

EFFECT OF COMPUTER AIDED INSTRUCTION ON STUDENTS ACADEMIC ACHIEVEMENT IN COMPUTER STUDIES IN SENIOR SECONDARY SCHOOLS IN ENUGU EAST LOCAL GOVERNMENT AREA, ENUGU STATE

Chiwetalu Chibuike Remigius

Department of Science and Computer Education Godfrey Okoye University, Enugu Enugu State

Abstract: This study focused on determining the effect of CAI on the academic achievement of SSII students in computer studies in Enugu East Local Government Area in Enugu state. Two research questions and two hypotheses guided the study. The study adopted quasi experimental research design. The population for the study was 1368 SSII students comprised of 653 males and 715 females. Sample size was 75 SS II students that's offering computer studies. Purposive sampling techniques was adopted. The instrument used for data collection was Computer studies Achievement Test (CAT) developed by the researcher. The Computer studies Achievement Test (CAT) is a 25-item multiple choice questions with four options lettered A-D for each question. The reliability index of 0.87 was established using Kuder-Richardson 20 (K-R 20) formula for internal consistency. To avoid experimental bias, regular class teachers in the participated secondary schools were used to teach their students. The classroom teachers involved in administering the instrument were briefed by the researcher for both the experimental and control groups in order to ensure homogeneous instruction across the groups. The experimental group was taught with computer aided instruction (CAI) while the control group was taught with conventional teaching method. Prior to the treatment, pre-test was administered in the first week to all the groups as the experiment followed for a period of 6 weeks. After the treatment, post-test was administered to the two groups. The test scores generated from the pre-test and post-test was analyzed using mean and standard deviation to answer the research questions and Analysis of Covariance (ANCOVA) to test the hypotheses at 0.05 level of significance. Data analyzed revealed that experimental group performed better than the control group in computer studies. Furthermore, the findings on hypothesis, no significant difference exists between the mean scores of male and female students taught computer studies using CAI. It was therefore concluded that CAI is gender friendly hence, it was recommended among others that CAI should be adopted by computer studies teachers and curriculum planners for effective instructional delivery and outcome.

Keyword: Computer, Academic Achievement, Senior Secondary School, Enugu East

INTRODUCTION

Computer studies is a vocational subject that is designed to equip the learners with adequate knowledge, skills, abilities, understanding, competencies and attitude needed to perform in the business world as a database manager or a vocational teacher. According to the Federal Republic of

Nigeria (FRN, 2014) the knowledge, skills and competency acquired in computer will help the individual learner to understand the information about his nation which will in turn influence his present and future economic life. According to Obi (2015), to be a good member of the society, the individual should have a sound grasp knowledge

about computer studies in order to acquire the ability to use the services in any organization and business firms.

The study of Computer is very important to every nation because Computer is technological systems that are in operation in any country (Stoner, 2020). The author described Computer as the central mechanism which drives information system. In the same vein, Eboiyehi (2015) also described Computer as the life wire that holds the nation, this is because every individual male or female is in one way or the other involved in the act of operating and working with computer technologies. Without Computer, information will find it difficult to get the materials needed for transformation, the finished information on the other hand cannot be distributed or transfer to the receiver, the end user of the information may not get the things needed for the daily living.

The objectives of Computer studies as stipulated in Nigerian Educational Research and Development Council (NERDC, 2012) include: equip graduates of the Senior Secondary school with the basic skills, knowledge and competence to appreciate the importance of Computer studies and its relationship with other aspect of passing information, understand the basic concepts and principles for personal use and for further education, get general idea about technical entities, learn/gather enough knowledge to manage information either on their own or for someone else. It also enables the graduates to contribute positively to the economic development of the nation.

In this same vein, the achievement of the above lofty, objectives and importance of Computer studies would depend on the effective teaching and learning of the subject in Senior Secondary Schools. Computer studies are a skill subject and a sound knowledge that helps to develop the capacity of students using the acquired skills to solve practical problem. It was based on this that Igboke (2020) stated that teaching must first be directed to

imparting sound knowledge of general principles and then to applying them to relevant transactions. Stressing on this, Ikejiofor (2019) noted that the effectiveness of Computer teachers depends on their ability to consider the nature of the subject during instructional planning. For the effective study of Computer, the teacher has to select appropriate instructional strategy that will help to arouse the interest of the student for excellent performance (Eboiyehi, 2015). The effective teaching of computer studies therefore, demands that teachers need to possess the adequate knowledge of the subject matter, select appropriate instructional methods, mapped out the instructional strategies that will help to arouse the interest of the students for excellent performance. Instructional method can be viewed as the type of activity pursued by teachers and pupils together in a group work, surveys, and demonstration films among others which are intended to help pupils achieve stated lesson objectives or learning outcomes (Ughamadu, 2016). According to Sagor (2018), reliance on the conventional method of teaching computer as the main mode of student learning has been criticized as molding students into passive recipient of information transmitted by the teacher and making them highly dependent on the teacher for much of their learning needs; promoting rote-learning that involves mainly memorization and acquiring merit knowledge which is often difficult to apply in the work environment.

One of the problems of teaching computer studies as observed by Akume (2019), is the inadequate preparation by the teachers to acknowledge the fact that learning has shifted from the conventional chalk and talk to the use of information technology; where by diverse set of technological tools and resources like television, telephone, internet, computers and many others are used to communicate, create, disseminate, store and manage information. These arrays of technology according to Etonyeaku(2013) can be used as a driving force to promote and

enhance teaching and learning of computer studies in secondary schools. Different technological tools, when appropriately used, will help to expand access to education, strengthen the reliance of education to increasingly digital work place, raise education quality and help to make teaching and learning a real life active process. Information and technology tools required in secondary schools among others include internet and computer. Computers are used to present instruction by means of modern teaching technique known as computer aided instruction (Cotton, 2014).

Computer Aided Instruction (CAI) is an automated instructional technique in which a computer is used to present an instructional programme to the learners through an interactive process on the computer (Ajalabi, 2020). Its characteristics as highlighted by Bontempi and Hazelwood (2013) includes: capacity to individualized instruction to meet the specific needs of the learner, using the combination of text, graphic, sound and video in enhancing learning process, improves students performance on thinking logically, assists students in achieving cognitive objectives successfully and effectively, ensures the provision of opportunities to learners according to the individual own pace (Cotton, 2014). Olayiwola (2013), also affirmed that the use of computer aided instruction (CAI) improves students performance on thinking logically, formulating problems, solving procedures and understanding relationship.

A computer study is not a subject that can be taught with a mere memorization of textbooks. For effective study of computer, it is expected of the school system to provide adequate training to meet the current demand for human resources need of the society Akume (2019). The training of youths in computer studies will help to improve their knowledge in their desired area of study irrespective of their gender (sex) or location (urban or rural). Computer studies is a subject that can be studied by anybody irrespective of gender (sex) male or female.

Students, needs the knowledge of computer to enable him or her to function effectively either as a software developer or hardware maintenance, develop his or her talent, skills, ability, competencies, knowledge, attitude which would help him or her perform his or her gender roles in the society. However, West African Examination Council, Chief Examiner's report (2015) showed the evidence abounds of poor academic achievement of students in computer studies at the senior secondary school level in Enugu East Local Government of Enugu State. In support of the above statement, total number of seven (7) students failed computer studies out of eighteen (18) students that enrolled for computer studies in National Grammar School Nike, Enugu State (WAEC, (2014) Consequently, a close look at the students' achievement in some secondary schools in Enugu East Local Government Area of Enugu State showed that there is no consistency in the performance of male and female students in computer studies. However, the above situation is buttressed from the social psychological view, which poses that being a female even in today's more enlightened society has its drawbacks, and of which is less likelihood of career success (Mayer, 2020). In almost every culture, gender roles are constructed in such a way that those skills and traits considered masculine are more highly valued than those considered feminine (Calhoun, 2015). The author observed that instructional sequencing might influence the achievement of male and female students in learning. He held that while a number of instructional techniques are masculine oriented, others tend to be feminine, hence Sherman (2015) believed that because of the instructional approaches, the female students find it difficult to cope. This in his view is one of the reasons why male students do better in practical based classes than the female who are better off in theory. Consequently, the trend of performance in students' achievement in computer studies has remained abysmally low for quite some

time. According to Ebenebe (2013) poor academic achievement has been a major problem in Nigeria public secondary school examination. Poor academic achievement of students (male and female) in computer studies in secondary schools has been associated with two factors: quality and quantity of teacher and quality of teaching facilities and methods (Ogbaekirigwe, 2010). If the goals and objectives of computer studies must be realized at the secondary school level, there should be fundamental changes in the teaching/learning process. This change would also involve a new paradigm shift and focus on effective utilization of instructional technologies like Computer Aided Instruction (CAI). This is because today's workplace compared with modernization, technological advancement in the society demands individuals (male and female) with creative thinking skills, problems solving skills which the conventional models of teaching (subject matter absorption) does little to teach students (Ebenebe, 2013). Therefore, the enhancement of better performance in computer studies will entail effective utilization of instructional technologies like CAI. Several empirical studies have demonstrated the effectiveness of CAI in so many subjects like Mathematics, Chemistry and Biology. The work of Teo & Wong (2020), Boster, Mayer & Robert (2014) are examples of such studies.

Computer aided instruction, if properly implemented, will make students (male and female) to master the concept being taught and it will also help to promote the achievement of course objectives (Ezeanya, 2012). Unfortunately, some teachers find it difficult to use CAI at the secondary school level due to inadequate knowledge and skills needed for effective implementation (Akume, 2019).

Although computer aided instruction is said to have some research evidence in support of its potential effectiveness in other subjects like Mathematics, Physics, Biology and Chemistry. But none of such evidence seems to be available on its effect in

Computer studies hence, it is important that the effect of CAI be tried out in Computer studies to determine the extent of its effectiveness in improving the Computer studies achievement of senior secondary school students in Enugu State.

More so, in adopting CAI strategy, the influences of gender on the students' performance in the teaching learning procedure need to be addressed as well. This is because, while some research studies showed evidence of girls' superiority over boys in computer studies (Lee, 2011), some studies reported that girls' achievement are better than boys. Calhoun (2015) as well as Mayer (2020) reported significant gender differences in computer studies achievement. Following these inconsistencies, this work seeks to contribute in resolving the controversy on gender as it affects academic achievement in computer studies.

Statement of the Problem

The consistent poor achievement in computer in internal and external examinations conducted by West African Examination Council and National Examination Council (WAEC & NECO) respectively has been a concern to computer educators and the general public.

Research effort over the years has not only indicated poor achievement among the students, but has shown that the conventional teaching method has proved ineffective in achieving the desired achievement of students in computer studies. This failure has contributed to the call for new and effective methods which have been found effective in some areas or subjects.

Therefore, there is the need to find ways of improving student's achievement in computer studies, this has necessitated the need to employ more interactive strategies for improving teaching and learning. An interactive strategy considered by this study for improvement is the use of CAI.

Gender issues have raised on this search for improvement. Some studies conducted in respect of gender-related differences revealed that males

achieved better than females. The contra active evidence in achievement of students in Computer studies has resulted in the need to verify how CAI can influence students' achievement with regards to gender. Therefore, the problem of this study posed as a question is: would the use of CAI be effective in improving male and female students' achievement in computer studies?

Purpose of the Study

The main purpose of this study is to determine the effect of CAI on the academic achievement of SSII students in computer studies in Enugu East Local Government Area in Enugu state. Specifically, the study seeks to:

1. Find out the effect of computer Aided instruction on senior secondary two (SS2) students' academic achievement in computer studies
2. Determine the effect of computer Aided instruction on male and female students' means achievement scores in computer studies.

Scope of the Study

This study was limited to the effect of CAI on the academic achievement of students in computer studies. Two senior secondary schools in Enugu East Local Government Areas of Enugu State was involved. The general topic taught during the study comprises Central Processing Unit (CPU), Memory Unit and Logic Circuit under which the following sub-topics were covered: Arithmetic and logic unit and control unit, Function of ALU and Control unit, Types of memory, Differences between primary and secondary memory, Definition of logic gate, and Types of logic gates.

Research Questions

In order to achieve the purpose of the study, the following research questions were formulated to guide the study:

1. What are the mean achievement scores of SSII students taught computer studies using Computer Aided Instruction and those taught using conventional teaching methods?

2. What are the mean achievement scores of male and female students taught computer studies using Computer Aided Instruction?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance:

H0₁: There is no significant difference in the mean achievement SSII scores of students taught Computer studies using CAI and those taught using conventional teaching.

H0₂: There is no significant difference between the mean achievement scores of male and female students taught computer studies using CAI.

Methodology

The study adopted the quasi-experimental design. Thus, the researcher used intact groups (experimental and control) to determine the effect of Computer Aided Instruction (CAI) on the academic achievement of students in Computer studies in Senior Secondary Schools in Enugu State.

This study was carried out in Enugu State, focusing on Enugu East Local Government Area and it is made up of Ten (10) Government owned secondary schools. The local government area is chosen because the researcher's observation in the area and also familiar with the area.

The population for this study was 1368 SSII students comprising 653 male and 715 female SS II students offering Computer studies in 10 Government Secondary Schools in Enugu East Local Government Area of Enugu State (Post Primary Management Board, (PPSMB) Enugu, 2022).

The sample size for this study was 75 SS II computer studies students made up of 29 male and 46 female students. The sample was drawn from two senior secondary schools selected from the 10 senior secondary schools within the local government areas (Enugu East) of Enugu State, through purposive sampling techniques. This technique was adopted

because out of the 10 senior secondary schools in Enugu East offering computer studies, only two schools have adequate ICT facilities.

The instrument for data collection is Achievement test titled Computer studies Achievement Test (CAT), developed by the researcher. The content of the CAT was based on Computer studies content of SSII syllabus for Senior Secondary Schools. The topics covered were: Central Processing Unit (CPU), Memory Unit and Logic. Total number of questions in the instrument (CAT) were 25 multiple choice questions with option (A-D) and each question answered correctly was scored 4 marks, while questions answered wrongly was scored 0 mark. The items were drawn using a table of specification to ensure adequate coverage of the content area and to maintain even spread across the different levels of cognitive.

The instrument for the study was subjected to face content validation by three specialists, to ascertain the appropriateness of the instrument. Two experts from Measurement & Evaluation and one from Computer Science Education programme of Godfrey Okoye University. Table of specification was used to ensure content validity, and to ensure coverage.

The reliability of the Computer studies Achievement Test (CAT) was test-retested by administering the CAT among the Computer studies SSII students in one secondary school in Enugu South Local Government Area of Enugu state, which has the same characteristics with the schools that were studied. Kuder Richardson 20 (KR-20) formular was used to determine the reliability of the instrument, which yielded reliability coefficient index of 0.87.

Experimental Procedure

The quasi experimental study was carried out during the normal school period for computer studies. The regular computer studies teachers that teach computer studies were used in the study. The study involved two groups of students, experimental group and control group.

The experimental group was taught using CAI, the Computer Aided Instruction teaching plan was comprehensively prepared and stored in a compact-disc ready-only-memory (CD-ROM) for the experimental group.

Control group was taught using conventional teaching method. The school used in the study was National Grammar School Nike and Community High School Emene. Pretest was administered to both groups in the schools before the commencement of the lessons. The answer scripts were marked using the marking scheme prepared by the researcher to obtain students scores on achievement.

The regular computer studies teachers who were involved in the experiment were briefed by the researcher on how to carry out the exercise. This was done before the pretest. The regular computer studies teachers distributed the CAI among the experimental groups and also taught students on how to make use of it at their own convinence and pace. The experiment lasted for a period of six (6) weeks.

At the end of the lessons, the regular computer studies teachers administered the posttest to the two groups. The posttest and pretest achievement questions are the same in content for both groups but questions were rearranged. The answer scripts were marked using the marking scheme prepared by the researcher to obtain students' scores on achievement. The data collected from the pretest and posttest was used for further analysis.

Moreso, a post-test was administered to the experimental group and the control group. The researcher makes sure that post-test items were re-arranged to differentiate between the pre-test and post-test results from the students in the two groups. Before carrying out the experiment, pre-test was administered to all the students in the two groups using computer studies teachers in both selected schools. Meanwhile, the researcher briefed the teachers on how to carry out the task. The pre-test was used to determine the students' knowledge in

computer studies. At the end of the treatment, a post-test was administered to the students. The data obtained was collected, recorded and analysed using the mean and standard deviation to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses formulated for this study at 0.05 level of significance. The analysis was computer based, with

the use of the Statistical Package for the Social Science (SPSS).

RESULTS

Research Question 1

What are the mean achievement scores of SSII students taught computer studies using Computer Aided Instruction in the experimental group and control group in both pre-test and post-test?

Table 1: Mean and Standard Deviation of achievement scores of experimental and control groups in pretest and posttest.

| Group | N | Pretest | | Posttest | | Gain |
|------------------------|----|---------|-------|----------|-------|-------|
| | | Mean | SD | Mean | SD | |
| Experimental Group | 32 | 27.33 | 16.14 | 80.38 | 11.23 | 53.85 |
| Control Group | 43 | 25.73 | 14.88 | 56.21 | 20.25 | 30.48 |
| Total | 75 | 26.62 | 15.58 | 69.64 | 19.89 | |
| Mean Difference | | | | 24.17 | | |

As shown in Table 1, pretest mean and standard deviation values for CAI group(experimental group) is 27.33 and 16.14, while mean and standard deviation value for conventional teaching method(control group) is 25.73 and 14.88. This suggests that the two groups are almost in the same achievement mean baseline before treatment. However, after the instructional treatment, the mean and standard deviation values for experimental group are 80.38 and 11.23; while that of the control group

are 56.21 and 20.25. This means that experimental group had a higher mean score on transportation when compared with the control group with mean gain score of 24.17.

Research Question 2

What are the mean achievement scores of male and female students taught computer studies using Computer Aided Instruction in the experimental group?

Table 2: Mean and Standard Deviation Scores on the influence of gender on students’ academic achievement in computer studies when taught using CAI

| Method | Gender | Pretest | | | Posttest | |
|------------------------|--------|---------|-------|-------|----------|-------|
| | | N | Mean | SD | Mean | SD |
| Experimental group | Male | 11 | 27.53 | 15.07 | 80.95 | 8.94 |
| | Female | 20 | 27.06 | 17.63 | 79.61 | 13.79 |
| Total | | 32 | 26.62 | 15.58 | 69.64 | 19.89 |
| Mean Difference | | | | | 1.34 | |

As shown in Table 2, pretest mean and standard deviation values for males in CAI group

(experimental group) are 27.53 and 15.07, while that of females are 27.06 and 17.63. After the

instructional treatment, the mean and standard deviation values for males in experimental group are 80.95 and 8.94; while that of the females in the same group are 79.61 and 13.79. This means that male and female students in experimental group had almost the same mean score on computer studies with little mean difference of 1.34. This suggests that CAI is

gender friendly when compared to conventional teaching method in computer studies.

Hypothesis 1

H₀₁: There is no significant difference between the mean scores of students taught Computer studies using CAI and those taught using conventional teaching method.

Table 3: Analysis of Covariance on the mean scores of students taught Computer studies using CAI and those taught using conventional teaching method

Tests of Between-Subjects Effects

Dependent Variable: post-test-transport

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. |
|-----------------|-------------------------|----|-------------|---------|------|
| Corrected Model | 30339.175 ^a | 2 | 15169.587 | 60.408 | .000 |
| Intercept | 227277.718 | 1 | 227277.718 | 905.053 | .000 |
| Pretest | 465.590 | 1 | 465.590 | 1.854 | .175 |
| Method | 29414.734 | 1 | 29414.734 | 117.134 | .000 |
| Error | 51228.651 | 73 | 251.121 | | |
| Total | 1085395.000 | 75 | | | |
| Corrected Total | 81567.826 | 74 | | | |

a. R Squared = .372 (Adjusted R Squared = .366)

Table 3 shows the value of F_{method} (117.134) with associate probability value (P= 0.000). The associated probability value was less than 0.05 level of significance (P<0.05) set by the researcher, therefore the null hypothesis was rejected in favor of the alternative, hence there is a significant difference between the mean scores of students taught computer

studies using CAI and those taught with conventional teaching method.

Hypothesis 2

H₀₂: There is no significant difference between the mean scores of male and female students in computer studies when taught using CAI.

Table 4: Analysis of Covariance on the mean scores of male and female students in computer studies when taught using CAI

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. |
|-----------------|-------------------------|----|-------------|---------|------|
| Corrected Model | 32949.796 ^a | 2 | 8237.449 | 34.225 | .000 |
| Intercept | 227713.811 | 1 | 227713.811 | 946.114 | .000 |
| Pretest | 342.622 | 1 | 342.622 | 1.424 | .234 |
| Gender | 1783.105 | 1 | 1783.105 | 7.409 | .007 |
| Error | 48618.030 | 73 | 240.683 | | |
| Total | 1085395.000 | 75 | | | |
| Corrected Total | 81567.826 | 74 | | | |

a. R Squared = .404 (Adjusted R Squared = .392)

As shown in Table 10 above, the calculated value of $F_{gender}(7.409)$ with associate probability value ($P=0.007$). The associated probability value was less than 0.05 level of significance ($P<0.05$) set by the researcher, therefore the null hypothesis was rejected in favor of the alternative. This implies that there is a significant difference between the mean scores of male and female students taught computer studies using CAI. Hence, CAI is gender friendly.

Summary of Findings of the Study

The major findings of this work are summarized based on the results of the analysis of data;

1. The result of the study showed that the students who were taught computer studies using CAI performed higher than those taught without.
2. Mean achievement scores of male and female students differs significantly with male having higher mean differences.
3. The mean achievement scores of male and female students differs significantly with male having the higher mean difference.
4. No significant difference exists between the mean scores of male and female students taught computer studies using CAI.

Discussion

The results of this study are presented and discussed under the following sub-headings:

- Studies on Effects of CAI on Students Academic Achievement
- Studies on Influence of Gender on Students Academic Achievement

Studies on Effects of CAI on Students Academic Achievement in computer studies

Research Question 1 revealed that experimental group (group taught with CAI) achieved higher than that of the control group (group taught with conventional teaching method) in computer studies. Also, findings on the hypothesis, revealed significant difference in mean scores of students taught computer studies using CAI and those taught with

conventional teaching method. This finding is in line with the findings of Brown (2010), Sumia (2012), Ifeakor (2015), and Oguz (2010) that variously found students taught with CAI in different subjects, superior in academic achievement to group taught with conventional teaching method. Hence, the finding of the present study further supports the efficacy of CAI in instructional delivery in schools and across subjects.

Studies on Influence of Gender on Students Achievement

Finding of this study revealed no difference in the mean academic achievement of male and female students on CAI group in computer studies. The finding has further shown that CAI is a gender friendly instruction. The finding is in disagreement with the finding of Bontempi and Halzwood (2013) that found that male students feel comfortable with computer unlike that of the female counterpart. Also, other studies on gender in sciences for instance Kurumeh (2014), Okeke (2017) and Adigwe (2018) found gender significant on students' achievement.

Conclusion

Findings from others studies in the discussion were found consistent with the findings of the present study on effect of CAI on students' achievement in different school subjects. Hence, CAI could be said to promote instructional outcome better than conventional instructions. However, reviewed studies on gender showed that academic differences exist gender-wise on CAI and in sciences, which is in contrast with the findings of present study that found CAI gender friendly. What this suggests is that further researches should be carried out on gender implication of CAI.

Recommendations

In line with the findings of this study, the researcher made the following recommendations:

1. Computer studies teachers should adopt CAI in their instructional delivery to ensure better instructional outcome and gender friendly classroom.

2. Curriculum planners should adopt CAI in their future curriculum review because of its instructional effectiveness.

3. Government should equip schools with computers in order to ensure the use of CAI in instructional delivery by computer studies teachers.

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