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EEFECT OF COMPUTER ASSISTED INSTRUCTION ON BASIC CONCEPTS IN BIOLOGY ON SECONDARY SCHOOL STUDENTS ACHIEVEMENT IN ENUGU EDUCATION ZONE

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Abstract: *This study investigated the effect of computer-Assisted instruction on basic concepts in Biology on secondary school students' achievement in Enugu Education Zone Quasi-experimental research design, specifically the pretest, post-test, Non-equivalent control group design was employed. A sample of 365 SS1 Biology students (165 males and 200 females) in four schools drawn from a population of 20455 using simple random sampling to get 4 intact classes. Biology Achievement Test (BAT) developed by the researchers was used for data collection. The BAT was face validated and reliability co-efficient of 0.83 was obtained using Kuder-Richardson's 2D(KR-20). Three null hypotheses guided the study. Analysis of variance (ANOVA) was used to test the null hypotheses at 0.05 level of significance (P<0.05). The result showed that biology students taught with CAI achieved higher than those taught the same concepts using lecture method. There is no significant difference on the influence of gender on the academic achievement of Biology students taught with CAI and lecture methods Based on the findings, it was recommended among others that Biology teachers should be exposed to workshops, seminars and conferences on the integration of CAI in teaching and learning of Biology in secondary schools.*

KEYWORDS*: Effect, Computer-assisted instruction, Biology concepts, achievement.*

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Introduction

Computer assisted instruction is one of the activity-oriented and child-centered teaching methods. It is a method of instruction in which the computer acts like an instructor. It teaches, guides and tests the students until the desired level of proficiency is reached with the aid of specific application software – Computer Assisted Instruction (CAI) can also be seen as interactive

instructional technique whereby a computer is used to present the instructional materials and monitor the learning that takes place. It uses a combination of text, graphics, sound and video in enhancing the learning process. The computer has many purposes in the classroom and it can be utilized to help students in all areas of the curriculum including basic concepts in Biology at secondary school level. Biology as a branch of Science is the study of plants and animals. The knowledge of biology as a subject by secondary school students makes them well informed and motivated to assume roles in which the practical and theoretical aspects are used by unraveling some basic patterns of life (Ude, 2011). A good foundation in biology is required to produce adequate number of qualified doctors, pharmacists, biology teachers, and all those concerned with the study of animals and plant life.

For the students to perform highly in Biology there is need for mathematical background. Mathematics is an indispensable tool in the study of sciences, technology and humanities. Usefulness of Mathematics in human activities cannot be overemphasized as it is the precursor of scientific discoveries and inventions, of which any nation that overlooks the study of Mathematics and Biology and does not take interest in them would remain underdeveloped. Actually, every occupation which students may choose to pursue and much of their everyday lives are full of opportunities that need the application of Biology.

In Enugu education zone, passing Biology at credit level in West African Senior School Certificate Examination (WASSCE) and the National Examination Council School Certificate Examination (NECO SSCE) is a prerequisite for gaining admission into higher institution of learning but WAEC Chief Examiners Reports of 2018, 2019, 2020 recorded poor achievement of students in Biology. This poor performance has been attributed to poor teaching, poor quality and quantity of teachers, insufficient teaching and learning resources and materials, quest for paper qualification and negative attitude of students and the society towards this subject.

However, Computer Assisted Instruction (CAI) is one of multimedia instructions that were empirically proved to enhance students' performance, arouse their interest and reduce the boring and concretize the abstract concepts in Biology. CAI is a technique where computer system is used to deliver instruction directly to the students by allowing them to interact with lessons programmed into the system. There is now paradigm shift from the use of computer for administration, management and other uses to computer as a medium of instruction. Computer as an instructional media can be in form of Computer Based Instruction (CBI), Computer Based Learning (CBL), Computer Enhanced Learning (CEL) and Computer Aided Instruction (CAI); Computer Assisted Instruction (CAI) has been reported to be one of the most effective instructional strategies for developing interest, positive attitude and improvement in students' achievement in Biology. Gender issues have been linked to achievement.

Purpose of the Study

The purpose of the study was to investigate the effect of CAI on secondary school students' achievement in Biology. Specifically, the study sought to determine the influence of CAI on students' achievement in photosynthesis, animal nutrition and excretion.

Hypotheses

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

1. There is no significant difference between the mean Biology achievement scores of students taught photosynthesis, animal nutrition and excretion using CAI and those taught with lecture method.
2. There is no significant difference between the mean Biology achievement scores of male and female students taught photosynthesis, animal nutrition and excretion using CAI.
3. There is no significant interaction effect of CAI and students' gender on students' achievement in photosynthesis, animal nutrition and excretion.

Method

The researchers adopted non-equivalent control group. The area of the study is Enugu education Zone of Enugu State. Enugu Education Zone is made up of Enugu East, Enugu North and Isi-Uzo Local Government Areas. The population of the study consists of all Senior Secondary One (SS1) students in sixty-four (64) Government Secondary Schools in Enugu Education Zone of Enugu State numbering twenty thousand, four hundred and fifty-

five (20,455) (PPSMB, 2021). A sample of 365 SS1 Biology students (165 males and 200 females) in four schools was used. Two schools each formed experimental group and control group. Simple random sampling was used to get four (4) intact classes. Members of the experimental groups in the two schools were taught Biology topics – photosynthesis etc. using Computer Based Instruction (CBI) while the control groups were taught the same concepts using lecture method. The BAT developed by the researchers was used to collect data. The BAT was face validated and reliability coefficient of .83 was obtained using Kuder-Richardson's 20 (KR-20). Both pre-test and post- test were administered to the experimental and control groups at the beginning and end of the four weeks (4) exercise. The hypotheses were analyzed using (ANOVA) analyses of variance at 0.05 level of significance.

Results

Table 1 shows the descriptive statistics of students scores on photosynthesis, animal nutrition and excretion during the pre-test and post-test for students exposed to CAI and lecture methods.

Table 1: Pre-test and Post-test achievement scores of the CAI and lecture groups

Group	N	Pre-test Mean	SD	Post-test Mean	SD
CAI	200	31.5	2.1	85.4	.92 Lecture
165	28.2	3.5	62.5	4.4	

The pre-test mean achievement scores and SD for CAI group were 31.5 and 2.1 while that of lecture group were 28.2 and 3.5 respectively. The post-test mean achievement scores and standard deviation were 85.4 and 0.92 for CAI while that of lecture group were 62.5 and 4.4. Here the CAI group had higher mean of 85.4 and lower SD of .92. There were more extreme scores in lecture group while that of CAI is more reliable.

Table 2: Pre-test and Post-test achievement scores of male and female students

Group	N	Pre-test Mean	SD	Post-test Mean	SD
Male (CAI)	85	20.5	8.23	80.5	6.4
Male (Lecture)	65	221	7.05	53.2	10.5
Female (CAI)	115	20.4	8.05	81.3	6.25
Female (Lecture)	100	20.45	8.15	50.12	6.52

The pre-test mean achievement scores and SD of CAI groups were 20.5 and 8.23 for male students and 20.5 and 8.05 for female students. In the same vein the post-test mean achievement scores and SD of CAI were 80.5 and 6.4 for males and 81.3.5 and 6.25 for females while the lecture groups mean achievement scores and SD were 53.2 and 10.5 for males and 50.12 and 6.52 for females.

Hypotheses

$H0_1$: There is no significant difference between the mean Biology achievement scores of students taught photosynthesis, animal nutrition and excretion using CAI and those taught with lecture method.

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Source variance	Sum of square	Df	Mean squares	F.cal	Level of significance	Decision
Pre-test	31561.522	1	31561.522	271.212	.310	NS
Main effects	77241.633	2	44171.271	291.322	0.23	S
Method	68552.615	1	6744.616	776.150	.044	S
Gender	6447.655	1	6327.845	416.223	.100	NS
Method & Gender	229.213	1	219.213	638.008	.067	S
Explained	94435.611	4	32447.500	257.622		
Residual	262645.91	361	82.575			
Total	225004.512	265	419.465			

S = Significant, NS = Not Significant at 0.05 level of significance

$H0_2$: There is no significant difference between the mean Biology achievement scores of male and female students taught photosynthesis, animal nutrition and excretion using CAI in the post-test.

From table 3, the f-calculated value of 416.223 for gender main effect has probability of .100 which is more than 0.05 degree of significance; therefore gender was not significantly different.

$H0_3$: There is no significant interaction effect of CAI method and students' gender on students' achievement in photosynthesis, animal nutrition and excretion in the post-test.

Table 3, the f-cal value of 638.008 for interaction effect of method and gender has probability of .067 which is less than 0.05 degree of significance; therefore the interaction of method and gender was significantly different.

Discussion

The result of this work showed that the Biology students taught with CAI achieved better than those taught the same concept using lecture method. It agrees with Ozomadu (2020) in Mathematics, Egunjobi (2018) in geography and Onah (2017) in mathematics all confirmed that CAI has been effective in enhancing students' performance in other subjects and not just biology, than the conventional classroom instruction.

The influence of gender on the academic achievement of biology students when taught with CAI and those taught with lecture methods showed no significant gender difference. This finding is in line with findings of Bello (2012) on gender and performance in Biology. It also agrees with Danjuma (2015) who reported that gender was not significantly different in Physics achievements under CAI. The implication of this result is that CAI has the potency to equalize gender gap in Biology achievement. Gender has also been linked to academic achievement of students in some studies. This is seen in Sullivan (2012) work on gender imbalance in technology and the role of technology in future. While some studies revealed that male students achieve higher than females in Physics, Chemistry and Biology Ochuba (2015), Novak (1991). Others in their studies did not find any form of difference in performance exerted by gender (Aja and Imoko, 2015), Unodiaku (2013).

The interaction between CAI and students' gender on students' achievement in Biology was significantly different hence male and female do not achieve differently using CAI but the reverse is the case for lecture method. The result of the interaction effects of gender and method lays credence to the fact that teaching and learning of Biology with CAI is very effective compared with the use of lecture method.

Conclusion

The study showed that students taught Biology with CAI achieved better than those taught with conventional method. There was no significant difference in the biology achievement of gender using CAI method of teaching and learning.

Recommendations

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

1. Relevant CAI packages should be introduced and used in teaching and learning of Biology in Nigerian Secondary School System.
2. Biology teachers should be given periodic seminars, workshops and in-service training on the integration of CAI in their Science instructions.

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