approaches of Teaching educational measurement in Colleges of Educational Sultan Qaboos University in Oman. Retrieved on July 22, 2014.

Imarhiagbe, K.O (2003). *Instructional Methodology, Principle and Practice of Vocational Education.* Frontline Print& Publishers, Asba Nigeria PP. 48-62.

Joose, A. (1996). *The Effectiveness of Micro Computer in Schools*. Washington, DC Software Publishers. Association.

Kausar, T, Choudhry, B. N., & Gujjar, A. A. (2008) a comparative study to evaluate the effectiveness ofComputer assisted instruction (CAI) versus class room lecture (CRL) for computer science at ICS level *The Turkish Online Journal of Educational Technology* – TOJET October 2008 ISSN: 1303-6521 volume 7 Issue 4

Keziah, A.A. (2011). Using Computer in Science Class: The Interactive Effect of Gender. *Journal of African Studies and Development*. Vol. 3(7), RP 131-134, July, 2011.

Khirwadikar, A. (2001). *Development of Computer Software for Learning Chemistry at Standard* XI. Retrieved March, 15, 2013, from http//www.

Klein, S.B. (1996). *Learning: Principles and Applications*. (3rd Ed). New York. McGraw Hill, Inc.

Kobaland, D. & Musek J. (2001). Self-Concept and Academic Achievement: Slovenia and France. Personality and Individual Differences. 30, 887 – 899. Development of Psychology, University of Ljubljana, Ljubljana, Slovenia.

Kuchler, J. M. (1998). *The Effectiveness of Using Computers to Teach Secondary School (Grades 6 -12) Mathematics: A Meta-Analysis*. (On-line) Ph.D Dissertation, University of Lowell. [Online] Available :http://www.OCLC. com (May 20, 2010)

Lafer, S. & Market, A. (2009). Authentic Learning Situations and the Potential of Lego TC Logo. *Computers in Schools*, 11(1), 79 – 94.

Levy, M. (1997). *Computer Assisted Language Learning* (CALL): *Context and Conceptualization*. New York, Oxford University Press.

Locates, C.N. & Atkinson, F.D (1984). *Media and Technology for Education and Training.* Columbus. Charles E. Merrill Publishing Co.

Maddux, C.D.; Johnson, D.L & Willis, J.W. (1997). *Educational Computing; learning with Tomorrows Technologies*. Boston; Allyn and Bacon Publishers.

Makama, G.B. (2005) *Teaching Vocational and Technical Education.* Personal Touch Productions. Kafanchan, Nigeria

Maler, P., Barnett, L., Warren, A., & Brunner, D. (1998). *Using Technology in Teaching and Learning*, London: Kogan Page.

Mangena, J. (2002). The Effects of Computer Assisted Instruction on Students. *The Turkish Online Journal of Educational Techniques* (TOJET), 2(4), Article 11.

McEnery, T., Baker, P. & Wilson, A. (1995). *A statistical analysis of corpus based computer versus traditional human teaching methods of part of speech analysis.* Computer Assisted Language Learning, 8, 259-274.

Micheal, E. (2004). Microsoft Encarta Encyclopedia premium Suite CD-Rom.

Middleton, B. M. & Murray, R.K. (2009). The Impact of Instructional Technology on Students' Academic Achievement in Reading and Mathematics. *International Journal of Instructional Media.* 26 (1), 109.

Muhammad, K.M. (2004). Development of Computer Assisted Instruction (CAI) on Students Achievement in General Science in Punjab, India. Retrieved February 7, 2013, from http//www.

Munden, C.D. (1996). What is Computer Assisted Instruction? Retrieved from www.Google.com.on 23/12/12.

Muzammila A. Hafiz, M. A. & Murad, A. (2011). The effect of computer Assisted Instruction (CAI) in Chemistry on the students Achievement at Higher Secondary Level. *International Journal of social sciences and Education* Vol. 1, pg 426 – 435.

Nagata N., (1996). *The Relative Effectiveness of Production and Comprehension Practice in Second Acquisition*, University of San Francisco, USA, 1996.

Nebraska, A. H (2003). Learning Teaching Techniques University of Nebraska, Lincoln Extension. Retrieved July 22, 2014 from http://www.4h.edu/volunteer/ toolkit/ learninghtml.

Niclkin, M. & Kenworthy, S. (1995). Reading and computer assisted Instruction applications and implications CALL-EJ (on-line).

Nutta, J. (2001). *Is Computer - Based Grammar Instruction as Effective as Teacher – Directed Grammar Instruction for Teaching L2 Structures*? University of South Florida. USA.

Nzewi, U.M (1999). *Teaching Methods in Improving the Quality of Teaching in Primary Schools.* In: Ingawa S.Y (Ed) Ahmadu Bello University Press Ltd. 144. Zaria PP. 13-47.

Olaitan, S.O & Agusiobo O.N (1981). *Principles of Practice Teaching* John Wiley and Sons Limited. New York U.S.A, PP. 59-64.

Orhun, E. (2013) Computer-based cognitive tools in teacher training: The COG-TECH projects, *Turkish Online Journal of Educational Technology*.2 (3) Retrieved July 22, 2014 from http://www.tojet. sakarya.edu.tr.

Osuwa, A.A. (2002). *Information Technology and its Application in Accounting Education*. Book of Reading by Nigerian Association of Business Education. 3(5), 37.

Owusu, K.A Monney, K.A Appiah J.Y. & Wilmot, E.M. (2010) Effects of Computer-assisted instruction on performance of senior high school biology students in Ghana, An Unpublished M.Ed Thesis, University of Cape Coast.

Oyedele, J.F. (2002). Technology Utilization in Business Education: *Business Education Journal*, Nigeria Association of Business Educators. 3(5). 181-193.

Patrick, L.T. (2003). Effect of Computer Assisted Instruction on Different Learners. *Journal of Instructional Psychology*. Retrieved on 7/1/2013 from http//findarticle.com/pr/ articles/mofce

Papo, M. (2007). Effect the Success of Computer-aided Applications in Physics Teaching. *The National Education Jorunal,*161, 160-171

Patten, B., & Cadienno, T.(1993a). Explicit instruction and input processing Studies in Second Language Acquisition, 15, 225-243.

Quinn, S. (2000). Computer-assisted instruction reading and intervention in a secondary school. An Evaluation Study. *British Journal of Educational Technology* 31 (4) pp 25-38

Roblyer, M.D. & Edwards, J. (2000). *Integrating Educational Technology into Teaching.* (Second Edition) Upper Saddle River: Prentice Hall Inc.

Roth, W.; Woszezyna, C.; & Smith, G. (1996) Affordances and constraints of computer in science education. *Journal of Research in Science Teaching.* 33(9) (995-1017)

Rothstein, R. (2000) *Finance Fungibility: Investing Relative Impacts of Investment in Schools and Non-school Educational Institutions to Improve Students' Achievement.* Washington, DC: Centre on Educational Policy Publications.

Sampath, K.; Pannerer, S. A. & Santhanam, S. (1998). *Introduction to Educational Technology*. (4th Revised Edition). New Delhi, Sterling Publishers Private Limited.

Sandholtz, J.H., Ringstaff, C. & Dwyer, D.C. (2005). *Teaching With Technology Creating student-centered classrooms.* New York: Teachers College Press.

Scardamalia, M. & Bereiter, C. (1996) Computer support for knowledge-building communities. In T. Kotchmann (Ed), CSCL: *Theory and Practice of an Engineering Paradigm* Mahwah, New Jersey. Lawrence Erlbaum Associates.

Sharp, H. (1996). The Enhancement of the Teaching and Learning of Sciences in Secondary Schools using Computer Assisted Instruction. Retrieved 12/08/2013 from Computer-asisted instruction html.

Sloane, H.N., Gordon, H,M.; Gunn, C. & Mickelson V.G. (1989). *Evaluating Educational Software*: A Guide for Teachers. Eagleword Cliffs; Prentice Hall Inc.

SPSS (2007). Statistical Package for Social Sciences. Version 16.0.

Stelberg, E.R. (1991). *Computer Assisted Instruction. A Synthesis of Theory Practice and Technology*. Hillsderlt. Lawrence Erlbaum Associates Publishers.

Tabassum, R. (2004). *Effect of computer assisted instruction (CAI) on the secondary school student achievement in science*. Ph. D Thesis, University of Arid Agriculture, Rawalpinda, Pakistan, Retrieved on 20/04/08 Prr.hec.gov.pk/thesis/235.pdf

Tiene, D. & Ingram, A. (2001). *Exploring Current Issues in Educational Technology*, Boston: McGraw Hill.

U.S. Congress Office of Technology Assessment. (1998). Power on New Tools for Teaching and Learning. Washington, D.C.; Government Printing Press.

UBEB (2008). Universal Basic Education Board. Refresher workshop Manual. Universal Basic Education Board. Federal Teachers Scheme participant Yaliam Press Ltd. Sokoto: Nigeria, pp. 1-19.

UNESCO (2002). Information and Communication Technology in Education Curriculum for Schools and Programmed of Teacher Development. Retrieved March, 17, 2013, from unesco.org.images

Uzosika, C. (2008). A study of the Relations between consumer behavior and acquisition of household equipment. Implication for teaching home management in Secondary Schools. M.Ed Thesis Unpublished.

Watkins, D.C (1984). Experimental Methods of Science. *National Chiropractic Journal* 18, (9):22-38.

Yenice, N. (2003). The Effects of Computer Assisted Science Teaching on Students' Science and Computer Attitudes. *The Turkish online Journal of Educational Technology*. 2(4), 12.

Yigit, N. & Akdeniz, A.R. (2003). The Effects of Computer Assisted Instruction on Student' gain at Physics Instruction: Electrical Circuits Example. *Journal of Gazi Educational Research,* 23(3), 99-113.York: Pegem Publication.

Yusuf, K. (2010). *Effect of Information and Communication Technology on Teaching and Learning of Business Education Courses at NCE Level in Nigeria*. Unpublished M.Ed. Business Education Thesis. Faculty of Education, Ahmadu Bello University, Zaria.

Yusuf, M.O, Afolabi A.O. (2010). Effects of Computer Assisted Instruction (CAI) on Secondary School Students performance in Biology. The Turkish-online *Journal of Educational Technology*. Vol. 1 issue (1); 62-69, Retrieved on 22/6/2014 from http;//www.tojet.net/articles/918pt

APPENDIX A

DEPARTMENT OF VOCATIONAL & TECHNICAL EDUCATION
AHMADU BELLO UNIVERSITY, ZARIA NIGERIA
FACULTY OF EDUCATION

Telephone: ***069-51755, 50692***
Vice Chancellor: **Professor. Abdullahi Mustapha** B.Sc. (Hons) Pharm(ABU), Ph.D (London) FPSN
Head of Department : **Professor A.A Udoh** B.Ed. (Hons) Nsukka M.Ed. & Ph.D Bus Edu. (ABU)

*Your Ref:*_____ 13th November, 2014

Our Ref: M.Sc/Educ/12828/2010-2011 *Date:*_____

Letter of Introduction

SA'ADU ZAILANI ABUBAKAR– M.SC/EDUC/12828/2010 -2011

This is to certify that the above mentioned name is a Postgraduate student (M.Sc Agric Education) in the Department of Vocational and Technical Education, Ahmadu Bello University, Zaria carrying out a research topic: **Influence of Computer Assisted Instruction on Performance of Senior Secondary school Students in Agricultural Science in Kaduna State, Nigeria.**

Please, kindly give him every assistance he may require.

Professor A.A. Udoh
HEAD OF DEPARTMENT

APPENDIX B
LESSON PLAN

LESSON PLAN FOR THE EXPERIMENTAL GROUP (CAI)

Name of Teacher:	Sa'adu Zailani ABUBAKAR
Name of School:	Barewa College, Zaria
Group:	Experimental Group
No. of Students:	15
Class:	SS1
Average Age in years of students:	16
Subject:	Agricultural Science
Topic:	Agricultural Development in Nigeria
Duration:	80 minutes (double periods) (1 hour, 20 minutes)
Instructional Materials:	Computers, Projector and Agricultural Science Software
Previous Knowledge:	The students are familiar with the system of farming in their junior secondary schools.
Behavioral Objectives:	By the end of this lesson, students should be able to: i) define the concept of Agriculture ii) state the importance of Agriculture to the National Economy iii) list and briefly explain the branches of Agriculture, iv) mention the types of Agriculture (subsistence and commercial Agriculture).
Introduction:	The teacher introduces his lesson by asking students questions based on the previous knowledge, for example: mention five systems of farming you know?
Presentation:	Lesson is presented using the following steps;
Step I:	The teacher defined and explains the concepts of Agriculture. Agriculture is the preparation of land for crop production, rearing of animals and sales of farm product for man use.

	Step II:	The teacher states and explain the importance of Agriculture to the National Economy as follows: i) Source of food ii) Source of employment iii) Source of industrial raw materials iv) Source of foreign exchange through export. v) Source of capital formation
	Step III:	The teacher highlights and explains the branch of Agriculture which include: i) Animal Science ii) Agricultural Education iii) Agricultural Engineering iv) Crop Science v) Soil Science
	Step IV:	The teacher also mention and briefly explain the types of Agriculture namely; i) Subsistence Agriculture ii) Commercial Agriculture
Summary:		A brief run through the lesson to ensure students are all carried and to clarify the difficulties.
Conclusion:		The teacher concludes his lesson by allowing the students to ask questions.
Evaluation:		Students will be given a twenty items multiple choice (A - D) that will cover the four behavioral objectives.
Assignment:		Write short note on nomadic farming

LESSON PLAN FOR THE CONTROL GROUP (CAI)

Name of Teacher:	Sa'adu Zailani ABUBAKAR
Name of School:	Barewa College, Zaria
Group:	Control Group
No. of Students:	15
Class:	SS1
Average Age in years of students:	16
Subject:	Agricultural Science
Topic:	Agricultural Development in Nigeria
Duration:	80 minutes (double periods) (1 hour, 2) minutes)
Instructional Materials:	Chalkboard and cardboard paper containing some drawing of crops and animals.
Previous Knowledge:	The students are familiar with the system of farming in their junior secondary schools.
Behavioral Objectives:	By the end of this lesson, students should be able to: i) define the concept of Agriculture ii) state the importance of Agriculture to the National Economy iii) list and briefly explain the branches of Agriculture, iv) mention the types of Agriculture (subsistence and commercial Agriculture).
Introduction:	The teacher introduces his lesson by asking students questions based on the previous knowledge, for example: mention five systems of farming you know?
Presentation:	Lesson is presented using the following steps;
Step I:	The teacher defined and explains the concepts of Agriculture. Agriculture is the preparation of land for crop production, rearing of animals and sales of farm product for man use.

	Step II:	The teacher states and explain the importance of Agriculture to the National Economy as follows: vi) Source of food vii) Source of employment viii) Source of industrial raw materials ix) Source of foreign exchange through export. x) Source of capital formation
	Step III:	The teacher highlights and explains the branch of Agriculture which include: vi) Animal Science vii) Agricultural Education viii) Agricultural Engineering ix) Crop Science x) Soil Science
	Step IV:	The teacher also mention and briefly explain the types of Agriculture namely; iii) Subsistence Agriculture iv) Commercial Agriculture
Summary:		A brief run through the lesson to ensure students are all carried and to clarify the difficulties.
Conclusion:		The teacher concludes his lesson by allowing the students to ask questions.
Evaluation:		Students will be given a twenty items multiple choice (A - D) that will cover the four behavioral objectives.

APPENDIX C
INSTRUMENT
AGRICULTURAL SCIENCE ACHIEVEMENT TEST (ASAT)

Instruction: Answer all questions by circling the right option in section A and answer all in section B

Time: 40 minutes

Section A:

1. The area of agriculture that deals with plant diseases, prevention and control is called:
   a. Crop science
   b. Horticulture
   c. Pathology
   d. Soil Science
2. A branch of agricultural science which deals with crop improvement is
   a. Anatomy
   b. Breeding
   c. Pathology
   d. Physiology
3. The branch of agriculture that deals with the cultivation of ornamental plants, vegetables and fruits is known as:
   a. Agricultural Education
   b. Agricultural Engineering
   c. Agronomy
   d. Horticulture
4. Early men practiced the following agriculture except:
   a. Animal Hunting
   b. Fruit gathering
   c. Mechanized farming
   d. Subsistence Agriculture
5. The first stage in the development of agriculture was?
   a. Animal husbandry
   b. Commercial agriculture
   c. Hunting and gathering
   d. Large scale farming
6. Agriculture can be best defined as the production of
   a. Export crops
   b. Fibre crops for man
   c. Food for man
   d. Vegetables for man
7. Government generates revenue from agricultural activities through the following ways except:
   a. Export duties from cash crops
   b. Salaries paid to peasant farmers
   c. Sales of agricultural product.

d. Taxes paid by agro-industries.

8. The early men wandered from place to place mainly in search for:
   a. Food
   b. Fruits
   c. Fuel
   d. Water
9. The form of agriculture practiced by farmers depends on the following except:
   a. availability for labor
   b. Nearness to urban areas
   c. Size of the farmland
   d. Vegetation of the location
10. The study that deals with the production and management of timber and other forest products is termed
   a. Floriculture
   b. Forest
   c. Forestry
   d. Phonology
11. Who should be consulted in preventing and controlling of animal diseases?
   a. Agronomist
   b. Florist
   c. Nutritionist
   d. Veterinarian
12. The most common types of agriculture practiced by peasant farmers is?
   a. Subsistence agriculture
   b. Commercial agriculture
   c. Peasant plantation
   d. Agrarian revolution
13. In subsistence agriculture the following practice pre-dominate
   a. Small scale production
   b. Large scale production
   c. Medium scale production
   d. Extra large scale production
14. Commercial agriculture is largely practiced by
   a. Medium scale farmers
   b. Part-time farmers
   c. Large scale farmers

d. Peasant farmers

15. The following are types of agriculture except:

   a. Mixed farming
   b. Animal production
   c. Crop production
   d. Plantation forestry

16. Which of the following is not correct about the importance of agriculture?
    a. Production of food
    b. Provision of employment
    c. provision of the basic raw materials
    d. Serving as a source of income
17. Which of the following is not the characteristics of subsistence agriculture?
    a. Large piece of land
    b. Family labour
    c. Large scale production
    d. Intensive use of machines
18. One of these is not a feature associated with commercial agriculture
    a. Family labour
    b. Hired labour
    c. Intensive use of labour
    d. Skilled labour
19. Intensive food production can be achieved by
    a. Intensive commercial food production
    b. Semi-intensive food production
    c. Subsistence food production
    d. Part-time intensive cropping
20. Agriculture is defined as the art and science of
    a. Tilling of the soil
    b. Raising farm animals
    c. Cultivation of the land and production of animals
    d. Supplying raw materials to industries

Section B: Essay Test Questions

1a. Define the term Agriculture?

b. State 5 importance of Agriculture to the Nigerian economy

2a. State 5 branches of Agriculture and briefly explain one out of each

b. List and briefly explain the two types of Agriculture

c. Mention 2 problems of Agriculture in Nigeria

APPENDIX D
MARKING SCHEME FOR AGRICULTURAL SCIENCE ACHIEVEMENT TEST

Section A:

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

Any 1 x 20 = 20 marks

Section B: (Essay Test)

1a. Agriculture is the preparation of land for crop production, rearing of animals and sales of farm produces for man's use.

X 2 (2 marks)

b. **Importance of Agriculture to Nigerian economy**:

- Source of food
- Source of employment
- Source of industrial raw materials
- Increased income as a stimulus of industrialization
- Source of foreign exchange through export
- Source capital formation Any 5 x 1 = 5 marks

Total = 2 +5 = 7 marks

2a. **Branches of Agriculture**

1. Agronomy
2. Animal Science
3. Agricultural Economics Extension and Rural Sociology
4. Plant Science
5. Fisheries

6. Agricultural Engineering
7. Agricultural Education

Any 5 x 1 = 5 marks

b. **Types of Agriculture**
   1. Subsistence Agriculture
   2. Commercial Agriculture

Any 2 x 1 = 2 marks

Subsistence Agriculture: This has to do with the small farming, simple tools, low capital and labour is cheap 1 mark

Commercial Agriculture: This deals with the large scale farming, provision of more food for people, high capital and labour is expensive. 1 mark

c. **Problems of Agriculture in Nigeria**
   1. Land Tenure System
   2. Basic Amenities
   3. Inadequate Storage Facilities
   4. Financial Problems

Any 2 x 1 = 2 marks

Total = 5 + 2 + 2 + 1 + 1 + 2 = 13 marks

APPENDIX E

```
T-TEST
  /TESTVAL=0
  /MISSING=ANALYSIS
  /VARIABLES=precon prOex posOb posobexp
  /CRITERIA=CI(.9500).
```

T-Test

```
[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav
```

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
pre test control group	45	14.4444	3.29983	.49191
per test experimental group	45	14.4444	2.73492	.40770
Post test Objective Control group	45	14.4000	3.17232	.47290
Post test experimental group	45	26.6000	3.63943	.54253

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
pre test control group	29.364	44	.000	14.44444	13.4531	15.4358
per test experimental group	35.429	44	.000	14.44444	13.6228	15.2661
Post test Objective Control group	30.450	44	.000	14.40000	13.4469	15.3531
Post test experimental group	49.029	44	.000	26.60000	25.5066	27.6934

```
T-TEST
  /TESTVAL=0
  /MISSING=ANALYSIS
  /VARIABLES=pr0 VAR00009 VAR00010 VAR00002
```

```
  /CRITERIA=CI(.9500).
```

T-Test

```
[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav
```

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
pretest objectives control group	45	6.8444	1.88240	.28061
pretest objectives experimental group	45	6.8667	1.80404	.26893
post test objective control group	45	6.8000	2.17004	.32349
post test objectives expermental group	45	13.4889	2.70204	.40280

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
pretest objectives control group	24.391	44	.000	6.84444	6.2789	7.4100
pretest objectives experimental group	25.533	44	.000	6.86667	6.3247	7.4087
post test objective control group	21.021	44	.000	6.80000	6.1480	7.4520
post test objectives expermental group	33.488	44	.000	13.48889	12.6771	14.3007

```
T-TEST
  /TESTVAL=0
  /MISSING=ANALYSIS
  /VARIABLES=VAR00003 VAR00004 VAR00011 VAR00006
  /CRITERIA=CI(.9500).
```

T-Test

[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
pre test essay control group	45	7.6000	2.20948	.32937
post test essay control group	45	7.6000	1.55797	.23225
pre test essay experimental group	45	7.5778	1.91274	.28513
post test essay experimental group	45	13.1111	3.17105	.47271

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
pre test essay control group	23.074	44	.000	7.60000	6.9362	8.2638
post test essay control group	32.724	44	.000	7.60000	7.1319	8.0681
pre test essay experimental group	26.576	44	.000	7.57778	7.0031	8.1524
post test essay experimental group	27.736	44	.000	13.11111	12.1584	14.0638

```
T-TEST
  /TESTVAL=0
  /MISSING=ANALYSIS
  /VARIABLES=VAR00003 VAR00004 VAR00011 VAR00006
  /CRITERIA=CI(.9500).
```

T-Test

[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
pre test essay control group	45	7.6000	2.20948	.32937
post test essay control group	45	7.6000	1.55797	.23225
pre test essay experimental group	45	7.5778	1.91274	.28513
post test essay experimental group	45	13.1111	3.17105	.47271

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
pre test essay control group	23.074	44	.000	7.60000	6.9362	8.2638
post test essay control group	32.724	44	.000	7.60000	7.1319	8.0681
pre test essay experimental group	26.576	44	.000	7.57778	7.0031	8.1524
post test essay experimental group	27.736	44	.000	13.11111	12.1564	14.0658

```
T-TEST
  /TESTVAL=0
  /MISSING=ANALYSIS
  /VARIABLES=VAR00003 VAR00004 VAR00011 VAR00006 pr0 VAR00009 VAR00010 VAR00002 precon probex prskv pskelexp Jose
  /CRITERIA=CI(.9500).
```

T-Test

```
[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav
```

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
pre test essay control group	45	7.6000	2.20948	.32937

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
post test essay control group	45	7.6000	1.55797	.23225
pre test essay experimental group	45	7.5778	1.91274	.28513
post test essay experimental group	45	13.1111	3.17105	.47271
pretest objectives control group	45	6.8444	1.88240	.28061
pretest objectives experimental group	45	6.8667	1.80404	.26893
post test objective control group	45	6.8000	2.17004	.32349
post test objectives expermental group	45	13.4889	2.70204	.40280
pre test control group	45	14.4444	3.29983	.49191
per test experimental group	45	14.4444	2.73492	.40770
Post test Objective Control group	45	14.4000	3.17232	.47290
Post test experimental group	45	26.6000	3.63943	.54253
zone	45	2.00	.826	.123

One-Sample Test

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
pre test essay control group	23.074	44	.000	7.60000	6.9362	8.2638
post test essay control group	32.724	44	.000	7.60000	7.1319	8.0681
pre test essay experimental group	26.576	44	.000	7.57778	7.0031	8.1524
post test essay experimental group	27.736	44	.000	13.11111	12.1584	14.0638
pretest objectives control group	24.391	44	.000	6.84444	6.2789	7.4100
pretest objectives experimental group	25.533	44	.000	6.86667	6.3247	7.4087
post test objective control group	21.021	44	.000	6.80000	6.1480	7.4520
post test objectives expermental group	33.488	44	.000	13.48889	12.6771	14.3007
pre test control group	29.364	44	.000	14.44444	13.4531	15.4358
per test experimental group	35.429	44	.000	14.44444	13.6228	15.2661
Post test Objective Control group	30.450	44	.000	14.40000	13.4469	15.3531

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Post test experimental group	49.029	44	.000	26.60000	25.5066	27.6934
zone	16.248	44	.000	2.000	1.75	2.25

```
SPLIT FILE OFF.
ONEWAY precon prOex posOb posobexp BY zone
  /MISSING ANALYSIS.
```

Oneway

```
[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav
```

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
pre test control group	Between Groups	21.378	2	10.689	.981	.383
	Within Groups	457.733	42	10.898		
	Total	479.111	44			
per test experimental group	Between Groups	25.378	2	12.689	1.754	.185
	Within Groups	303.733	42	7.232		
	Total	329.111	44			
Post test Objective Control group	Between Groups	5.733	2	2.867	.275	.761
	Within Groups	437.067	42	10.406		
	Total	442.800	44			
Post test experimental group	Between Groups	124.133	2	62.067	5.685	.007
	Within Groups	458.667	42	10.921		
	Total	582.800	44			

```
ONEWAY VAR00003 VAR00011 VAR00004 VAR00006 BY zone
  /MISSING ANALYSIS.
```

Oneway

```
[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav
```

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
pre test essay control group	Between Groups	8.400	2	4.200	.855	.433
	Within Groups	206.400	42	4.914		
	Total	214.800	44			
pre test essay experimental group	Between Groups	8.578	2	4.289	1.182	.317
	Within Groups	152.400	42	3.629		
	Total	160.978	44			
post test essay control group	Between Groups	.533	2	.267	.105	.900
	Within Groups	106.267	42	2.530		
	Total	106.800	44			
post test essay experimental group	Between Groups	128.044	2	64.022	8.553	.001
	Within Groups	314.400	42	7.486		
	Total	442.444	44			

```
ONEWAY precon prOex posOb posobexp BY zone
  /MISSING ANALYSIS.
```

Oneway

```
[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav
```

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
pre test control group	Between Groups	21.378	2	10.689	.981	.383
	Within Groups	457.733	42	10.898		
	Total	479.111	44			
per test experimental group	Between Groups	25.378	2	12.689	1.756	.185
	Within Groups	303.733	42	7.232		
	Total	329.111	44			
Post test Objective Control group	Between Groups	5.733	2	2.867	.275	.761
	Within Groups	437.067	42	10.406		
	Total	442.800	44			
Post test experimental ...	Between Groups	124.133	2	62.067	5.683	.007

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Post test experimental group	Within Groups	458.667	42	10.921		
	Total	582.800	44			

```
ONEWAY precon prOex posOb posobexp pr0 VAR00009 VAR00010 VAR00002 VAR00003 VAR00011 VAR00004 VAR00005 BY zone
  /MISSING ANALYSIS.
```

Oneway

```
[DataSet1] C:\Users\USER\Documents\malam finalSaaad.sav
```

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
pre test control group	Between Groups	21.378	2	10.689	.981	.383
	Within Groups	457.733	42	10.898		
	Total	479.111	44			
per test experimental group	Between Groups	25.378	2	12.689	1.755	.185
	Within Groups	303.733	42	7.232		
	Total	329.111	44			
Post test Objective Control group	Between Groups	5.733	2	2.867	.275	.761
	Within Groups	437.067	42	10.406		
	Total	442.800	44			
Post test experimental group	Between Groups	124.133	2	62.067	5.683	.007
	Within Groups	458.667	42	10.921		
	Total	582.800	44			
pretest objectives control group	Between Groups	16.178	2	8.089	2.431	.100
	Within Groups	139.733	42	3.327		
	Total	155.911	44			
pretest objectives experimental group	Between Groups	6.933	2	3.467	1.068	.353
	Within Groups	136.267	42	3.244		
	Total	143.200	44			
post test objective control group	Between Groups	7.600	2	3.800	.801	.456
	Within Groups	199.600	42	4.752		
	Total	207.200	44			

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
post test objectives expermental group	Between Groups	160.044	2	80.022	20.845	.000
	Within Groups	161.200	42	3.838		
	Total	321.244	44			
pre test essay control group	Between Groups	8.400	2	4.200	.855	.433
	Within Groups	206.400	42	4.914		
	Total	214.800	44			
pre test essay experimental group	Between Groups	8.578	2	4.289	1.182	.317
	Within Groups	152.400	42	3.629		
	Total	160.978	44			
post test essay control group	Between Groups	.533	2	.267	.105	.900
	Within Groups	106.267	42	2.530		
	Total	106.800	44			
post test essay experimental group	Between Groups	128.044	2	64.022	8.553	.001
	Within Groups	314.400	42	7.486		
	Total	442.444	44			

Page 4

Pre Control	Pre Objective	Post Control	Post Objective	Pre Control	Pre Objective	Post Control	Post Objective	Pre Control	Pre Objective	Post Control	Post Objective	Zone
4.0	4.0	4.0	8.0	9.0	9.0	4.0	14.0	13.0	13.0	8.0	22.0	1.0
10.0	10.0	10.0	14.0	9.0	9.0	7.0	14.0	19.0	19.0	17.0	28.0	1.0
8.0	8.0	8.0	16.0	8.0	8.0	8.0	12.0	16.0	16.0	16.0	28.0	1.0
7.0	7.0	7.0	13.0	8.0	8.0	7.0	13.0	15.0	15.0	14.0	26.0	1.0
7.0	5.0	12.0	14.0	9.0	9.0	8.0	12.0	16.0	14.0	20.0	26.0	1.0
8.0	8.0	8.0	17.0	6.0	6.0	8.0	16.0	14.0	14.0	16.0	33.0	1.0
9.0	9.0	9.0	12.0	6.0	6.0	9.0	17.0	15.0	15.0	18.0	29.0	1.0
7.0	7.0	7.0	13.0	6.0	6.0	7.0	19.0	13.0	13.0	14.0	32.0	1.0
6.0	6.0	6.0	13.0	6.0	6.0	6.0	15.0	12.0	12.0	12.0	28.0	1.0
6.0	6.0	6.0	15.0	6.0	6.0	6.0	11.0	12.0	12.0	12.0	26.0	1.0
9.0	9.0	9.0	14.0	6.0	6.0	9.0	20.0	15.0	15.0	18.0	34.0	1.0
7.0	7.0	7.0	12.0	7.0	7.0	7.0	13.0	14.0	14.0	14.0	25.0	1.0
9.0	9.0	7.0	15.0	12.0	9.0	9.0	14.0	21.0	18.0	16.0	29.0	1.0
9.0	6.0	4.0	15.0	10.0	9.0	9.0	18.0	19.0	15.0	13.0	33.0	1.0
8.0	8.0	6.0	15.0	9.0	9.0	8.0	16.0	17.0	17.0	14.0	31.0	1.0
8.0	8.0	8.0	14.0	7.0	7.0	8.0	15.0	15.0	15.0	16.0	29.0	2.0
9.0	9.0	9.0	15.0	12.0	9.0	9.0	12.0	21.0	18.0	18.0	27.0	2.0
6.0	7.0	11.0	15.0	6.0	6.0	8.0	6.0	12.0	13.0	19.0	21.0	2.0
6.0	8.0	8.0	13.0	9.0	9.0	9.0	11.0	15.0	17.0	17.0	24.0	2.0
8.0	10.0	7.0	15.0	7.0	7.0	9.0	7.0	15.0	17.0	16.0	22.0	2.0
5.0	5.0	5.0	17.0	9.0	9.0	5.0	9.0	14.0	14.0	10.0	26.0	2.0
7.0	7.0	7.0	16.0	9.0	9.0	7.0	9.0	16.0	16.0	14.0	25.0	2.0
5.0	5.0	5.0	18.0	8.0	8.0	5.0	17.0	13.0	13.0	10.0	35.0	2.0
4.0	4.0	4.0	13.0	6.0	8.0	8.0	12.0	10.0	12.0	12.0	25.0	2.0
5.0	7.0	5.0	18.0	9.0	9.0	9.0	10.0	14.0	16.0	14.0	28.0	2.0
8.0	8.0	8.0	16.0	7.0	7.0	8.0	9.0	15.0	15.0	16.0	25.0	2.0
9.0	9.0	7.0	18.0	8.0	8.0	9.0	10.0	17.0	17.0	16.0	28.0	2.0
3.0	7.0	2.0	14.0	6.0	9.0	8.0	11.0	9.0	16.0	10.0	25.0	2.0
4.0	6.0	6.0	16.0	9.0	9.0	7.0	14.0	15.0	15.0	13.0	29.0	2.0
5.0	5.0	8.0	17.0	8.0	8.0	5.0	12.0	15.0	13.0	8.0	29.0	2.0
6.0	4.0	6.0	16.0	8.0	8.0	6.0	11.0	17.0	12.0	12.0	29.0	3.0

8.0	4.0	8.0	10.0	9.0	9.0	8.0	14.0	17.0	13.0	16.0	24.0	3.0
4.0	5.0	4.0	12.0	6.0	6.0	4.0	13.0	10.0	11.0	8.0	25.0	3.0
5.0	5.0	5.0	9.0	1.0	1.0	5.0	12.0	6.0	6.0	10.0	21.0	3.0
9.0	9.0	9.0	12.0	10.0	11.0	9.0	12.0	19.0	20.0	18.0	24.0	3.0
3.0	3.0	3.0	11.0	7.0	7.0	9.0	18.0	10.0	10.0	12.0	29.0	3.0
5.0	5.0	5.0	12.0	7.0	10.0	8.0	11.0	12.0	15.0	13.0	23.0	3.0
8.0	8.0	8.0	11.0	13.0	10.0	8.0	11.0	21.0	18.0	16.0	22.0	3.0
9.0	9.0	9.0	9.0	9.0	9.0	9.0	17.0	18.0	18.0	18.0	26.0	3.0
6.0	6.0	5.0	10.0	8.0	8.0	9.0	11.0	14.0	14.0	14.0	21.0	3.0
9.0	7.0	9.0	12.0	7.0	7.0	11.0	10.0	16.0	14.0	20.0	22.0	3.0
8.0	8.0	8.0	14.0	5.0	5.0	8.0	18.0	13.0	13.0	16.0	32.0	3.0
6.0	6.0	6.0	15.0	4.0	4.0	6.0	13.0	10.0	10.0	12.0	28.0	3.0
7.0	7.0	7.0	12.0	3.0	3.0	7.0	12.0	10.0	10.0	14.0	24.0	3.0
9.0	9.0	9.0	7.0	8.0	8.0	9.0	16.0	17.0	17.0	18.0	23.0	3.0

Zone = 1.0, Zone II= 2.0 , Zone III =3.0

Reliability

Case Processing Summary

		N	%
Cases	Valid	50	50.0
	Excluded[a]	50	50.0
	Total	100	100.0

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

Reliability Statistics

Cronbach's Alpha	Part 1	Value	.[a]
		N of Items	1[b]
	Part 2	Value	.[a]
		N of Items	1[c]
	Total N of Items		2
Correlation Between Forms			.824
Spearman-Brown Coefficient	Equal Length		.903
	Unequal Length		.903
Guttman Split-Half Coefficient			.894

a. The value is negative due to a negative average covariance among items. This violates reliability model assumptions. You may want to check item codings.

b. The item is: SCORE1

c. The item is: SCORE2

Inter-Item Correlation Matrix

	SCORE1	SCORE2
SCORE1	1.000	.824
SCORE2	.824	1.000

The covariance matrix is calculated and used in the analysis.

Intraclass Correlation Coefficient

	Intraclass Correlation[a]	95% Confidence Interval	
		Lower Bound	Upper Bound
Single Measures	.808[b]	.685	.887
Average Measures	.894[c]	.813	.940

Two-way mixed effects model where people effects are random and measures effects are fixed.

Intraclass Correlation Coefficient

	F Test with True Value 0			
	Value	df1	df2	Sig
Single Measures	9.436	49.0	49	.000
Average Measures	9.436	49.0	49	.000

Two-way mixed effects model where people effects are random and measures effects are fixed.

a. Type C intraclass correlation coefficients using a consistency definition-the between-measure variance is excluded from the denominator variance.

b. The estimator is the same, whether the interaction effect is present or not.

c. This estimate is computed assuming the interaction effect is absent, because it is not estimable otherwise.