

Effects of Computer Assisted Instruction on Students' Academic Achievement and Attitude in Biology In Osun State, Nigeria

Adedamola. A. Kareem

Department of Teacher Education,
University of Ibadan, Nigeria

Abstract

The study investigated the effects of introduction of computer-assisted instruction (CAI) in biology compared to the traditional method of teaching on senior secondary school students' achievement and attitude. A science class was randomly selected in each of the three purposively selected schools. One hundred and fifty-two students participated in the study. One-group pretest-posttest experimental design was used. Students' pre- and posttest examination scores were used to assess the effect of the instruction. Students' Attitude to Computer Instruction Questionnaire (SACAIQ) with reliability (r) = 0.78 was used to assess students' attitude towards computer-assisted instruction. Data collected were analysed using descriptive and inferential statistics. The result of the study revealed that a statistical significant difference existed between students' academic achievement and mode of instruction but no significant difference existed in the students' attitude. Therefore, it is recommended that computer-assisted instruction should be used in the teaching of biology at secondary school to improve students' academic performance on the subject.

Keywords: computer - assisted instruction, students' achievement, students' attitude, biology, secondary school

INTRODUCTION

Biology is a science subject being taught at the senior secondary school. The subject appears to be the most popular science subject at this level. Biology teaching helps learners to understand biological concepts, principles theories and laws. Among others, the objectives of teaching biology at secondary school level as stated by National Policy on Education FME (2004) involve ability of the learners' to development of an awareness of the environment, to have meaningful and relevant knowledge in biology necessary for successful living in a scientific and technological world and to make room for technological advancement.

In view of the above, it would be observed that the schools are not only to equip learners with basic knowledge of biology content but also the practical skills needed for enhancing self development. In order to achieve this, the pedagogical approach which is centered on teachers' method of imparting facts and concepts of the subjects is important. The implication is that biology teaching must be effective and meaningful to achieve this goal. The conventional instructional methods may not be able to achieve these goals. NTI (2008) remarked that the conventional instructional method is teacher centered while Adeyemi (2012) also commented that the conventional instructional method is characterized by emphasis on instructor behaviour rather than students' behavior, minimal responses of students to the instructional materials and delayed feedback on students' performance.

In order to facilitate the achievement of such goals, the recent moves of information revolution and knowledge explosion in technology have brought about changes in the educational system. Technology is utilized in enhancing instruction thus shifting from teacher centered conventional methods attitude have increased across many countries and have proved to be effective. Ochoyi and Ukwumunu (2008) reported that the use and increasing growth of technology in the classroom provides new opportunities for delivery of instruction. Educators utilizing technology to enhanced instruction have increased in number across a variety of disciplines and the method has been proven to be effective. Research has indicated that technology in the classroom can be useful in pedagogy management and an effective teaching enhancement. Technology has been described by Abimbade, Aremu & Adedoja (2003) as a systematic and integrated organization of man, machine, idea and procedure to achieve a desire goal. Over the years, various machines have been invented by man in technology. The major and most influential technology in the last millennium is the introduction of computer.

The introduction of computer in education has not only being found to improved access to learning by all and quality knowledge delivery; its application has also being in the teaching-learning process. This may improve students' achievement in some subjects such as biology where students' performance is very low. Students' performance in biology has consistently been reportedly low over the years in Nigeria especially in public examinations such as

senior secondary school certificate examination (WAEC Chief Examiners' Report, 2010)

Hayes and Robins (2000) found that the use of computer based instruction is effective on the achievement of pre-service teachers as well as their attitude towards computer instruction. In similar study, Ogunleye (2007) also noted that computer in expands pedagogical resources available to teachers in science classroom thus supporting teaching. The implication of this is that the introduction of computer in the delivery of biology instruction as a science subject in classroom may improve the quality of pedagogical delivery and students' learning outcome.

It has also been commonly accepted and proven that information and communication (ICT) is the engine of the 21st century and beyond as it will chart the economy, cultural, legal, etc particularly of developing countries. Therefore, the integration of computer which is the major and most influential technology in the last millennium into education especially in the classroom could be beneficial in building students' capacity in technology. Human capacity building has been described by Tachiki (2002) as the process of equipping individuals with the understanding, skills, and access to information, knowledge and training that enables them to perform effectively in an information society. The use of Computer Assisted Instruction in sciences especially biology would encourage exposure and capacity building in understanding, skills, knowledge and access to information in the technology world. Such capacity building will encourage social technological relevance and sustainable development of the country.

However, in spite of the benefits of the introduction of computer in presenting science learning materials, studies have shown that it is not yet widely used in Nigerian science classroom. This may be the reason why computer is being introduced into some secondary schools in Osun State of Nigeria by the state government. This study therefore investigated the effect of the introduction of Computer Assisted Instruction (CAI) on students' learning outcomes in the selected secondary schools in Osun State, Nigeria.

OBJECTIVES OF THE STUDY

The objective of this study is to examine whether the introduction of Computer Assisted Instruction (CAI) into secondary school classroom would improve students' performance in biology.

STATEMENT OF THE PROBLEM

The teaching of biology in Nigerian secondary schools has been with the use of traditional method of instruction. However, the achievement of students in

the subject especially at SSCE level has consistently remained poor. This may imply that students are not learning from the use of this method of teaching. Meanwhile, the introduction of computer into secondary school classroom in other countries has proved to be effective in improving teaching and learning process. This study therefore determined the effect of introducing computer in biology classroom on students' learning outcome.

RESEARCH HYPOTHESES

- 1) There is no significant main effect of treatment on students' academic achievement in Biology.
- 2) There is no significant main effect of gender on students' academic achievement in Biology.
- 3) There is no significant interaction effect of treatment and gender on students academic performance in Biology
- 4) There is no significant main effect of treatment on students' attitude.

SIGNIFICANCE OF THE STUDY

Findings from this study would encourage the use of Computer Assisted Instruction (CAI) in the teaching of biology at secondary school level for improved students' achievement in the subject.

The information provided in this study would also encourage the introduction of computer tablets into other public secondary schools in the state by the state government for general improvement in students' achievement in biology and other subjects.

It is also expected that the result would promote the introduction of computer-assisted instruction into private secondary schools in the state by their respective stakeholders.

The result of the study would also promote the use of and development of skills in computer operations by such students taught with Computer Assisted Instruction (CAI).

A further significance of study is that its result would build such students capacity and empower them in the technological world which would assist them in future learning and general development and global relevance as the world is becoming a global village of learning.

METHODOLOGY

Design

The study is experimental. It adopted one-group pretest-posttest experimental design.

Instruments

The instruments used in the collection of data are:

- 1) The students’ first and second terminal examination result.
- 2) Students’ Attitude to Computer Assisted Instruction Questionnaire (SACAIQ). The instrument was validated and trial tested and the reliability used Cronbach alpha stood at 0.78.

Scope of The Study

The study covered co-educational senior secondary school II students in three secondary (one in each senatorial districts of the state) schools which were presented with computer tablets by the state government. The study attempted to determine the effect the introduction of computer tablet on the academic achievement and attitude of the students.

Population

All the SS II students that were offering biology in their schools in Osun State comprised the population of the study.

Sampling and Sample

The three public senior secondary schools whose SS II students and teachers were provided with computer tablets by the state government of Osun, Nigeria were purposively selected for the study. One SS II science class was randomly selected for the study in each of the three schools. An intact class of the science classes selected was used for the study. In all a total of 152 students participated in the study.

Research Procedure

The SS II students and teachers of the three selected schools were presented computer tablets by the state government after the first terminal examination (i.e.

during the first term holiday). Each computer tablet contains already programmed curriculum content of every subject including Biology in SS II curriculum. The computer tablets were used by the biology teachers and students during teaching and learning process in the classroom. During each of these processes, the teachers and students open to the biology content in the computer tablets and make use of it. This was carried out through out the second term. At the end of the term, the second terminal examination was conducted.

The researcher visited the three secondary schools on resumption in second term with a research assistant. One science class was randomly selected in each of the schools and the first term scores in biology of the selected science class was collected from the school authority. This serves as the pretest scores for the students. On resumption in the third term, the researcher and the research assistant visit the selected schools to collect the second term examination result of the students previously collected. This served as the post test scores. Thereafter attitude questionnaire was administered to the same set of students.

Data Analysis

The data collected were analyzed using Analysis of Covariance (ANCOVA). The hypotheses were tested at 0.05 level of significance.

RESULTS

The results of this study were presented according to the hypotheses stated.

Hypothesis One: There is no significant main effect of treatment on students’ academic achievement.

Table 1; Summary of Analysis of Covariance (ANCOVA) on Biology Achievement

Source	Type III sum of squares	df	Mean square	f	sig.	Eta Squares
Corrected Model	24906.103 ^a	12	2075.509	12.507	.000	.519
Intercept	32127.281	1	32127.281	193.592	.000	.582
PREBIO	500.676	1	500.676	3.017	.085	.021
TRTGRP	19647.763	2	9823.881	59.196	.000*	.460
SEX	205.382	1	205.382	1.238	.268	.009
ATTITUDE	412.148	1	412.148	2.484	.117	.018
TRTGRP SEX	851.613	2	425.807	2.566	.080	.036
TRTGRP ATTITUDE	554.548	2	277.274	1.671	.192	.023
SEX ATTITUDE	19.749	1	19.749	.119	.731	.001
TRTGRP SEX ATTITUDE	785.109	2	392.554	-2.365	.098	.033
Error	23067.575	139	165.954			
Total	533987.000	152				
Corrected Total	47973.678	151				

a. R Squared = .519 (Adjusted R Squared = .478)

Table 2

SEX	Mean	Std Error	95% confidence interval	
Male	56.592a	1.519	53.588	59.596
Female	59.196a	1.338	55.681	62.311

Table 1 shows that there is a significant effect of treatment of biology students academic achievement

($F_{(1,151)} = 59.196; P < 0.05; \eta^2 = .460$). Hence, hypothesis 1 is rejected.

Hypothesis Two: There is no significant main effect of gender on students' academic achievement in Biology.

Table 1 revealed that there is no significant effect of gender on students' academic achievement ($F_{(1,151)} = 1.238$; $P > 0.05$; $\eta^2 = .009$). Although, in table 2, the mean score of female students is slightly higher than the male students, the difference is not significant, the Eta squared on table 1 is very small, this also showed that it is not significant. Hypothesis two is accepted.

Hypothesis Three: There is no significant interaction effect of treatment and gender on students' academic achievement in Biology.

Table 1 shows that there is no significant interaction of treatment and gender on students' academic achievement ($F_{(1,151)} = 2.586$; $P > 0.05$; $\eta^2 = 0.36$). Therefore, hypothesis 3 is accepted.

Hypothesis four: There is no significant main effect of attitude on students academic achievement in biology.

Table 1 shows that there is no significant effect of attitude on students' academic achievement in ($F_{(1,151)} = 2.484$; $P > 0.05$; $\eta^2 = .018$). Hence, hypothesis four is accepted.

DISCUSSION

Judging by the findings, it is evident and was clearly indicated that the treatment was statistically significant on the students' achievement. The introduction of computer-assisted instruction into SS II has showed from the findings to improve students' academic achievement in biology. This finding support previous assertion by Tabassum (2004) that students taught through computer assisted instruction as supplementary strategy performed significantly better in science.

This implies that the use of computer must have facilitated and improve instruction thus improving understanding of the content of the subject and therefore improve students' academic achievement. The result is also consistent with Ochoyi and Ukwumunu (2008) who submitted that the integration of computer in secondary school curriculum produced positive effect on students' learning. However, the result negates the findings Owusu, Monney, Appiah and Wilmot (2010) that the performance of students instructed by the conventional approach performed better on the post-test examination.

The non-significant effect of gender on students' academic achievement may be that the computer-assisted instruction produced the same learning effect

on both gender. Hence, there is no difference in their achievement. This is in support of the earlier findings of Tabassum (2004) that the computer-assisted instruction was equally effective for both male and female students.

The study also shows no significant effect of students' attitude towards computer-assisted instruction. This may be due to the school environment of the students, the mode of utilization of or type of the computer tablet issued out to the students, teachers' attitude towards the type of instruction or other unknown variables which has made the students' attitudes to remain significantly indifferent. However, this result is consistent with the finding of Abimbade (2006) of low students' attitudes towards introduction of computer in classroom as a result of low teacher's attitude. But Hayes and Robins (2000) submitted that there was increase in students' attitude to computer-assisted instruction which negates the findings of this study. Evidences from this study have shown that the use of Computer Assisted Instruction (CAI) would help in building in the students' capacity in the knowledge of biology. This may also bring about an indirect empowerment of such students in computer operations.

RECOMMENDATIONS AND CONCLUSION

Based on the findings of this study, it is recommended that computer-assisted instruction should be used in the teaching of biology in secondary schools. Also, the government should ensure availability of computer in all public and private secondary schools to ensure easy utilization computer-assisted instruction in the teaching biology.

LIMITATION OF THE STUDY

The study is limited to three public secondary schools whose secondary school two (SS II) students and teachers were presented with computer tablet by the state government.

REFERENCES

- Abimbade, A. (2006). Information and communication technology in education: Teachers' preparation and quality assurance. A paper presented at the 19th National Conference of Curriculum Organization of Nigeria (CON) September 12-15, 2006. Held at Olabisi Onabanjo University. Ago-Iwoye, Ogun State, Nigeria.
- Abimbade, A.A., Aremu, A and Adedoja, G. O. (2003). Providing Information and Communication Technology (ICT) environment for teaching and learning in the Nigerian education system In O. Ayodele-Bamisaye, I. A. Nwazuoke and A. Okediran (Eds), Education this millennium: innovations in theory and practice, Ibadan, Macmillian Nigeria Publishers Ltd.172-188.

Adeyemi, B. A. (2012). Effects of Computer Assisted Instruction (CAI) on students' achievement in social studies in Osun State, Nigeria. *Mediterranean Journal of Social Sciences*.3.2. 269-277.

Federal Ministry of Education (FME). (2004). *National Policy on Computer Education*. Lagos: Nigeria Educational Research Council NERDC 4th edition.

Hayes, B. G and Robins, E. H. (2000). Assessing counselor education students' attitudes towards computers and multimedia instruction. *Journal of Humanistic Education and Development*.

NTI, (2008). *Manual for the re-training of primary school teachers on basic science and technology. A Millennium Development Goals Project (MDG)*. Kaduna: National Teachers' Institute Press.

Ochoyi, U. E and Ukwumunu, A. I. (2008). Integration of ICT in secondary school curriculum in Nigeria: Problems and Prospects. *Proceedings of 49th Annual Conference of Science Teachers' Association of Nigeria (STAN)*.

Ogunleye, B. O. (2007). Teachers' perceived barriers to successful implementation of ICT in the teaching and learning of science subjects in Nigerian secondary school. *Nigerian Journal of Computer Literacy*. 8.1.16-31.

Owusu, K. A., Monney, K. A., Appiah., J. Y and Wilmot., E. M (2010). Effects of computer assisted instruction on performance of senior high school biology students in Ghana. *Journal of Computer and Education*. 55.2. 904-910

Tabassum, R. (2004). Effects of Computer Assisted Instruction (CAI) on the secondary school students' achievement in science. Ph.D. Thesis. University of Arid Agriculture. Rawalpindi.

Tachiki, D. S. (2002). Human capacity building in SMES: Japanese experiences and regional challenges. *The Impact of Globalization and Human Capacity Development*. Retrieved from www.icde.org/filestore/Resources/Reports/Capacitybuilding.pdf

West African Examinations Council (2010) WAEC Chief Examiners' Report'