



The Study Investigate the Effect of (CAI) Computer Assisted Instruction in Teaching and Learning of Biology in Secondary School

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ABSTRACT

The study investigation the effect of (CAI) computer assisted instruction in teaching and learning of Biology within Seat of Wisdom Secondary School as a case study. The purpose of the study was to find out if there is any effect or impact made using (CAI) in teaching and learning of Biology. The sample for the study consisted of Seat of Wisdom Secondary School SSI student. The sample procedures were experimental group and control group using a t-test method matching questions and interview used for the study. The data collected were organized in tables and analyzed in t-test. The investigation formulated four hypothesis and based on these hypothesis contracted twenty-five test terms for the students to answer, the result showed that students use CAI benefited and enjoyed more and that was a great benefit in the student performance and understanding four hypothesis were tested and the findings of the work were discussed. Limitations, implications, of the study and recommendation were put forward and suggestions were made for further studies. in conclusion, computer aided instruction is an effective tool in teaching and learning of Biology and other subjects

INTRODUCTION

Human society and race have benefited from science and technology. Everyone wants to be successful in life. He has developed numerous strategies for surviving, refining, and updating his approaches to make his challenges easier to handle. Computer use is one of these methods. Although mechanical computers have existed for a large portion of recorded human history, a computer is a mechanism that manipulates data in accordance with a set of instructions. In the middle of the 20th century, between 1940 and 1945, the first electronic computers were created. They used up as much power as several hundred contemporary personal computers (PCs) and were the size of a big room. The 1960s saw the introduction of computers, which were specialized learning devices, into classrooms. They drilled students on state, capitals and multiplication of facts.

A rapidly growing range of computer technologies that support the teaching and learning process is known as computer assisted instruction, or CAI. Computer aided instruction is another name for computer assisted instruction (CAI). Examples of call applications include computer-assisted communication between teachers and students, computer-assisted practice sessions, and guided drills. In 1951, there was one computer for every 125 pupils in American classrooms; by 1996, that figure had increased to one for every student. Although Western European and Japanese schools are also highly computerized, the United States leads the world in the number of computers per student. Information that aids in instruction or promotes interaction can be displayed on computers in the form of text or multimedia formats, such as images, videos, animation, speech, and music. A computer software called the guided drill asks students questions, provides feedback, and then chooses more questions depending on the students' answers. Current guided drill systems integrate subject matter knowledge and educational principles into the computer software.

Additionally, computers can assist kids in visualizing objects that are unattainable or difficult to view. Computers can be used, for instance, to represent intricate geometric objects, molecular structures, or human anatomy. CAI can be used to explore and manipulate simulated settings, from sophisticated virtual worlds like those found in airline flight simulators to virtual laboratory studies that could be too risky, costly, or difficult to conduct in a classroom setting. Drilling instruction still uses computer-assisted instruction (CAI). Teachers are aware of the benefits of drilling on a computer. Students who require repeated drills find this compassionate teacher non-threatening, and they study at their own pace with immediate feedback. The experts' main suggestion is to thoroughly examine how science is taught and learned in our senior school. According to the experts, the current situation is already making students avoid science for a variety of reasons, from the perception that science is a challenging subject to the scarcity of employment options. The child's level of intellectual and emotional development is comprised of their biology. He asserts that, in light of Burner's theory of preparedness, elementary school students are unlikely to be able to handle the demands of the distinct disciplines or find such specialized coursework enjoyable.

Science instructors can include rich learning experiences into their lessons by using computer simulations. In contrast to lectures, lab experiences, demonstrations, or photographs, simulations frequently allow the student to observe concepts and principles in action in either black and white or color. Computers can also be used to assist pupils visualize things that are hard or impossible to see. For instance, they can be used to show chemical structures and human anatomy. CAI can be used to explore and manipulate simulated environments, such as virtual laboratory experiments that might be too risky, costly, or difficult to do in a classroom setting, or too sophisticated virtual worlds like those used to model airplane trips. It is crucial to consider the influence and efficacy of CAI in the core curriculum disciplines. In addition to opening up a wide range of possible applications in science, CAI has also been linked to a number of potential advantages for teachers and students, according to various groups. At the instance of this, the present study goes to study the influence of computer assisted instruction in the teaching and learning of biology.

One of the science courses taught in Nigerian secondary schools, biology plays a significant role in the advancement of society. In secondary schools, a lot of pupils offer it. However, it is regrettable that many pupils perform poorly in the subject on the West African Examination Council's (WAEC) senior schools certificate examination (SSCE). Thus, the subject's unsatisfactory performance raises questions about how the uncomfortable situation came to be. One significant factor might be the teachers' methods of instruction. It is feasible that the situation will improve if computer-assisted instruction is used in biology classes. At the instance of this, the present study geos to study the effect of computer aided instruction in the teaching and learning of biology.

Hypothesis

The following hypothesis were formulated and tested in the study.

- H0(1): There is no significance difference in the performance of students taught using computer aided instruction and those taught with conventional method of teaching.
- H0(2): There is no significant difference in the performance of students taught with CAI based on gender
- H0(3): There is no significant difference in the understanding of difficult concept among those taught with CAI and those taught without CAI.
- H0(4): There is no significant difference in the retention capacity of students taught with CAi and those taught without CAI.

LITERATURE REVIEW

Use of CAI and the Understanding of Difficult Concepts in Biology

Among the tools teachers employ to improve the effectiveness, durability, and enjoyment of their lessons are instructional materials. Computers that are utilized as teaching tools, resources, and methods work well to help students focus on comprehending synthesis and strengthening their attitudes toward the course material. By giving pupils a more tangible understanding of abstract concepts, educational materials help students understand and retain the information (Cepni et al., 2004 and Demieri, 2004). Thus, the use of visual aids is

equally crucial for teaching abstract ideas, such as those covered in scientific classes, helping students grasp the information, and enhancing their attitude toward the course.

Computer-assisted instruction, or CAI for short, is a kind of educational application that is utilized extensively in the US and other nations as a teaching aid. Tutorials, quizzes, and Q&A sessions are used in CAI programs to introduce a subject and assess students' understanding. In addition to allowing students to work at their own pace, CAI programs have been shown to be successful in teaching fundamental math skills and a few other topics that encourage relaxation and practice. Among the many terms that have similar meanings and are associated with computer-based learning, computer-augmented learning, computer-based training, and computer-managed teaching is CAI. Because the CAI contains a computer that will remove the tediousness of computation, it will be beneficial to focus on the process of issue solution.

According to research, using computers as an application tool in science and math classes makes the courses more engaging and motivating. Thus, more complex scientific ideas can be learned in a more efficient and long-lasting manner. From language development to handwriting lessons, from social sciences to scientific courses, from mathematics to preparing students for life in school, computers are utilized in a wide range of fields. particularly when considering that elementary school pupils struggle to understand abstract ideas and education. particularly when considering that elementary school pupils struggle to understand abstract ideas and education.

Like everywhere else in the globe, computer use in science education is growing in popularity in Turkey. Computer-assisted training has become more important since science contains many abstract and theoretical ideas that are hard for students to understand and require visual aids to master. The use of computer-assisted instruction has many significant benefits. To help students view all facets of a subject and make generalizations, they can offer text, graphs, audio, video, animation, and simulation all in one medium. In an effort to provide our schools with cutting-edge technology for efficient learning, the government is currently providing computers to schools. The goal is to make the most of these computers by enhancing the teaching and learning of academic topics. All educational subjects, particularly the more complex and abstract ones like science, may be taught and learned using computers. Utilizing computer-assisted learning in biology classes gives the student a unique history and set of traits that allow them to gain from the computer's educational assistance.

In biology, computers were utilized to start solving problems. He discovered that problem-solving instruction became considerably simpler and less taxing. Once more, it was found that the pupils do significantly better than those who are exposed to the traditional approach to problem-solving. As a result, the use of computers in the classroom was seen as beneficial for both teachers and pupils, particularly in secondary schools.

Effect of CAI on Teacher's Method of Instruction

Teachers of science in Nigeria must learn the fundamentals of computer and internet literacy. The computer will give the instructor the fundamental abilities required to thrive in the current information and communication technology environment. These skills will include the ability to browse the internet, navigate it, and use it to stay afloat in a world that is constantly changing. One can utilize microtechnology as a tool to accomplish goals more rapidly, more affordably, or more effectively. Even things that were thought to be unachievable a decade ago are made possible by it.

It is anticipated that teachers will benefit from CAI as well since they will have more time to work one-on-one with students, less repetition and dredging, easier access to updated educational resources, and more accurate assessment and verification of students' progress. Many now view computer assisted instruction (CAI) as a way to deliver pertinent training to a large number of pupils due to the growing advancements in computer technology. New educational and instructional opportunities are brought about by technological advancements. People are currently looking at how to use computers more efficiently rather than if they are useful for educational and instructional purposes. According to some study findings, virtual classrooms are 20%-30% more successful than conventional ones.

Visual stimuli have a greater impact on young children than aural ones (Halis, 2002). It is challenging to pique students' interest and influence their understanding in the classroom because of this circumstance. The purpose of CAI is to increase the durability of knowledge. Students today are growing up with visual aids like computers, televisions, and the internet. These students cannot be engaged with standard tactics that were employed in the past. The last quarter of the 20th century saw technical advancements that led to significant differences in the manner that knowledge was introduced into society. Computers and televisions, which are mostly used in our daily lives, provide students with a wealth of knowledge that is graphically enhanced.

Effect of CAI on Student's Achievement in Biology

Individual and mastery learning through computer-managed and computer-assisted instruction (CAI) has been shown to be a more effective teaching strategy than the conventional "Chalk and talk" methods. The CAI's iterative nature is one of its main features; appropriate individualization of instruction is improved when students are able to direct their own learning in terms of material selection and in line with their intellectual capacity.

This method of teaching biology with CAI has the potential to greatly improve students' understanding of the topic, particularly for poor achievers. Such breakthroughs cannot occur on their own, regardless of CAI's educational qualities. A computer system of the size required for the CAI must exist, as well as a computer base from which to operate. Students need to understand the computer itself, and there are a lot of courses available in secondary schools that cover many facets of computer operation. One of the many tactics being employed to raise students' academic performance in a variety of topics, including reading, is computer-assisted instruction (CAI). Since their inception,

CAI programs have advanced significantly. more than 20 years ago. These applications identify issues, record students' progress, tutor and drill them, and offer the material in print and other formats. They are said to be a reflection of what effective educators do in the classroom.

Recent studies have looked into potential connections between students' performance on national tests and exams and the use of CAI in the classroom. The British Educational Communications and Technology Agency's current research (Becta, 2000, 20001b) have attempted to compare the performance of pupils in schools with enough ICT resources with those with fewer. The best outcomes were observed in schools where CAI was applied throughout the curriculum, and achievement was greater in those where it was regularly employed in biology and science classes. Research looked at how CAI and other microcomputer programs affected students' attitudes in addition to learning outcomes. For example, attitudes towards computers and the use of computers in education, course content/subject matter, quality of instruction, school in general and self-as-learner. Still other investigated the effect of CAI, on locus of control, attendance, motivation and time on the task.

Effect of CAI on Students' Knowledge Retention in Biology

It is clear that visual aids are employed in all fields these days, and pupils are impacted by technology, particularly computers and televisions. Instructional materials with a range of music, images, and animations are seen as more effective, entertaining, and long-lasting. According to Demirch (2004), 83% of people learn by seeing, 11% by hearing, 3.5 by smelling, 1.5% by touching, and 1% by tasting. Similarly, 75% of people learn by seeing, 13% by hearing, 6% by smelling, 3% by touching, and 3% by tasting (Kucukahmet, 2001). It is anticipated that CAI will help students. Among the benefits that have been expected are better and more comfortable learning for students, since they learn at their own pace and convenience opportunities to work vastly superior materials and more sophisticated problems; personalized; automatic measurement of progress and others.

Both theoretical viewpoints and technological developments have shaped the course of educational technology research over the years. CAI, which includes any type of computer practice, tutorials, simulations, instructional management, supplemental exercises, database development, and writing using word processors and other applications, was the focus of the introduction of personal computers in the classroom. These activities originated from Skinner's units and were arranged sequentially to accommodate different learning speeds. Typically, assignments are evaluated based on difficulty level, learners must finish one work before proceeding on to the next, and they receive rapid feedback. To improve involvement with the student, more modern authoritative tools, however, allow for the creation of non-linear lessons and the integration of multimedia resources (video, animation, and audio).

In terms of achievement, research endeavors centered on contrasting CAI with conventional, teacher-directed instruction. The "no significant difference" phenomenon has been used to describe these investigations. Researchers use computers to create lessons and assess whether or whether students'

performance improves in a way that is educationally meaningful. Some studies have concluded that CAI is better than conventional training, while others have found no difference at all. Additionally, researchers have shown evidence that CAI improves learning rate.

Effect of CAI on Student's Performance in Biology

This entails a good knowledge and understanding of the particular area being taught with the aid of CAI. Effect of CAI on students achievement in biology based on gender. With the aid of CAI the both gender were able to understand and perform excellently in the pretest carried out to the student.

METHODOLOGY

Population of The Study

The population of the study is all senior secondary school biology students in Anambra state of Nigeria.

Table 1. Below is the Pollution Distribution By Zones

Educational zones	Schools	Biology teachers	Number of students
Nnewi	43	65	21500
Onitsha	32	48	29040
Awka	63	95	31500
Ogidi	68	102	34000
Aguata	54	81	27000
Otuocha	40	19	20100
Total	300	410	163,140

All SS 1 pupils at Seat of Wisdom Secondary School were included in the sample, which was sampled and utilized as a case study. The Nnewi Education Zone was chosen through random selection. The sample for the study consists of 150 participants because there are 150 pupils in total.

Instrument for Data Collection

The teacher-made digestion test served as the device for gathering data. The biology achievement test (BAT) is the name of the exam. The researcher constructed the BAT. Twenty multiple-choice questions and five matching items make up the 25-item objective test. Each question is worth four (4) points.

RESULTS

Making A Total of One Hundred (100) Marks for the Achievement Test

There is no significant difference in the performance of students taught using computer aided instruction and those taught with correctional method of teaching.

Table 2. T-Test Summary Examining the Effect of CAI on Student's Performance in Biology

Group	N	X	SD	DF	T.CAI	T.C rit	Level of Sign	Decision rule
Experimental group	90	76.45	14.36	148	13.49	1.96	0.05	H0 _T rejected

Control group	60	49.31	19.63					
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Source: Field survey

$P < 0.05$, $T_{cal} (13.49) > T_{critical} (1.96)$

From the table 2 above it was observed that the probability (p) of the difference being due to error is less than 0.05 level of significance. The calculated t.value is 13.49 which is greater than the critical t-value which is 1.96.

Following the above, therefore a significant difference exists in the mean performance of the students. The null hypothesis (H_0) is hereby rejected. According students taught biology with CAI and those taught without CAI differs significantly in performance as measured at 0.05 statistical level of significance.

Null Hypothesis (H02)

There is no significant difference in the performance of students taught with CAI based on gender.

Table 3. T-Test Summary Examining the Effect of CAI on Students' Achievement in Biology Based on Gender

Gender	N	X	SD	DF	T.CAI	T.Crit	Level of Sign	Decision rule
male	70	71.01	13.03	148	0.41	1.96	0.05	H_{0T} accepted
Female	80	70.60	13.71					

Source: Field survey

$P < 0.05$, $t_{CAI} (0.41) < t_{critical} (1.96)$ from the table it is observed that the probability (p) of the difference being due to error is greater than 0.05 at 0.05 level of significance. This calculated t-value which is 0.41 is less than the t-critical value which is 1.96.

Following the above, therefore no significant difference exists in the mean performance of boys and girls. The null hypothesis (H_0) is thereby upheld. Accordingly, gender is not a significant factor in the performance of students taught biology with CAI as measured at 0.05 statistical level of significance.

Null Hypothesis (H03)

There is no significant difference in the understanding of difficult concepts among those taught with CAI and those taught without CAI.

Table 4. The T-Test Summary Examining the use of CAI and the Understanding of Difficult Concept in Biology

Group	N	X	SD	DF	T.CAI	T.Crit	Level of Sign	Decision rule
Experimental group	90	63.5	23.15	148	20.70	2.15	0.05	H_{0T} accepted
Control group	60	42.32	16.05					

Source: Field survey

$P < 0.05$, $t_{CAI} (20.70) > T_{critical} (2.15)$ from table 4 above, the mean values is less than the T. Cal 25.70 is greater than t. critical 2.15 and level of

significance. Therefore the hypothesis stated is false and can be restated, there is a significant effect between the use of CAI and the understanding of difficult concept in biology.

Null Hypothesis (H03)

There is no significant difference in the retention capacity of students taught with CAI and those taught without CAI.

Table 5. T-Test Summary Examining the Effect if CAI on Student’s Knowledge Retention in Biology

Group	N	X	SD	DF	T.CAI	T.Crit	Level of Sign	Decision rule
Experimental group	90	50.72	.836	148	22.54	1.96	0.05	H0 _T rejected
Control group	60	30.66	6.72					

Source: Field survey

$P < 0.05$, $t_{cal} (22.54) > t_{crit} (1.96)$. from the above, it is observed that the possibility (p) of the difference being due to error is less than 0.05 at 0.05 level of significance the calculated t-value is 22.54 which is greater than the critical t-value which is 1.96, following the above, therefore a significant difference exists in the mean achievement of the students based on knowledge retention, the null hypothesis (H0) is hereby rejected accordingly. Students taught biology with CAI and those taught with CAI significantly differ in knowledge retention.

DISCUSSION

The findings of the study were discussed here under the following theme:

1. Effect of CAI on Students Performance in Biology

From the table 1: it shows that there is significant different between those taught with CAI and those taught without it. Therefore, the hypothesis stated is false and can be restated; there is a significant difference in the performance of those taught with CAI and those taught without CAI. This is in line with Kulk, Bangert and Williams (1963) which stated that teachers as well are expected to gain from CAL as they experience less drudgery and repetition, rgreater ease in updating instructional materials, more accurate appraisal and documentation of students progress and more time to work directly with students.

2. The Effect of CAI on Students’ Achievement in Biology Based on Gender

From the table two, the findings show that there is high effect between the students taught with CAI based on gender. Therefore, the hypothesis stated is false and can be restated as there is significant relationship between the 150 taught with George (2006) which interest in science education and science related careers.

3. The Use of CAI and the Understanding of Difficult Concept in Biology

From the table 3 above, the findings shows that there is high effect between the use of CAL and understating of difficult concept in biology, therefore, there is a null hypothesis which states that the use of CAL has significant effect on the understanding of difficult concepts in biology. This is in line with Halis (2002)

which states that complicated science concepts can be learnt in a more lasting and effective way using CAI.

4. The Effect of CAI on Students Knowledge Retention in Biology

From the table 4 above, the findings show that there is high effect between the retention capacity of students taught with CAI. Therefore, the hypothesis stated is a false and can be restated as there is significant relationship between the student taught with CAI in the retention of knowledge of biology this is in line with Kulik, Bangert and Williams (1983) which states that teachers as well are expected to gain from CAI.

In an age ravaged by great technological breath through via information technology, the dynamism and vigour with which the computer is applied in day to day activities has led to complex human problem. Computer aided instruction appears to be at least as effective as a conventional instruction. From the results, it is clear that there was no significant difference between the achievement of learners in the control group and the experimental; group for the achievement of learners in the control group and experimental group for the test. The same effect has been observed in other studies.

Students in the experimental group were more highly motivated in biology class during the treatment than when biology is being taught using a traditional classroom approach. We therefore propose to shift the problem towards improving the overall process with respect to students 'motivation, perceived with learning and satisfaction rather than just focusing on performance.

CONCLUSIONS AND RECOMMENDATIONS

The use of CAI in teaching biology and its effectiveness has adequately highlighted the motivation towards the control group and experimental group of the students is presented not all school in the country have the slight idea about the use of computer and the cost of maintaining it. If the government can fund the cost of computer and create a forum or committee to look into the set of computers in schools and the application packages use in developing the computer aided instruction also the equipment, there will definitely be a change in the education system. We can then compete with the western world or the schools abroad. Our children will no longer go out of the country to study when we do what they can do.

FURTHER STUDY

This study still has limitations, so it is necessary to conduct further research related to the topic of The Study Investigate the Effect of (CAI) Computer Assisted Instruction in Teaching and Learning of Biology in Secondary School in order to perfect this study and increase insight for readers.

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