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EFFECT OF COMPUTER-BASED INSTRUCTION ON STUDENTS' ACADEMIC ACHIEVEMENT IN COMPUTER STUDIES IN SECONDARY SCHOOLS IN ASABA EDUCATIONAL ZONE

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ABSTRACT

This study investigated the effect of computer-based instruction on students' academic achievement in computer studies in secondary schools in Asaba education zone. Two research questions guided the study and three hypotheses were tested at .05 alpha level of significance. The design of the study was quasi-experimental design. The pretest posttest non- randomized control group design was used. The study was conducted in Oshimili South Local Government Area (LGA) of Delta State. It is one of the 25 LGA making up Delta State. The population of this study comprised 546 senior secondary computer studies students in the 13 public secondary schools in Oshimili South Local Government Area of Delta State. The total sample size of the study was 87 computer studies students. The instruments that were used for data collection are Computer Studies Achievement Test (CSAT). Content validity for the instrument was determined the reliability of the instrument was established using Kuder-Richardson Formula 20 (KR-20) and found to be 0.79. Data was collected through direct delivery approach and the mean achievement scores were used to answer research questions. In order to establish if the treatment group differ significantly in their mean achievement scores, hypotheses were tested using Two-way Analysis of Covariance at 0.05 alpha levels. The findings of this study revealed that CBI is a good strategy that leads to high achievement in computer studies. CBI was more effective because students are more actively involved during instructional process. When students are actively involved, they seemed to understand the concepts better than just listening to lessons only. The result of the study portrayed that there was significant difference in the mean achievement scores of male and female students taught computer studies using CBI. Conclusions were drawn and it was recommended that in-service training, workshops, seminars and symposia should be organized by Ministry of Education, Professional associations like Science Teachers Association of Nigeria (STAN), Curriculum Organization of Nigeria (CON) for practicing teachers so that they can understand and practice the use of various types of Computer-based instruction in computer studies classroom.

Keywords: Computer-Based Instruction (CBI), Students' academic achievement, Computer studies, Secondary schools.

Introduction

Education in the world today has remained a springboard and indispensable instrument for human progress and empowerment. It is a vital means to every form of development and ways through which citizens acquire necessary knowledge and skills to be useful in building the nation. Educational system is gradually becoming a system of technology especially in the present information driven economy. As a result of the rapid development of the information and communication technology, the Federal Ministry of Education introduced computer studies at all levels of education in Nigeria (Federal Republic of Nigeria, 2013). According to Nwanze (2018), Computer studies involve teaching and inculcating in the learner the basic skills required to independently manipulate the computer to achieve educational goals. Nwanze further stated that computer studies as a subject is aimed at making students acquire skills and competencies required in this digital world of competitiveness. Such basic skills and competencies upon graduation make them conversant with term and practices embedded in the world of computer.

The importance of computer studies to individual citizens and to the society at large has been emphasized. The Federal Republic of Nigeria (FRN, 2013) in the National Policy on Education included Computer studies as one of the vocational, science and technological subjects in secondary school. It also stated the aims of computer studies to include; life-long learning, preparation for responsible citizens and preparing for occupation in the world of work. These aims are in line with the United Nations Educational Science and Cultural Organization (UNESCO, 2002) recommendation, that all vocational and technical subjects in the 21st century should be geared towards life-long learning. Besides, secondary school education prepares students for meaningful living in the society as well as further education. According to Ekundayo (2010), secondary school level is the bridge between the primary and tertiary levels. The underlining principle here is that, the secondary schools should be able to provide quality secondary education to all students.

The above stated objectives notwithstanding, the achievement of secondary school students in computer studies which is one of the vocational subjects is very discouraging. The evidence of this perception could be based on the reports of Chief examiners of West African Examination Council (WAEC) on computer studies from 2020-2023. The reports indicated the candidates' persistent average performance and weaknesses as having little understanding of the content of the subject matter, specifically in acronyms, basic programming, keywords in defining terms, misinterpretation of computer files, inability to differentiate between data and information, confusion between algorithm and flowchart. Other weaknesses include; logic operation, inability to differentiate between types and examples of computer virus, answer questions on number bases,

poor handwriting, spelling mistakes and poor knowledge of computer keywords.

Instructional method can be viewed as the type of activity pursued by teachers and students together in a group work, surveys, demonstrations, films and TV viewing, which are intended to help students achieve stated lesson objectives or learning outcomes (Sophia, 2016). Adigun (2020) stated that reliance on the conventional teaching method has been criticized as molding students into passive recipient of information transmitted by the teacher and making them highly dependent on the teachers for much of their learning needs. Personal observation by the researcher shows that the predominant method of teaching Computer studies in most of the secondary schools in Asaba educational zone is the conventional lecture method.

Methodology refers to the teaching process that gears towards effecting meaningful learning. It seems that the method of teaching vocational and technology subjects in schools was inadequate. This may have accounted for the Weaknesses in students' performance in computer studies examination. The WAEC Chief examiners (2020-2023) suggested that computer studies instructors should identify the correct teaching methodology that will help the students to understand the contents better. One method of teaching that is often commonly used by secondary school teachers is conventional lecture method. Conventional lecture teaching method (CTM) is a traditional method of teaching in which knowledge flows from the teacher to the students. It is a process in which teachers do the talking while the learners absorb by listening (Rogayan, Padrique and Costales, 2021). Computer studies, being a practically inclined subject is hierarchically organized and failure to comprehend prerequisite knowledge is likely to interfere with students' further learning. It appears that secondary school computer studies teachers prefer to employ conventional method to activity-oriented models of instruction. Conventional method can be described as an expository approach to teaching whereby, the teacher remains the chief source of information.

Computer-Based Instruction (CBI) refers to instruction or remediation presented on a computer. According to Muchiri (2018), CBI mean the use of computer system to deliver instructions to students by allowing them to interact with lessons programmed into the system, start their learning from different points, take different routes, finishing at different time. Similarly, Kiboss, Ndirangu and Wekesa (2018) stated that, CBI is an instructional medium that facilitates teaching and learning. Barchok (2021) opined that CBI is a self-learning technique usually offline/online, involving interaction of students with programmed instructional material. CBI is an interactive method that uses a computer to present material, track learning, and direct the user to additional material which meets the students' needs. It can also be used to describe internet-based instruction through the use of web pages, web bulletin boards, listers and newsgroups, video and real-audio, graphics and hands-on application (Communities Resolving Our Problems, CROP, 2006). In other words, CBI is the form of teaching that is carried out using computer. Operationally, CBI is defined as a teaching process directly involving the

computer in the presentation of instructional materials in an interactive mode to provide and control the individualized learning environment for each computer studies' students. CBI is strongly advocated in the classroom. Computer technology makes learning easier, more efficient and more motivating (Clarian and Schultz, 2016).

Achievement is the outcome of education; the extent to which a student, teacher or institution has been able to realize her educational goals (Ezeudu, 2016). It is an act of accomplishing a result gained by efforts, the quality and quantity of student's work. Academic achievement is a measure of knowledge gained through education process usually indicated by test scores, grade point average and degree (Bitrus, 2014). According to Nwagba (2013), academic achievement is defined as performance of students in schools. It could be getting high grades and a high GPA level. The researcher defines academic achievement as learning outcomes which has to do with the knowledge attained in school Computer studies activities as a result of learning. In this study, academic achievement will be measured using Computer studies achievement test.

Achievement deals with the successful accomplishment of goals. it is the act or process of achieving something (Hornby, 2000). As a concept in teaching-learning process, achievement means attainment in a school subject as symbolized by a score or mark on achievement test (Okoro in Abd-El-Aziz and Abd-El-latif, 2013). Achievement in teaching and learning process connotes accomplishment of desired learning outcomes. Achievement in learning rests on varied factors, According to Antherson (2013), it is dependent upon several factors which include; instructional method, learning environment and the learner. That is to say that achievement of learning objectives requires adoption of teaching methods that provide the learner opportunity to interact with the learning environment. Students' attitude has the potential to either facilitate or inhibit learning, as the poor academic achievement of students may be affected by their attitude

According to Adebowale and Adediwura (2019), computer-related attitudes influence students' desire to use computers, their desire to enroll in computer-related subjects and courses, and their choice of career path. It is most likely that students' attitude in computer studies may increases the academic achievement of male and female students if taught with CBI. Gender refers to the many socially and actually constructed characteristics, qualities, behaviours and roles which different societies ascribe to males and females (Nnamani and Audu cited in Rosali,2020). It is also referred as behavioural pattern and attitude perceived as masculine or feminine with a culture. Nigerians generally uphold that males are superior to females in terms of physique, cognition, logical reasoning and even in academic reasoning. In the study of Orhorhoro (2015), it was revealed that males perform better than females when instructional approach adopted in sciences is competitive while girls perform optimally in a cooperative academic environment. Etukudo and Etim (2017) discovered in their study on the use of interactive Basic programme package in teaching graphs of quadratic expressions as an instructional

strategy that there was no significant gender difference in science-related achievement of male and female students. The different reports on male and female students' achievement in science-oriented subjects have shown that other factors apart from sex role stereo-type can affect students' attitude and academic achievement than gender issue. The discrepancies in the findings about gender call for continuous research works with regards to achievement and attitude. Hence, the need for the present study effect of computer-based instruction on students' academic achievement in computer studies in secondary schools in Asaba Education Zone.

Purpose of the study

The purpose of this study is to determine the effect of computer-based instruction on students' academic achievement in computer studies in secondary schools in Asaba Education Zone. Specifically, this study determined;

1. Difference in the mean achievement score of students taught Computer studies using Computer-based instruction (CBI) and those taught using the Conventional Lecture Method (CLM).
2. Difference in the mean achievement scores of male and female students taught Computer studies using CBI.
3. Interaction effect of gender and teaching methods (CBI and CLM) on academic achievement in Computer studies.

Research questions

The following research questions guided the study.

1. What is the difference in the mean achievement score of students taught Computer studies using Computer-based instruction (CBI) and those taught using the Conventional Lecture Method (CLM)?
2. What is the difference in the mean achievement scores of male and female students taught Computer studies using CBI?

Hypotheses

The following null hypotheses were tested at 0.05 alpha level.

1. There is no significant difference in the mean achievement scores of students taught Computer studies using Computer-Based Instruction (CBI) and those taught using Conventional Lecture Method (CLM).
2. There is no significant difference in the mean achievement scores of male and female students taught Computer studies using CBI and those taught using CLM**.**
3. There is no interaction effect of gender and teaching methods (CBI and CLM) on students' academic achievement scores in Computer studies.

Methods

The design of the study was quasi-experimental design. The pretest posttest non- randomized control group design was used. The design is the one that seeks to establish cause and effect relationship between variables of interest in the study but where random assignment of the participants to experimental and control groups is not

possible (Nworgu, 2015). The study was conducted in Oshimili South Local Government Area (LGA) of Delta State. It is one of the 25 LGA making up Delta State. The choice of Oshimili South Local Government Area is because of students' poor performance in computer studies in both their external examinations NECO and WASSCE. The population of this study comprised 546 senior secondary computer studies students in the 13 public secondary schools in Oshimili South Local Government Area of Delta State (Source: Post Primary School Services Commission PPSSC, Asaba, 2023). The total sample size of the study was 87 computer studies students. Purposive sampling technique was employed to select only five (5) public co-educational secondary schools out of the thirteen (13) public co-educational secondary schools in Oshimili South Local Government Area of Delta state. This is because only five schools offer computer studies in external examination in the LGA. A Simple random sampling technique (balloting with replacement) was used to select two out of five public co-educational secondary schools. The researcher chose SS2 computer studies students from the two schools.

The instruments that were used for data collection are Computer Studies Achievement Test (CSAT). The CSAT consist of two sections namely; section A and section B. Section A is designed to generate information on the bio-data of the respondents. Section B is a 50-item multiple choice objective test with four options A-D derived from WASCE past questions. The item of CSAT Covers the knowledge, comprehension and application levels of Bloom's (1971) taxonomy of educational objectives. In order to ensure that the instrument was usable, acceptable and measured what it was meant to measure and establish content validity of CSAT; the researcher developed table of specification for CSAT. The reliability is concerned with the degree of consistency of the measuring instrument. For CSAT, the reliability of the instrument was established using Kuder-Richardson Formula 20 (KR-20). This was to determine the internal consistency of the test items. The CSAT was administered to 30 SS2 computer studies students and the scores were obtained from students, The reliability of the instrument was found to be 0.79. The value 0.79 for CSAT was considered to be higher enough for the instrument to be used for the study.

Experimental Procedure

The researcher made use of research assistants (regular class teachers of computer studies) during the study. The group teachers were trained. CBI group teachers were trained on the following techniques as simulation, educational games/gamification, Drill and practices; while CLM group employed memorizing, singing, narrating, reciting, memorizing, planned repetition and questioning. The researcher developed lesson plan which was used to train the teachers. The training lasted for one week on the topics involved. The study involved two groups of subjects namely, the computer-based instruction (CBI) group and the conventional Lecture method (CLM) group. The CBI group formed the experimental group while the CLM groups are the control group. On the first day of the experiment, the test instrument computer studies

achievement test (CSAT) was administered to both groups. The scores obtained from the pre-test were recorded. The recorded scores served as pre-test score for both groups. After the pre-test, both groups were taught by their regular teachers for four weeks using the lesson plan developed by the researcher as a guide. Both groups were taught at their regular lesson period. The teachers were trained on how to use the lesson notes for uniformity. At the end of the fourth week, CSAT were reshuffled and administered to both groups. The scores served as post achievement and post attitude scores respectively.

In order to generate achievement scores of computer studies students, the researcher administered the instrument CSAT (pretest) on 87 senior secondary 2 students in the sampled schools in their various classes with the help of the regular computer studies teachers of the participating classes in each school. The CSAT for pretest were administered to the students one day before the treatment started. The administered pretest (CSAT) was marked and recorded on the spot by their teachers. The scores generated after the first administration became the pretest scores. However, immediately after the four weeks teaching period, the same instrument (CSAT) where researcher and administered to same students as posttest in their classrooms under the same classroom conditions. The teachers of the participating classes in each school administered the tests under the guidance of the researcher to avoid experimenter bias. The researcher administered test was marked and recorded on the spot by- their teachers. The scores generated this second time became a posttest scores of students CSAT. In the analysis of data, the researcher computed the mean achievement scores. The mean achievement scores were used to answer research questions. In order to establish if the treatment group differ significantly in their mean achievement scores, hypotheses were tested using Two-way Analysis of Covariance at 0.05 alpha levels. The reason for adopting Two-way Analysis of Covariance was because pretest was used as covariate. The p-value were compared with alpha level (a = 0.05) for appropriate decisions on the null hypotheses tested. Reject the null hypotheses if the p-value is less than the alpha level (a = 0.05), otherwise, do not reject the null hypotheses.

Presentation of Results

The result for the study is presented as follows.

Research question 1: What is the difference in the mean achievement score of students taught Computer studies using Computer-based instruction (CBI) and those taught using the Conventional Lecture Method (CLM)?

Table 1: Difference in the Mean Achievement Scores of Students taught Computer Studies using Computer-Based Instruction (CBI) and Conventional Lecture Method (CLM).

Group	N	Mean		Mean gain	Standard Deviation	
		Pre-test	Post-test		Post-test	Pre-test
CBI	35	27.94	79.31	*51.37*	13.78	9.01
Conventional	52	26.54	40.84	14.3	4.85	7.44
Mean Difference		1.40	38.47	**37.07**		

Table 1 revealed that students taught computer studies using computer-based instruction method had a mean of 27.94 and standard deviation of 13.78 in the pre-test achievement test while the conventional (control) group had a mean of 26.54 and standard deviation of 4.85. After treatment, the computer-based instruction group (experimental) had a mean of 79.31 and standard deviation of 9.01 in the post-test achievement test while the conventional (control) group had a mean of 40.84 with standard deviation of 7.44.

Thus, the difference in the mean achievement scores of students in the two groups is 37.07. This implies that the computer studies students taught with computer-based instruction (CBI) achieved higher than those taught with the conventional lecture method. From the standard deviation scores in both pretest and posttest, the scores of students in the experimental group are closer to the mean (more homogeneous) than that of those in the control group. Thus, they are far apart from the mean scores (more heterogeneous). However, the SD posttest reveal that the treatment with CBI was able to bring the participant scores closer to the mean (SD-9.01) than before the treatment (SD =13.78).

Research question 2: What is the difference in the mean achievement scores of male and female students taught Computer studies using CBI?

Table 2: Difference in the mean Achievement Scores of male and female students taught computer studies using (CBI)

Group	N	Mean		Mean gain	Standard Deviation	
		Pre-test	Post-test		Pre-test	Post-test
Male	14	25.86	77.86	52.0	15.04	11.02
Female	21	29.33	80.29	50.96	13.06	7.52
Mean Difference		-3.47	-2.45	**1.04**		

Table 2 showed that the mean achievement scores of male and female students taught computer studies using CBI. Male computer studies students taught computer studies using CBI in their pretest had a mean of 25.86, standard deviation of 15.04; while their female counterparts had a mean of 29.33 with standard deviation of 13.06. In the post-test achievement scores by gender, male Counterparts had a mean of 77.86 with standard deviation of 11.02, Their female Counterparts had a mean of 80.29, standard deviation of 7.52, Hence, the difference in the mean achievement scores of students by gender is 1.04 while the SD of the gender post-test achievement scores shows very little or no disparity. Furthermore, the standard deviation scores in both pretest and posttest, the scores of male and female students in experimental group are closer to each mean (more homogeneous). Therefore, the SD posttest reveal that the treatment with CBI by gender was able to bring the participant scores closer to the mean (SD 11.02, 7.52 respectively) than before the treatment (SD= 13.06, 15.04 respectively).

Hypotheses Testing

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught Computer studies using Computer-Based Instruction (CBI) and those taught using Conventional Lecture Method (CLM).

Table 3: Summary of Two-way Analysis of Covariance Test for Significant Difference in the Mean Achievement Scores of Students taught Computer Studies with CBI and Conventional lecture Method

Source	Type III Sum of Squares	Df	Mean Square	F Sig.
Corrected Model	46372.745[a]	4	11593.186	207,828
Intercept	33543.751	1	33543.751	.000
Pretest	243.995	1	243.995	601.330
Method	43915.106	1	43915.106	.000
Gender	76.203	1	76.203	4.374
Method*gender	23.533	1	23.533	.040
Error	4574.174	82	55.783	787.254
Total	279586.000	87		.000
Corrected Total	50946.920	86		1.366
				.246
				.422
				.518

a. R Square=.910(Adjusted R Square= .906)

Data in Table 3 showed that there is a significant main effect of CBI on students achievement in computer studies F (1.86) = 787.254, p >.0001. The null hypothesis is rejected indicating that there is significant difference between the mean achievement scores of the students exposed to CBI and Conventional lecture method. The difference was in favour of the students who were exposed to CBI, Therefore, students exposed to CBI achieved significantly higher than those exposed to Conventional lecture method.

Hypothesis 2: There is no significant difference in the mean achievement scores of male and female students taught Computer studies using CBI and those taught using CLM**.**

Table 4: Summary of Two-way Analysis of Covariance Test for Significant Difference in the Mean Achievement Scores of Male and Female Students taught Computer Studies using CBI

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	263.004[a]	2	131.502	1.686	.201
Intercept	47288.870	1	47288.870	606.137	.000
Pretestach	213.461	1	213.461	2.736	.108
Gender	77.716	1	77.716	.996	.326
Error	2496.539	32	78.017		
Total	222936.000	35			
Corrected Total	2759.543	34			

a. R Square=.095 (Adjusted R Square= .039)

Table 4 revealed non-significant main effect of gender on students' achievement in computer studies f(1.34) = 996. p< .326. The null hypothesis is therefore not rejected indicating that there is no significant difference in the mean achievement scores of male and female students in computer studies

Hypothesis 3: There is no interaction effect of gender and teaching methods (CBI and CLM) on students' academic achievement scores in Computer studies

Hypothesis 3 was tested with two-way analysis of covariance (ANCOVA) and the result of the test is summarized in Table 5. Data in Table 5 indicated non- interaction of gender and teaching method on students achievement scores in computer studies f(1.86)= 422, p<518. The null hypothesis is therefore not rejected. The interaction effect of gender and teaching method on students' mean achievement scores in computer studies is therefore not statistically significant.

Discussion of Findings

The result revealed that the mean gain of the experimental group is 51.37 and their SD in the pretest and posttest is 13.78 and 9.01 respectively, "The control group had a mean gain of 14.3. with SD of 4.85 and 7.44 in their pretest and posttest respectively. Hence, the difference between the mean achievement scores of students taught computer studies using CBI and those taught with conventional lecture method is 37.07. To find out if the difference in the mean achievement scores between the groups was significant or not a Two-way analysis of covariance was used which showed that a significant main effect for strategy on students achievement in computer studies. The findings of this study revealed that CBI is a good strategy that leads to high achievement in computer studies. CBI was more effective because students are more actively involved during instructional process. When students are actively involved, they seemed to

understand the concepts better than just listening to lessons only.

The findings of this study is in agreement with the findings of Mihindo, Wachanga and Anditi (2017) who conducted a study on effects of computer-based simulations teaching approach on students' achievement in the learning of chemistry among secondary school students were there was statistically significant difference It was therefore concluded that CBS has a positive and significant contribution to the understanding of chemistry concepts and principles as reflected by the higher performance of students, computer-based simulation which is an aspect of (CBI) should be adopted in teaching and learning process, more especially in teaching computer studies for higher academic achievement.

Evidence of the result revealed that the mean gain is 1.04 whereas the SD for the pretest for male is 15.04, 13.06 for female. SD posttest for male is 11.02 and 7.52 for female. In other to find out if the difference in the mean achievement scores between the male and female students was significant or not, a Two-way analysis of covariance was used. The result of the study portrayed that there was significant difference in the mean achievement scores of male and female students taught computer studies using CBI. However, the socialization process of male being allowed to explore their environment not withstanding: female students performed equally with the male students. This finding is supported by Falode, Usman, Ilobeneke, Mohammed, Godwin and Jimoh (2016). who. reported that there was no significant difference between the mean achievement scores of male and female students taught computer studies with computer simulation instructional package (which is an aspect of CBI). The finding of Falode, et. al is in line with the finding of the present study.

Conclusion

The findings from the study showed that computer-based instruction is an effective method that can be used to enhance academic achievement of students in computer studies. Also, there is no gender influence on students' achievement in computer studies. It implies that computer-based instruction is a gender friendly strategy that can be used to teach computer studies to both male and female students. Based on the findings, it is concluded that there is no significant interaction effect between instructional method and gender on mean achievement scores of students in computer studies.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Since the use of Computer-based instruction was found to be effective in improving students' achievement and attitude in computer studies; computer studies teachers should adopt it's use in teaching computer studies in secondary schools.
2. In-service training, workshops, seminars and symposia should be organized by Ministry of Education, Professional associations like Science Teachers Association of Nigeria (STAN), Curriculum Organization of Nigeria (CON) for practicing teachers so that they can understand and practice the use of

various types of Computer-based instruction in computer studies classroom.

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