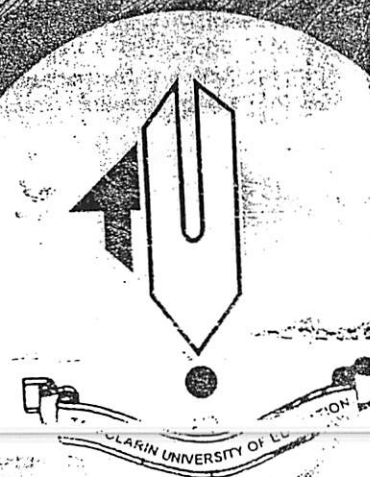


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Contributors

- Yaya Japhet & Oyediran-Tidings O. are Librarians of Main Library of Yaba Technology, Yaba, Lagos.
- Hammed Adefeye is a lecturer in the Department of Counselling Psychology TASUED, Ijebu-Ode.
- Babayemi John O. is a doctoral student in the Department of Teacher Education University of Ibadan, Ibadan.
- Anthony Nnana Chukwu, Ph.D. is a Senior Research Fellow in National Institute for Educational Planning and Administration (NIEPA), Ondo.
- Adefunke Ekin, Ph.D. is a lecturer in the Department of Educational Foundations and Instructional Technology, TASUED, Ijebu-Ode.
- Onasanva Samuel, A. Hammed M.A. and Adefuye Linus Adefayo are Senior lecturers from University of Ilorin and Tai Solarin University of Education, Ijebu-Ode, respectively.
- A.A. Adekunle & T.D. Oke are Senior Lecturers in the Federal College of Education Osiele, Abeokuta.
- Yonlounfun V.E. Ph.D. is a lecturer in the Department of Educational Management TASUED, Ijebu-Ode.
- Rosenje, M. Olapeju & Moliki, A.O. are lecturers in the Department of Political Science, TASUED, Ijebu-Ode.
- Olalere Olaewe, Ph.D. is a Senior Research Fellow in the Department of Science Technology and Mathematics Education, Ogun State University, Ipetu-Ijesa Campus.
- Onasanya, A.S., Ph.D. is a Senior Lecturer in the Department of Agricultural Extension and Rural Sociology, Olabisi Onabanjo University, Yewa Campus Ayetoro, Nigeria.
- S.D. Osaal, Ph.D. & Omordu Chidi Ph. D are Senior Lecturers in the Faculty of Education, University of Port Harcourt, Port Harcourt Nigeria.
- Ayodeji Gafar, I. is a lecturer in the Department of Political Science, TASUED, Ijebu-Ode.
- Akiwowo Anthony O., Nwoha, P. Ojukwu M., Uwakwe, C.B.U. & Adekeye, O.A. write from University of Ibadan, Obafemi Awolowo University, Ile-Ife, Michael Okpara University, Umudike Umuahia, and Covenant University Otta, Ogun State, Nigeria respectively.
- Pitan O. writes from National Open University, Victoria Island, Lagos, Nigeria.
- Kehinde Taiwo Olubunmi is a lecturer in the Department of Business Management, College of Social and Management Sciences, TASUED, Ijebu-Ode.

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COMPUTER-BASED LEARNING AND STUDENTS' COGNITIVE ACHIEVEMENT IN BIOLOGY IN SELECTED SECONDARY SCHOOLS KWARA STATE

¹ONASANYA SAMUEL ADENUBI, ¹AHMED MULKAH ADEBISI
AND ²ADEFUYE LINUS ADETAYO

¹Department of Science Education, Faculty of Education
University of Ilorin, P. M. B. 1515, Ilorin, Nigeria

²Department of Educational Foundation & Instructional Technology,
Tai-Solarin University of Education, Ijagun, Ijebu-Ode, Ogun-State,
Nigeria.

Dr. Samuel Adenubi ONASANYA is an Associate Professor of Educational Technology in the Department of Science Education, Faculty of Education, University of Ilorin.

Dr. (Mrs) Mulkah Adebisi AHMED is a Lecturer of Biology Education in the Department of Science Education, Faculty of Education, University of Ilorin.

Abstract

This research investigated effect of computer based learning on students' cognitive achievements towards biology in Secondary Schools in Ilorin, Kwara State. The target population for the study were forty senior school students which were randomly selected and grouped into experimental and control groups respectively. The method used was quasi experimental of pretest and posttest control which was used to analyze the data collected. From the study, it was revealed that students exposed to computer based learning performed better than their conventional group counterpart. The study also showed that the major effect of the use of computer based instruction in the teaching and learning of biology was that the student exposed to computer-based learning performed better than those taught using the conventional. Also, gender has a significant effect on the performance of the students. Based on the result of this study, a number of recommendations were

made. These include that the computer assisted learning be adopted and intensified to compliment the traditional approach in all science subjects especially in biology and that the National Association of Educational Media and Technology (NAEMT) should provide a form for closer reflection on computer assisted instruction through symposia, seminars and workshops among students and science teachers.

Background to the Study

Computer based learning (CBL), is becoming more and more widely spread and it is important especially on difficult subjects in science for over two decades. Collection and manipulation of data accessing and processing them has gain speed. (Zielinski and Swift, 1997). But most secondary schools in Nigeria, especially the public schools have little or no access to computer. Computer has been defined by several authors and analysis has shown that those definitions bring out the same meaning to what computer really is.

Computer is a device which presents wonderful opportunities for learning and teaching process. Using to teach, manage show and communicate made the computer unique compared to other learning devices. However, it has now been used instead of text book, laboratory, and lecture in classes both in the secondary and the University (Tieleman and Collis, 1999). Computer has used to be produced teaching, manage, show and communicate, but other devices, which are used to learn are less effective than computer.

Oladimeji (1996) defines computer as an electronic device, which accept data or information, requires electricity and is capable of processing data and sending it back to the user through the output device. Computer plays an internal role in the education of teachers. Computer-based instructional materials such as educational software and the internet expose students to a range of experience and promote interactive learning. Through the internet, students anywhere in the world allowing themselves to share experience and differing view points. Students also use the internet for individual research project to gather information. Computer is used in other classroom activities as well as in solving biology, physics chemistry and mathematical and problems in other subjects that are both in the science and social science.

Computer based learning (CBL) is a method which use computer in learning media, strengthening students and motivation and education process. It gives opportunities to both students and teachers to learn by their speed and combine active learning with computer technology. Collette increase

motivation and desire to lectures and laboratory in the process of learning. There are a lot of important reasons for using computer and world wide web (www) in biology education. Not only can computer gather many materials from various centers, but also, it can get text, graph, audio, video, picture, animator and simulator in the same media to students. Many students also supported the idea that CBL has positive effect on students' achievement and attitudes (Aiello and Wolfe, 1980 Burns and Bonzeman, 1981)

Nothing before has captures the imagination and internet on educators simultaneously around the globe more than the world wide web. The web is now causing educators, from pre-school graduate school, to re think the very nature of teaching, learning and solving problems. Basically educational technology connotes the continuous improvement of effectiveness in education, especially quality in the teaching and learning process. One of the goals of educational technology is to provide a learning medium that can facilitate knowledge dissemination and acquisition of skill by both the teacher and the learners. Thus, the use of CBL is a further development of educational technology and in this research work.

Biology is known as the study of living things. Sarojini (2009) defined biology as the study of interaction between the living and the non-living components of the environment. Kimball(2011) also defined biology as the study of life. The central position of biology in the science world cannot be over-emphasized as biology is the gateway to professions like medicine, pharmacy and a host of others. Biology is therefore important to the general education of human beings and as such has to be taught well by the teacher and learnt well by the learners. One of the ways by which this could be done effectively is through the use of computer-based learning. Hence, this study sought to examine the effects of computer-based learning on students of biology in selected secondary schools in Ilorin. Computer can be used to meet some new challenges and to solve complex tasks with little human intervention. Computer can perform, in second complex task that would take an expert several days to accomplish. Thus, the researchers of this study want to see the effect of computer Based Learning on students' attitudes and achievements in biology in Model Secondary School, Ilorin.

Many studies have been carried out on gender difference. Studies that examined female-male differences in several countries such as the one carried out by Hartz (1980), who emphasized the importance of gender and environmental influence on students. One such influence on carrier choice of young people is teacher (Vetter, 1980). Welch and Laurenz (1982) also

believed that one source of influence of the carrier choice of young people is the teacher. Science teachers' characteristics have been shown to be related to students' achievements and attitude. In support of the above assertion, various researchers show that students' tend to choose courses that they find interesting and useful. Welch and Laurenz (1982) conducted a research known as Adaptation of the Cognitive Preference Test Based (ACPTB). They used models to study teachers' teaching and student' learning effect on students academic achievement based test on sex. The test was a multiple choice format with preference on facts, fundamental, principle, generalizations and physical application. Respondents were requested to rank the test items from the highest (5) to the lowest (1) The findings of this study revealed that science group had the highest on preference for practical application. The findings also revealed that there were significant differences among the groups, while sex had no significant effect on the teaching and the academic achievement of the learner. Also, Ahmed (2009), in her study revealed that there is a significant difference in the ratings of male and female biology lecturers on the difficulty levels of genetic concepts in Nigerian Colleges of Education. Therefore, this study also looked at the effect of gender on the use of Computer Based Learning strategy on student achievement in Biology.

Research Type

The study is an experimental research design. Quasi experimental of pre test and post test was used in the study. The research used two level of independent variables where both experimental and control groups were given the pre test and both groups were as well exposed to post test after the treatment. Experimental group was exposed to treatment through conventional method.

Sample and Sampling Procedure

The target population for the study was made up of forty senior secondary three students (20 males and 20 females) randomly selected from two classes of Model Secondary School, Ilorin, Kwara State. The first 10 students randomly selected from each of the two selected classes of Model Secondary Schools in Ilorin West Local Government area of Kwara State, (20) were sampled as the experimental groups, while the rest (20) were sampled as the control group respectively. A pre test on photosynthetic experiment was to determine whether they were equivalent in their level of understanding of the topic under discussion. The subsuming concepts that were presented as prior instructional

material included sunlight, carbon dioxide, chlorophyll and water as conditions necessary for photosynthesis. For testing if chlorophyll is necessary for photosynthesis, the newly plugged green leaves, boiling water, hot alcohol and iodine solution were provided. However use of letters and numbers to stand for the unknown, identifying keywords, making a balanced equation, solving for the unknown in the equivalent equation were demanded. The prior CAL was presented to the experimental group before teaching the actual topic through the conventional method of training. The SS3 students were selected because they are already preparing for WASSCE O'Level examinations.

Research questions

Four research questions were raised to be answered for this study. These are

1. What is the performance of SS3 biology students on the achievement test?
2. Is there any significant difference in the pre-test and post-test of the male biology students?
3. Does the male post-test experiment and their female counterparts differ significantly in biology?
4. Is there any significant difference in the t-test analysis comparing the post test experimental and control groups?

Research hypotheses

- HO1: There is no significant difference in the pre-test and post-test of the male biology students.
- HO2: The male post-test experimental and the female post-test control groups did not differ significantly in biology.
- HO3: There is no significant difference in the t-test analysis comparing the post test experimental and control groups.

Research Instrument

The instrument for this study was past examinations questions of WASSCE O' level biology both in theory, objectives and alternative to practical. These questions were selected and given to all the students in experimental and control groups. The experimental group was exposed to CAL while the control group was exposed to normal traditional chalk and talk method of instruction. Both were treated for two weeks before applying the instrument. A delayed test was also administered in order to determine whether the topic was adequately retained in the students' memories.

The administered questions are shown in appendix I at the back of this work, also the knowledge of computer appreciation given to the experimental group are shown in appendix II and finally, the marking schemes of work for marking the administered questions is shown in appendix III at the back of this work.

Validation of the Instrument

The validity of the instrument was determined when we gave the prepared CAL program to education technology and biology experts of University of Ilorin and also experts in the field of biology education in secondary schools in Ilorin to determine the appropriateness of the material.

Data Analysis Technique

The data collected for this research work were analyzed using the t-test method, since the study intended looking for the effect of computer-based learning method on biology as a subject in Model Secondary School Ilorin. This was tested using mean scores of the students which were computed and analyzed using the t-test statistical procedures to clarify the null hypotheses.

Discussion of Tables

HYPOTHESIS ONE: There is no significant difference in the post-test experimental and control groups of the male biology students. In order to test this hypothesis, t-test statistics was used to compute the mean of post-test scores of the experimental and the control groups. The result is reported in Table 1 below.

Table 1: t-test analysis comparing the male post-test experimental and control groups

Group	No of Cases	Mean	df	Calculated	t-tail	Remark
Experimental group	10	70.00	18	3.12	2.10	Rejected
Control group	10	59.00				

At 0.05 significant level of alpha.

It is evident from Table 1 above that there was a marginal difference in the post-test mean scores for the experimental group and control group. When hypothesis one was tested using t-test, the calculated value of 3.12 was recorded while 2.10 was the critical value ($t = 3.12 > t_c = 2.10$) at alpha level of significance. This result implies that the null hypothesis is therefore not accepted because the calculated t-value is greater the critical value. In other word, the male students in experimental group are significantly better than their female students in conventional control counterpart when assessment was based on all the attributes of the test.

HYPOTHESIS TWO: The male post-test experimental and the female post-test control groups did not differ significantly in biology. In order to test this hypothesis, t-test statistics was used to compute the mean of post-test scores of the experimental group when all attributes were considered. The result is reported in Table 2 below.

Table 2: t-test analysis comparing the male post-test experimental and the female post-test control groups

Group	No of Cases	Mean	Df	Calculated	t-tail	Remark
Experimental group	10	53.40	18	2.18	2.10	Rejected
Control group	10	45.10				

At 0.05 significant level of alpha.

It is evident from Table 2 above that there was a marginal difference in the post-test mean scores for the experimental group and control group. When hypothesis two was tested using t-test, the calculated value of 2.18 was recorded while 2.10 was the critical value ($t = 2.18 > t_c = 2.10$) at alpha level of significance. This result implies that the null hypothesis is therefore not rejected because the calculated t-value is greater the critical value. In other word, the male students in experimental group performed significantly better than their female conventional control counterpart when assessment was based on all the attributes of the test.

HYPOTHESIS THREE: There is no significant difference in the t-test analysis comparing the post test experimental and control groups. In order to

test this hypothesis, t-test statistics was used to compute the mean of post-test scores of the experimental and control groups when all attributes were considered. The result is reported in Table 3 below.

Table 3: t-test analysis comparing the post-test experimental and control groups

Group	No of Cases	Mean	Df	Calculated	t-tail	Remark
Experimental group	20	62.00	38	4.42	0.02	Rejected
Control group	20	50.10				

At 0.05 significant level of alpha.

It is evident from Table 3 above that there was a marginal difference in the post-test mean scores for the experimental group and control group. When hypothesis three was tested using t-test, the calculated value of 4.42 was recorded while 0.02 at alpha level of significance and then for 38 df. This result implies that the null hypothesis is therefore rejected, because the calculated t-value is greater the critical value. In other word, the male students in experimental group performed significantly better than their conventional control counterpart when assessment was based on all the attributes of the test.

Discussion

This study assessed the effect of computer based learning on students' attitudes and achievements towards biology in Model Secondary School students. Forty students of Model Secondary Schools, SS III A and B who were preparing for their WASSCE O' level examinations were randomly sampled for the study. Quasi experimental was the instrument used to obtain the necessary information from the subjects. The study further investigated whether there were statistically significant differences between the students in experimental group (CALI) and their counterparts in control group. To accomplish this, sampled past WASSCE O' level biology examinations' questions were administered to the two groups (experimental and control groups) consisting of twenty students made up of ten males and ten females respectively.

The results of the statistical analysis of the data obtained showed that there is computer assisted instruction in the teaching and learning of biology in

Model Secondary School, Ilorin in Ilorin West Local Government Area of Kwara State. The level of significance used on 5%. The null hypotheses one and three in this research were rejected whereas hypothesis two was not rejected, and consequently bringing us to the conclusion that there is significant relationship between those students in experimental group (CALI) and the conventional control counterpart.

The investigation in this research study was the effect of using computer assisted learning instruction in the teaching and learning of selected topics in biology for secondary school students (SS IIIA ad IIIB). This was done by considering the academic performance of secondary school e.g. Model Secondary School students in biology as a subject.

The purpose of the study was to establish the relationship between the experimental and control group on the performance of students in biology at Model Secondary School, Ilorin. The major variables considered in the study are the ability and gender of the students. The research was limited to Model Secondary School in Ilorin West Local Government Area of Kwara State. The essence of this study is that the findings will highlight the importance of computer assisted learning instruction in the achievement of effective programming in education, particularly at the secondary school level in biology.

This section gives a brief summary of the review of related literature. The concept of CALI connotes computer assisted learning instruction which includes the laboratory furniture and equipment which enhance teaching and learning process. In planning school, computer instructional or computer aided instruction professionals such as teacher, school managers, engineers, architects, lawyers, businessmen, school administrators must be involved. The involvement of these professional would go a long way to assist the school boards in appreciating the need of the school and the people.

An adequate school CALI should be readily accessible to teachers and parents to be served by educational system, the educational needs of students are met by providing suitable and adequate CALI that would enhance teaching, learning and quick understanding.

Conclusion

The study shows that there was significant difference between the performance in all the groups in the experimental students exposed to CALI and those not exposed to it. When all attributes of the test were considered, students exposed to CALI performed better in the test than their conventional

control group counterpart. This may mean that if the concepts of biology in learning process entering on the optimal design, implementation and evaluation of teaching and learning, then the basic approach adopted in this research has fully utilized the concepts of educational technology. The major finding of this study call for more seriousness on the part of biology teachers concerning the need to get more involved practically with computer assisted instruction to teaching.

Since education is dynamic, instrument for changing biology programs need to be constantly reviewed to ensure their adequacy and continued relevance for better teaching and consequently national development.

Recommendation

In view of the findings in this study, the following recommendations are hereby put forwards.

- (a) That the computer assisted instruction be adopted and intensified to complement to traditional approach in biology programme in schools.
- (b) That the National Association for Educational Media and Technology (NAEMT) should provide a forum for a closer reflection on computer assisted instruction through symposium, seminars and workshop among students and teachers of basic sciences, biology inclusive.
- (c) That the Federal Ministry of Education in collaboration with the Nigeria Universities Commission (NUC) makes computer equipment with all its facilities available for instruction in the universities, college of education, polytechnic, secondary schools and in other educational multimedia related centres.

Suggestion for Further Studies

Examining the result of the findings of this study, the following are suggested for further researches. Since the study has investigated the effect if computer based learning instruction on students achievements towards biology in selected secondary school in Ilorin, Kwara State.

Further researchers can include some other fields of endeavours in higher institutions of learning like physics, chemistry, mathematics etc; this makes the work to be extensive. Further researchers can add more samples like students in other schools. This would make the future researchers to work on the perception or views of other schools in education industry rather than only biology students.

Lastly, there are other variables that were not examined in this study. Further researches could include such variables in their works. Such variables include age of students, area of specialization of staff, included in the sample as respondents.

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