

## Effects of Computer Assisted Instruction (CAI) Package on Senior Secondary Schools Students' Achievement in Computer Studies in Oyo Education zone of Oyo State, South-West Nigeria

OTUNLA, Adekunle Olusola (Ph.D.) & TIAMIYU, Yinusa Bolanle

Institute of Education  
University of Ibadan  
Ibadan, Nigeria,

Corresponding Author: Dr. A. O. Otunla; [otunlad@yahoo.com](mailto:otunlad@yahoo.com), Tel: +234 802 335 4237

### ABSTRACT

The Nigeria National Policy on Information Technology recommends design and development of innovative materials such as e-learning tools and resources for effective teaching in schools. This study designed, developed and evaluated the effects of Computer Assisted Instruction (CAI) on secondary schools students' achievement in Microsoft Word and presentation package themes in computer studies among senior secondary school students in Oyo Education zone of Oyo State, South-West Nigeria. The study adopted pre-test, post-test control group quasi-experimental design. It involved one hundred and sixty senior secondary school one students from four schools including one private school in Iseyin and Itesiwaju Local Government Areas of Oyo State. Seven hypothesis guided the study using one instrument i.e. Students' Computer Studies Achievement Test (CSAT)  $r=0.83$ , Computer Assisted Instructional Guide for Computer Studies (CAIGCS) and Computer Assisted Instructional Package (CAIP) were also used for the deployment of teaching. Findings from the study revealed that there was significant main effect of Computer-Assisted Instruction (CAI) on students' academic achievement in Computer Studies [ $F_{(1,151)} = 101.179, P < 0.05; \eta^2 = .401$ ] CAI accounted for 40% of the total observed variance in the post-test scores of students' achievement in computer studies while the independent variables accounted for about 60% of the variation. Findings further revealed that there was no significant main effects of; age [ $F_{(1,151)} = .100; P > 0.05; \eta^2 = .001$ ] and gender [ $F_{(1,151)} = .275; p > 0.05; \eta^2 = .002$ ]. Conclusively, the effect of computer assisted instruction was positive on students' achievement in computer studies. The study therefore, recommend hands-on and intensive computer authoring software application training for teachers and provision of adequate facilities for computer assisted instruction deployment in teaching students in schools. Lastly, the study recommends diffusion and replication of CAI package for the development of other thematic areas of computer studies and content in other schools subjects.

**KeyWord:** Computer Assisted Instruction, Information Technology Policy, Word Processing, Presentation Software,

### Introduction

Daily routines of human activities are constantly changing due to advances in computer technology just as its application is taking over many of classroom interactions in educational institutions from elementary to tertiary. Innovative teachers are also taking advantage of the relevant technology tools and resources for teaching and training of students. The use of computer in teaching and learning has become widespread among educational institutions because computer has become devices that assist both teachers and learners in the process of teaching and learning respectively. Thus, unprecedented changes brought about by the advent of computers and communication technologies have necessitated drastic changes in educational goals of many nations. Globally, schools are not only instructed to equip the learners with basic knowledge of Computer Studies, but are expected to develop in them required skills that could assist them to be competent in computer education and to enhance their self-development and continuous learning. The recognition given to the value of computer in the teaching and learning processes in the modern world prompted the introduction of computer education into the Nigerian school curriculum exactly two decades ago.

To attain meaningful teaching and learning of computer education and dissemination of computer knowledge in Nigeria, the National Commission for Colleges of Education (NCCE) projected the need to produce seasoned professional teachers in computer education, so as to accomplish the following objectives:

22. to teach computer studies at the primary and secondary school levels.
23. to program and process given data with maximum speed and accuracy and;
24. to demonstrate reasonably high level of competence for further studies in computer education and allied disciplines. (NCCE, 1996)

Adamu (2004) noted that there are two fundamental uses of computer systems in education namely; computer as a medium of instruction and also as the subject of instruction. Ciwar (2005) asserts that the use of computer in teaching decreases situation that could embarrass students for not finding answers to questions raised by the teacher.

The author also observe that some, teachers who use Computer Assisted Instruction (CAI) often implement it as supplementary instruction in form of regular assignments, meaning that children using CAI are receiving additional instruction and have opportunity to practice independently. Plomp, Pelgrum and Law (2007) observes that educational institutions around the world are under increasing pressure to use the new Information and Communication Technologies (ICTs) so as to bring about changes into the classroom interactions, help students to become lifelong-learners within a context of collaborative enquiry and to help them to work and learn from experts and peers in a connected global community. Along this same notion the National Teacher Institute (NTI); an agency of the Federal Government of Nigeria (FGN) saddled with the responsibility of middle level professional training in teacher education affirms that the old approach to teaching is teacher-centred which implies that teacher does all the talking and the learners do all the listening (NTI, 2008).

Adeyemi (2012) also noted that the traditional or the conventional method of instruction is characterized by unspecified or vague objectives, placement of emphasis on instructor behaviour rather than students and minimal responses of students to the instructional materials among other lapses. Adeyemi (2012) further observed that under the traditional system of instruction, the student is motivated primarily by the fear of receiving a poor grade, losing a course credit or of being forced to leave the college (dropping out) for catalogue of academic failure. However, the new technology-driven approach is learner-centred, in such a way that the learner is not treated as an empty vessel. Therefore there is no gainsaying that the quality of education is largely dependent on the quality of instruction provided in the classroom by the teachers via the use of modern educational technology. According to Obiadazie (2014) Computer education involves computer literacy, computer assisted instruction (CAI) and computer appreciation. The author stresses that computer education is the effort or the ability to make citizen to become computer literate.

As a result of the need to integrate computer technology into the Nigerian educational system to support innovative teaching and learning in knowledge acquisition, development and information management the Federal Republic of Nigeria (FRN) launched and implement the National Policy on Computer literacy at all level of education in Nigeria; from primary, to secondary and to tertiary levels of education. The objectives of the National Policy on Computer Education and Literacy for secondary school include:

- to bring about a computer literacy in each student in Nigeria;
- to develop the use of computer as teaching tool in all subject areas and to familiarize students with the use of computer technology;
- to enable the present generation of school children at the secondary school level appreciate the potentials of the computer and be able to utilize the computer in various aspects of life and later occupation; and

- to expose the teachers and the students to the latest scientific knowledge and skills (Federal Republic of Nigeria, 2004a; 2004b; 2008; 2013).

The general objectives of computer education according to the National Policy on Computer Education are:

- i. to help meet with the demand of our time and technological development.
- ii. to help expose the rudiment of the computer and its workshop to the pupils.
- iii. to lay a solid foundation in computer science education at the early stages of the pupils.
- iv. to encourage and stimulate the interest of the pupils to computer education.
- v. to paves way for easy application of computer education in other discipline.
- vi. to ensures literacy in computer education at the secondary school level (Federal Ministry of Education, 2009).

The specific objectives for teaching computer in the secondary school curriculum are:

- i. to develop competence in the basic skill and understanding of dealing with computer.
- ii. to develop the habit of effective and direct thinking involving analytical data basic concept.
- iii. to develop the habit of effective and intellectual independence with regard to computer.
- iv. to develop necessary computer educational background for further education.
- vii. to create a technologically based education at the secondary school level (Federal Ministry of Education, 2009).

The policy statement and the document specified the hardware and software requirements in terms of suitable hardware options and recommended that pilot schools should be provided with eight computer systems for the effective implementation of curriculum development. The recommendation of eight computers per school, which is in a ratio of one computer to five students (in an ideal classroom of forty students), as against the ideal ratio of one computer to one student, this is far from the ideal. The document contains secondary school computer studies curriculum which had further been broken down into junior secondary syllabus and senior secondary school syllabus. From literature, the integration of computer in education and training cut across all levels of education i.e primary, secondary and tertiary, the use of computers is applicable. Computers can be used in education as a teaching tool through the use of Computer Assisted Learning (CAL), Computer Assisted Instruction (CAI), Computer Mediated Learning (CML), Computer Managed Instruction (CMI). Computer Assisted Learning (CAL) which is somehow similar to CAI is generally being used in learning and instruction. CAL involves the development of software that can be used as a learning tool by the students.

CAL works in a way that the computer would present module of instructions in sequences for the students to learn and the package would also test their mastery of the topics. The response of the learner determines the progress or otherwise of the learners which is largely dependent on the accuracy of the answers supplied by the students.

On the other hand Computer Assisted Instruction according to Ekiregwo (2001) is a programme of instructional materials presented by means of a computer or computer systems. Fakomogbon (2002) also describe CAI as any instructional materials production in audio disc format or audio-visual digital disc that can be played-back on the available screen. Adegbiya and Onasanya (2007) define Computer Assisted Instruction as the use of computer to provide instruction directly to the students by simulating teaching and learning situation. CAI is applicable in the areas of lecture demonstration in the classroom, interactive teaching or tutorial aids and self-testing exercise for students working individually, learning-in-pairs or group-learning. Using self-instructional mode CAI affords a learner to go at his/her own pace whereby; students are highly motivated to do extra work for academic enrichment with little or no input from the teachers or external guidance.

Fakomogbon, Omiola, Awoyemi and Mohammed (2014) state that Computer Assisted Instruction is the term used to describe the use of computers to provide instruction directly to students in order to simulate teaching and learning situation i.e. a simulated instructional environment presented by means of a computer or computer systems. Clark (2008) discusses the potential benefits of online and computer-mediated learning and how educators and policy makers might work toward realizing the potentials. The author also differentiate between potentials and misconceptions of online learning. Fakomogbon et.al (2014) further asserts that what makes CAI most interesting is the degree of information between the users and the machine as facilitated by colourful and attractive machine interface. Also with CAI, students can be brought into a computerized environment. Obiadazie (2014) commend the introduction of computer studies into the Nigerian educational system as a step in the right direction in as much that computers has many applications in education, engineering and business. In summary, whenever computer is used to stimulate actions, engage students in tutorial and teach students directly, it is referred to a Computer Assisted Instruction (CAI).

However, for students to effectively use CAI in learning, students must first obtain general computer knowledge and skills on how to use the keyboard, give commands and instructions on the computer hardware and must be familiar with relevant software applications. Further, students must learn how to navigate the mouse by practicing or playing games on the computer to develop keyboard skills alongside peripheral devices. For students to actively learning using computers, they must understand the concepts of digital learning objects or material and see how the concepts in the CAI fit together, they must also combine the information in their own minds, apply the information in a useful way, receive feedback and act on the feedbacks.

Fakomogbon et.al. (2014) reported that CAI programmes that are designed using research-based teaching strategies were found to be highly effective and that student taught through CAI as supplementary strategy performs significantly better than the other students. Within a typical classroom, each student will have different needs that the teacher is required to meet, because students learning styles are different and can never be the same; what motives each group of students may also be different and their understanding level may not be the same. Thus, CAI must take care of all the differences.

Further, computer assisted Instruction (CAI) can take care of some of the individual differences. In agreement with this notion, Olabiyi, Aiyelabowo and Keshinro (2013) agrees that it is understandable that computer cannot solve all the educational and instructional problems but Computer Assisted Instruction can make teaching that is tailored towards individual student's needs more practical, activity-based and of course interesting. Over the years, there has been mixed findings in form of evidences from reported studies on the potentials of computer assisted instruction and other related technologies. For instance, Smith, Clark and Blomeyer (2005) in their report of a synthesis of the results of eight experimental research studies sponsored by the North Central Regional Education Laboratory (NCREL) in 2004; the authors concluded that no significant improvement was found in students' learning as a result of online learning. However, the authors noted that there are many important implications for further research of online learning. Peppler and Kafai (2007) after drawing inferences on ethnographic research done by some authors in computer clubhouses concludes that creative design in digital media proves beneficial to young people, giving them greater fluency and flexibility across platforms, providing an opportunity to explore their own interests while learning new skills, and developing a critical eye toward digital media in the world.

Englert, Zhao, Dunsmore, Collings, and Wolbers (2007) in a study examined the effectiveness of a web-based writing program with thirty-five elementary grade students from six special-education classrooms across five special-education schools. The study compared students' achievement in blended online courses with that in matched face-to-face classrooms. The authors from their findings reported that students in the blended online learning condition outperformed students in the face-to-face classroom conditions. Also, DiPietro, Ferdig, Black, and Preston (2008) reported on ascertaining weather teaching in online learning environments is different from teaching in face-to-face environments. The authors concluded that such differences actually exist and have implications for policy formulations and review; research agenda and instructional practice. Further, Means, Toyama, Murphy, Bakia and Jones (2009) from the reports of their studies on a meta-analysis of forty-six experimental studies that are related to comparism of online and face-to-face classroom interactions. The authors concluded that on average, post-secondary students in online learning conditions performed better than those receiving face-to-face instruction.

Yet in another study, Light, Cerrone and Reitzes (2009) conducted a study among schools in New York City and reported that the program drastically changes the role of the teacher while engaging students by giving them more accessibility to digital technology and interactions with online learning environments. Davis (2010) reporting on a qualitative research affirms that online programmes and courses could specially fit some students with individualized learning experiences. The author further asserts that virtual classroom and instruction are saturated with the use of online resources such as data collection, one-many and one-one online interactions with tutors and facilitators all which could offer more opportunities for accessing open educational resources (OERs) and online courseware materials more than what the face-to-face interactions within the brick-and-mortar schools could provide. Davis (2010) further suggest that researchers and proponents in the field of online education as well as online education service providers should describe in concrete terms; the potential of online learning for supporting self or individualized learning.

### Statement of the Problem

The National Policy on Information Technology, National Policy on Computer Education and Literacy and the Senior Secondary Schools Education Curriculum on Computer Studies were formulated and implemented by the Federal Government of Nigeria, the policy recommended among many other things the use of innovative materials in teaching in the Nigerian schools. The overall goal of the policy statements is to help students learn effectively and efficiently either individually or in groups. Further, one of the objectives of the National Policy on Computer Education and Literacy at the secondary school level in Nigeria is to develop techniques in the use of computer as teaching tool in all subject areas and to familiarize

students with the use of computer technology. However, provision of innovative materials by relevant government agencies such as the ministries, agencies and departments (MDA) is not realistic and in some instances where such materials are provided, they have been found to be more of foreign contents and are thus, alien to students' cultural background. Therefore, to actualize and realize these laudable policy statements, it calls for drastic steps and actions especially among secondary school teachers, whereas, they are perceived to lack the requisite knowledge and skills to produce and use such innovative materials. Therefore, this study design, develop and evaluate the effects of a Computer Assisted Instruction (CAI) package on teaching and learning of computer studies using Word processing and presentation package themes among senior secondary school one students in Oyo Educational Zone of Oyo State, South-Western, Nigeria.

### Research Hypothesis

6. There is no significant main effect of treatment (Computer Assisted Instructional Package) on teaching word processing and presentation package in Computer Studies.
7. There is no significant main effect of Age on students' achievement in computer studies.

8. There is no significant main effect of Gender on students' achievement in computer studies.
9. There is no significant interaction effect of computer Assisted Instructional Package and age on students' achievement in computer studies.
10. There is no significant interaction effect of treatment and gender on students' achievement in computer studies.
11. There is no significant interaction effect of age and gender on students' achievement in computer studies.
12. There is no significant interaction effect of treatment, age and gender on students' achievement in computer studies.

### Methodology

The study adopted pre-test, post-test control group quasi-experimental research design for the purpose of evaluating the effects of Computer-Assisted Instructional Package on Teaching of Computer Studies among students in the selected secondary schools in Oyo Educational zone of Oyo State. The Population of this study comprised all the senior secondary year one (SS1) Computer Studies students in the Oyo educational zone of Oyo State, South-West Nigeria. Purposive sampling technique was employed to select four co-educational schools from Iseyin and Itesiwaju Local Government Areas where computer equipment and accessories were provided for teaching computer studies. Simple random sampling was employed in selecting 40 students in each of the schools totalling 160 senior secondary school students that constituted the sample for the study. Subjects were therefore classified into the experimental and control groups

### Research Instruments

The main instruments used in generating data for this study was Computer Studies Achievement Test (CSAT). However, Computer Assisted Instruction Guide for Computer Studies (CAIGCS) and Computer Assisted Instructional Package (CAIP) were developed as intervention packages. Computer Studies Achievement Test (CSAT) was developed and validated by the researchers to test student's achievement in two selected topics in computer studies. It consists of forty items multiple choice objective test items with (4) options i.e. A, B, C, D; per item. Students were required to pick the correct option from the options provided. A pool of 100 items was developed following the principle of test construction; the draft copy of the pool of items was revised by two Computer Science experts and teachers in senior secondary schools, each of whom was given a copy of the draft. Based on their reactions, some of the items were substituted with new ones and some had either their stem or options modified. Thereafter, the pool of items was administered to one hundred (100) SS 1 students who were not part of the sample of study and their responses to the items were scored. Item analysis of the instrument was also carried out to determine the facility and discrimination indices; using discriminating power and difficulty index to select the best forty items that constituted the CSAT.

The final thirty items for the instrument were selected and the reliability coefficient using the split-half approach and the Kuder Richardson formula 21(KR-21) yielded a value of 0.83 which indicates a high correlation and reliability of the instrument.

The Computer Assisted Instruction Guide for Computer Studies (CAIGCS) is a programmed instructional package for the purpose of instruction in the classroom. The instructor guide which contain two major topics in Computer Studies i.e. Word Processing and Presentation Package. The guide consisted of a lesson plans for the entire module of lessons and each of the lesson plan contains specifications such as: the content or topics, the objectives to be achieved at the end of the instruction, the instructional materials and the assessment.

Computer Assisted Instructional Package (CAIP) for Senior Secondary Computer studies serves as the treatment package was developed by the researcher .The package contained two topics which were sub-divided into sixteen lessons which include an introduction, list of lessons, content and formative questions at the end of each topic. Faststone Screencast Software which allows users to easily record video and annotates learning objects on the screen including windows, images, menus, full screen, rectangular/freehand/fixed regions as well as scrolling windows or web pages was used in authoring the package. The second author under the guidance of the first author used the software together with necessary accessories such a laptop computer with installed software, headset microphone e.t.c. to add audio sound clips to the visual images. Thereafter Poststage Slideshow Software was used for editing the video produced in WMV and later converted to AVI to allow for ease of preview in portable devices like Mobile Phone/Iphone/Ipad or on video output setup such as; DVD movie which can be played on DVD Player or DVD Data which can only be played on computer system. The software can also be used to save video in WMV/MP4/NTSC/PAL/AVI format. For the purpose of this study the researchers used Photostage Slideshow software to convert the video to DVD Data which was installed in each computer system in AVI format for the use of students that are involved in the experiment.

### **Procedure for conduct of the experiment among Experimental and control group**

Procedure for conduct of the experiment involve the arrangement of the experimental group participants within the computer laboratory using CAIP as teaching strategy to facilitate self-learning process within a technology-driven learning environment; the students in the experimental group were guided on the use of the treatment package through a short introduction, guide to launching the CAI package, explorations of the CAIP, supervision of the participants' activities, responding to participants on ask questions as regards the deployment of the package by individual students, feedback and review. The procedure was preceded by administration of Computer Studies Achievement Test (CSAT) pre-test at the beginning of the procedure which was followed by teaching of the sixteen topics during the six weeks. At the end of the six weeks the Computer Studies Achievement Test (CSAT) was administered as post-test.

In the case of the control group; conventional method was employed by the researched assistant training for the same purpose using the scripts of the Computer Assisted Instruction Guide for Computer Studies (CAIGCS). The procedure was preceded by administration of Computer Studies Achievement Test (CSAT) pre-test at the beginning and followed by teaching of the sixteen topics during the six weeks. At the end of the six weeks the Computer Studies Achievement Test (CSAT) was administered as post-test.

In summary, the experimental group was exposed to Computer Studies lesson using Computer Assisted Instructional Package for the period of six weeks while the control group were taught Computer Studies lesson with conventional (face-to-face) method. The total number of lesson within six weeks was eighteen periods lasted for forty minutes each. After the duration of six weeks of treatment for the experimental group and six weeks of conventional method with control group, post-test was administered to both groups as appropriate. Lastly, each of the pre-test and post-test were coded with the a unique identifier as appropriate for each group and was later marked and scored over hundred per cent.

### **Method of Data Analysis**

The scores obtained from two intact classes were shorted into experimental group (forty students) and control group (forty students). The scores were computed and used in testing the seven hypotheses. Data were analyzed using mean, standard deviation and the Analysis of Covariance (ANCOVA). The level of significance adopted for the analysis was  $P \leq 0.05$ , which formed the basis for accepting or rejecting each of the hypotheses.

### **Findings and discussions**

**Hypothesis 1:** There is no significant main effect of treatment (Computer Assisted Instructional Package) on teaching word processing and presentation package in Computer Studies.

**Table 1: Analysis of Covariance (ANCOVA) of Post-test Mean Score of Students' Achievement in Computer Studies by Treatment, Age and Gender**

Source	Type III Sum of Squares	DF	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	6944.803 <sup>a</sup>	8	868.100	30.883	.000	.621
Intercept	6194.426	1	6194.426	220.366	.000	.593
Pretest	219.377	1	219.377	7.804	.006	.049
<b>Treatment</b>	2844.113	1	2844.113	101.179	.000	.401
Age	2.811	1	2.811	.100	.752	.001
Gender	7.718	1	7.718	.275	.601	.002
Treatment * Age	17.725	1	17.725	.631	.428	.004
Treatment * Gender	4.385	1	4.385	.156	.693	.001
Age * Gender	41.410	1	41.410	1.473	.227	.010
Treatment * Age * Gender	14.517	1	14.517	.516	.473	.003
Error	4244.572	151	28.110			
Total	103830.000	160				
Corrected Total	11189.375	159				

*Significant at  $p < 0.05$ ,  $R^2 = .621$  and adjusted  $R^2$  Squared = .601*

The result in Table 1 indicates that there is a significant main effect of computer Assisted instructional package on students' achievement in computer studies [F (1,151) = 101.179;  $p < 0.05$ ;  $\eta^2 = .401$ ]. The null hypothesis is therefore rejected. The partial eta squared ( $\eta^2$ ) of .401 indicates that the computer assisted instructional package accounted for 40.1% of the total observed variance in the post test scores of student achievement in computer study. The Adjusted R2 value .601 implies that the independent variables accounted for 60.1% of the variation in students' achievement in computer studies

**Table 2: Estimated Marginal Means and Standard Error of Treatment Group**

Treatment	Mean	Std. Error
<b>Treatment Group</b>	30.652 <sup>a</sup>	.752
<b>Control Group</b>	17.002 <sup>a</sup>	1.128

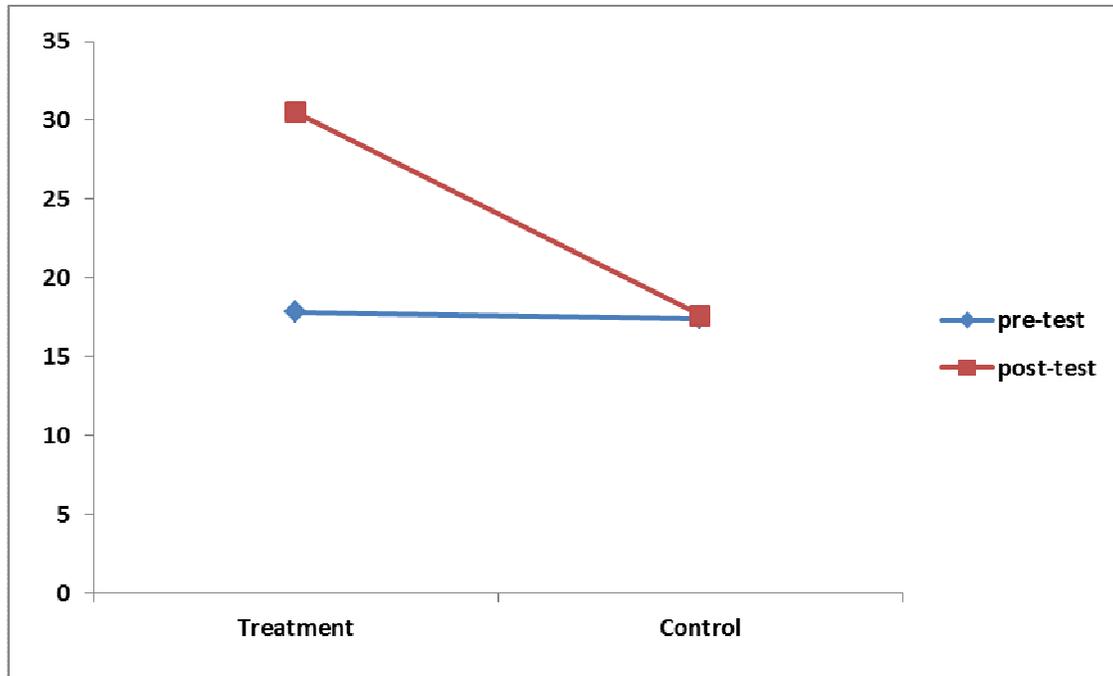
Table 2 shows that the mean post test scores of students in the experimental group is greater ( $x = 30.652$ ) than the mean of the control group ( $x = 17.002$ ). Therefore, it could be deduced that students performed better when being taught with computer assisted instructional package. In order to discern the source of the difference between the treatment and the control group, scheffe post hoc comparison test was conducted, the source of significant difference, direction and amount of variation due to each treatment group were unraveled and shown in the Table 3.

**Table 3: Scheffe Post-Hoc Multiple Comparison of Achievement in Computer Studies by Treatment**

Treatment (I)	Treatment (J)	Mean Difference (I-J)	Std. Error	Sig.
<b>Computer Assisted Package</b>	Conventional	13.650*	1.357	0.000
	Computer Assisted Package	-13.650*	1.357	0.000

**The mean difference is significant@ the 0.05 level.**

From Table 3 the main difference is significant at 0.000, a value less than 0.05. It follows that the experimental group improved in their achievement in Microsoft Word and presentation application after treatment than their counterparts in control group. It is further confirmed in the Figure 1. The profile plot which shows that the students in the experimental group performed better than those in the control group with mean scores of 30.652 and 17.002 respectively.



**Figure 1: Graph Showing Profile of Participants in the Experimental Group**

**Hypothesis 2:** There is no significant main effect of Age on students' achievement in computer studies.

The result on Table 1 indicates that there is no significant main effect of age on students' achievement of Computer Study [ $F_{(1,151)} = .100$ ;  $\rho > 0.05$ ;  $\eta^2 = .001$ ]. The null hypothesis  $H_{O2}$  is therefore not rejected and the partial eta squared of .001 implies that age accounted for 0.1% of the observed variance in the post-test scores of students' achievement in computer studies. The implication of this insignificance is that students do not differ in achievement in computer studies based on their on their age.

**Hypothesis 3:** There is no significant main effect of Gender on students' achievement in computer studies.

The result on Table 1 indicates that there is no significant main effect of gender on students' achievement in Computer Study [ $F_{(1,151)} = .275$ ;  $\rho > 0.05$ ;  $\eta^2 = .002$ ]. The null hypothesis  $H_{O2}$  is therefore not rejected and the partial eta squared of .002 implies that, gender accounted for 0.2% of the observed variance in the post-test score of students.

**Hypothesis 4:** There is no significant interaction effect of computer Assisted Instructional Package and age on students' achievement in computer studies.

The results on Table 1 indicates that there is no significant main effect of computer Package and age on students' achievement in computer studies [ $F_{(1,151)} = .631$ ;  $\rho > 0.05$ ;  $\eta^2 = .004$ ]. The null hypothesis  $H_{O4}$  is rejected and the partial eta squared of 0.004 implies that combination of treatment and age accounted for 0.4% of the observed variance in the post test.

**Hypothesis 5:** There is no significant interaction effect of Treatment and Gender on students' achievement in computer studies.

The results on Table 1 also indicates that there is no significant interaction effect of treatment and Gender on students' achievement in Computer Studies [ $F_{(1,151)} = .156$ ;  $\rho > 0.05$ ;  $\eta^2 = .001$ ]. The null hypothesis  $H_{O5}$  is not rejected. The partial eta squared of .001 implies that, Treatment and Gender accounted for 0.1% of the observed variance in the post-test scores of students' achievement in computer studies.

**Hypothesis 6:** There is no significant interaction effect of Age and Gender on students' achievement in computer studies.

The result on Table 1 further indicates that there is no significant interaction effect of Age and Gender on students' achievement in Computer Studies [ $F_{(1,151)} = 1.473$ ;  $\rho > 0.05$ ;  $\eta^2 = .010$ ]. The null hypothesis  $H_{O6}$  is not also rejected. The partial eta squared of .010 implies that Age and Gender accounted for 1% of the total observed variance in the post-test scores of students' achievement in computer studies.

**Hypothesis 7:** There is no significant interaction effect of Treatment, Age and Gender on students' achievement in computer studies.

The result on Table 1 indicates that there is no significant interaction effect of Treatment, Age and Gender on students' achievement in Computer Studies [ $F_{(1,151)} = .516$ ;  $\rho > 0.05$ ;  $\eta^2 = .003$ ]. The partial eta squared of .003 implies that of the three fixed factors Treatment, Age and Gender accounted for 0.3%

of the total observed variance in the post-test scores of students' achievement in computer studies. Hence, the null hypothesis  $H_0$  is not rejected.

### Discussions of Findings

The result of this study that indicated a significant main effect of computer Assisted instructional package (CAIP) on students' achievement in computer studies which corroborate that of Englert, Zhao, Dunsmore, Collings, and Wolbers (2007) who reported that students in the blended online learning condition out-performed students in the face-to-face classroom conditions. Thus, there is no gain-saying that the use of CAIP as a teaching strategy is effective over lecture method. Davis (2010) also affirms that online programmes and courses could specially fit some students with individualized learning experiences. This implies that individualization of instruction through CAI explained further the better performance of the experimental group. The result of the study also in agreement with similar studies that the performance of students exposed to CAI packages were enhanced in other subjects like that of Fakomogbon et.al. (2014) whose study reported that CAI programmes that are designed using research-based teaching strategies were found to be highly effective and that student taught through CAI as supplementary strategy performs significantly better than the other students.

The study also recorded no significant main effect of Age on students' achievement in Computer Studies. This implies that age of students in experimental and control group is insignificant to their achievement in Computer Studies. This finding agrees with Smith, Clark and Blomeyer (2005) concluded that no significant improvement was found in students' learning as a result of online learning. DiPietro, Ferdig, Black, and Preston (2008) also in a similar study ascertained that teaching in online learning environments is different than teaching in face-to-face environments.

Further, findings on no significant main effect of gender on students' achievement in computer studies also is in support of Smith, Clark and Blomeyer (2005) who concluded that no significant improvement was found in students' learning as a result of online learning. However, engaging students in computer learning activities presupposes a change in teachers role from that of custodian of learning to that of facilitators, this agrees with Light, Cerrone and Reitzes (2009) who concluded in their studies that while engaging students by giving them more accessibility to digital technology and interactions within computer learning environments bring about drastic changes in the role of the teacher.

### Summary of Findings

The findings of the study are summarized as follows:

- Experimental group exposed to Computer Assisted Instructional Package (CAIP) performed better than control group taught with conventional method only.
- Students' age had no significant main effect on their achievement in computer studies.
- Students' gender had no significant main effect on their achievement in computer studies.

- The interaction effect of treatment and age had no significant main effect on students' achievement in computer studies.

### Recommendations

Arising from the findings of this study, the following recommendations were made:

- Diffusion of CAI package and replication of the approach used in this study to develop other content areas of computer studies and other subjects in schools.
- Assurance of conducive learning environment through provision of adequate facilities for Computer Assisted Instruction (CAI) as a mode of teaching and instruction in schools for effective learning.
- The Nigerian IT policy should be fully monitored for proper implementation through orientation among stakeholders, facility support of ICT infrastructure in schools.
- Reinforced and properly implemented government policy on computer education and literacy at the secondary school level.
- Emphasize of practical teaching of computer studies in senior secondary schools by school administrators.
- Development of interest by teachers in the use of CAI tools and ICT resources for teaching computer studies in the Nigerian secondary schools.
- Training of teachers on computer skills and hand-on computer authoring software application through seminars, workshops, conferences as well as in-service training.

### Conclusion

Arising from the findings of this research work, we could draw conclusions that; innovative instructional strategies as advocated by the Nigerian policy on information technology if properly implemented in teaching computer studies at senior secondary school level will significantly improve students' achievement. More so that findings from this study showed better performance in computer studies was achieved through the use of CAI package. The Computer Assisted Instruction Package (CAIP) proved to be beneficiary and effective in teaching computer studies to students at the senior secondary school one.

## REFERENCE

- Adamu, U. A. (2004). *Computer Application and use of ICT for Teaching and Learning*. A workshop paper presented at Train-the-teacher workshop for capacity building for lecturers in colleges of education in Nigeria. Organized by Education Tax Fund (ETF) and National Commission for Colleges of Education (NCCE). Abuja 2004 at Akwanga.
- Adegbija, M. V. & Onasanya, S. A. (2007). *Practical Hand Book on Instructional Media*. Ilorin. Author
- Adeyemi, B.A (2012). Effect of Computer Assisted Instruction (CAI) on students' Achievement in Social Studies in Osun State, Nigeria. *Mediterranean Journal of Social Science Volume 3(2) pp 269-277*.
- Ciwar, A.M. (2005). Keynote address on Science, Technology and Mathematics (STM) education and professionalism. 46th Annual Conference proceedings
- Clark, T. (2008). Online learning: Pure potential. *Educational Leadership, Reshaping High Schools*, 65(8).
- Davis, M. R. (2010). E-Learning seeks a custom fit. *Education Week Digital Directions*, 3(2).
- DiPietro, M., Ferdig, R. E., Black, E.W., & Preston, M. (2008). Best practices in teaching K-12 online: Lessons learned from Michigan Virtual School teachers. *Journal of Interactive Online Learning*, 7(1), 10-35.
- Englert, C. S., Zhao, Y., Dunsmore, K., Collings, N. Y., & Wolbers, K. (2007). Scaffolding the writing of students with disabilities through procedural facilitation: Using an Internetbased technology to improve performance. *Learning Disability Quarterly* 30(1), 9-29.
- Ekiregwo, P. O. (2001). Using Computer Instruction in the Science Class -creation of CDs and Diskettes with CAIs. *A workshop paper presented at the "Train-the trainers" workshop organized by UNESCO/NCCE*.
- Fakomogbon, M. A. (2002). Instructional media technology and services for special learners. *Nigerian Journal of Educational of Educational Media and Technology*, 10 (1)
- Fakomogbon, M. A, Omiola, M. A, Awoyemi, S. O & Mohammed, R. E (2014) Effect of Computer Assisted Instructional Package on the Performance of Students in Mathematics in Ilorin Metropolis. *European Scientific Journal Vol. 10, No 25 pp 196-204*.
- Federal Ministry of Education (2009). *Senior Secondary Schools Education Curriculum on Computer Studies for Senior Schools 1-3*. National Educational Research and Development Council (NERDC). Abuja, Nigeria.
- Federal Republic of Nigeria (2004a). *Nigeria National Policy on Information Technology*, Available at: [http://www.nitda.gov.ng/use\\_html](http://www.nitda.gov.ng/use_html)
- Federal Republic of Nigeria (2004b). *The National Policy on Education* (4<sup>th</sup> Edition) Abuja National Education Research and Development Council (NERDC), Abuja: Federal Ministry of Education.
- Federal Republic of Nigeria (2008). *The National Policy on Education* (5<sup>th</sup> Edition) Abuja National Education Research and Development Council (NERDC), Federal Ministry of Education.
- Federal Republic of Nigeria (2013). *The National Policy on Education*. (6<sup>th</sup> Edition) Abuja National Education Research and Development Council (NERDC), Abuja: Federal Ministry of Education.
- Federal Republic of Nigeria (2004): *National Policy in Education* (4<sup>th</sup> ed.). Lagos: NERDC Press.
- Light, D., Cerrone, M., & Reitzes, T. (2009). *Evaluation of the School of One Summer Pilot: An Experiment in Individualized Instruction*. New York, NY: Education Development Center.
- Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2009). *Evaluation of Evidence- Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies*. Washington, D.C.: U.S. Department of Education, Office of Planning, Evaluation and Policy Development.
- National Commission for Colleges of Education (1996). *Minimum Standards for Nigerian Certificate in Education*. Kaduna: Government Press.
- National Teachers' Institute (2008). *Manual for the Retraining of Primary School Teachers on Social Studies. A Millennium Development Goals Project (MDG)*. Kaduna: National Teachers' Institute Press.
- Obiadazie, R. E. (2014) Strategies for Involving Communities in the Funding of Computer Education in Secondary Schools in Anambra State. *An International Multimedia Journal, Ethiopia volume 8 (1), serial No 32 pp 65-82*.
- Olabiya, O. S Aiyelabowo, O. P & Keshinro, O. T (2013) Relevance of Computer Assisted Instruction (CAI) for Effective Skill Development among Technology Education Students in Nigeria. *Nigerian Journal of Education and Practice Volume 4 No21 pp 80-90*.
- Onyemechara, N. C (2006) *Effect of Computer Assisted Learning on Students Achievement in Statistics in Secondary Schools in Orumba South L.G.A of Anambra State*, Unpublished TTC Project report. Federal College of Education (Technical), Umunze Anambra State.
- Peppler, K. & Kafai, Y. B. (2007) From SuperGoo to Scratch: Exploring media creative production in an informal learning environment. *Journal on Learning, Media, and Technology*, 32(2), 149-166.
- Plomp, T; Pelgrum, W. J. & Law, N. (2007). *SITES 2006- International Comparative Survey of Pedagogical Practices and ICT in Education*. Education and Information Technologies Vol.12 (2) pp; 83-92
- Smith, R., Clark, T., & Blomeyer, R. L. (2005). *A Synthesis of New Research on K-12 Online Learning*. Naperville, IL: Learning Point Associates