INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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   STATEMENT OF THE PROBLEM

   OBJECTIVES

   HYPOTHESES

   RESEARCH METHODOLOGY

   RESULTS & DISCUSSION

   FINDINGS

   RECOMMENDATIONS/SUGGESTIONS

   CONCLUSIONS

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EFFECT OF COMPUTER ASSISTED INSTRUCTION (CAI) ON ELEMENTARY SCHOOL STUDENTS' PERFORMANCE IN BIOLOGY

RAMANJEET KAUR
RESEARCH SCHOLAR
DEPARTMENT OF EDUCATION
KURUKSHETRA UNIVERSITY
KURUKSHETRA

SUSHAMA SHARMA
PROFESSOR
DEPARTMENT OF EDUCATION
KURUKSHETRA UNIVERSITY
KURUKSHETRA

ANIL K. TYOR
ASST. PROFESSOR
DEPARTMENT OF ZOOLOGY
KURUKSHETRA UNIVERSITY
KURUKSHETRA

ABSTRACT

The purpose of this study was to investigate the effect of Computer Assisted Instructional (CAI) on elementary school students' performance in Biology, and to explores whether CAI is differentially effective for boys and girls. *The study included three chapters of Biology from the Science course prescribed by Central Board of Secondary Education (CBSE) for class VII. Eighty students of class VII studying in CBSE affiliated School of District Karnal of Haryana (India) participated in the present study. The CAI package developed by the researcher was validated before administration to the students of experimental group. The control group received instructions through traditional method. Standardized achievement test in Biology developed by the investigator was administered as pre-test before the instruction and post-test after the experimentation on both the groups. Paired sample t-test was used to find any significant difference in the Mean Achievement scores of both the two groups. The findings revealed that students using the CAI package performed better than those taught through traditional Instruction (TI). Both boys and girls performed equally in achievement in Biology with CAI.*

KEYWORDS

Academic performance, Biology teaching, Computer Assisted Instruction (CAI).

INTRODUCTION

In the present state of knowledge explosion with increasing specialization, increased pupil-teacher ratio and increase in the workload of teachers, classroom instructions alone cannot bring out the desired goals from the teaching learning process. Conventional classroom teaching does not motivate the students as a result they lose interest in the subject. This is more often seen in Science subjects in general and Biology in particular. Researchers have identified defective teaching strategies as one of the reasons of the poor performance of students in Sciences. Hence, a number of studies relating to the strategies used in teaching Biology and the other Sciences have emerged. As a result, use of instructional technology, such as Computer Assisted Instruction (CAI) has become a part and parcel of teaching-learning process. Investigations have proved the effectiveness of CAI in various subject areas and grade levels. Yusuf and Afolabi (2010) found that CAI package enhances students' academic performance in Biology.

Cotton (1997) in his review of empirical studies concluded that use of CAI as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone. CAI as a supplementary tool with conventional teaching is found to be more effective for the average achievers (Kaur, 2007).

Effect of gender too has been linked with performance of students in several studies but without any definitive conclusion. Past studies suggest that, relative to traditional teaching, the use of CAI can give rise to gender inequities in classroom interaction and achievement (Hattie & Fitzgerald, 1987; Siann, Macleod, Glissov & Durndell, 1990). Some researchers are of the opinion that boys often monopolize the computer in CAI setting and they feel more comfortable than girls with using computers. Past studies revealed that male students perform better than females in Physics , Chemistry and Biology (Danmole, 1998; Novak & Mosunda, 1991) while others revealed that female students are better off than male (Kelly, 1978). Some studies as those of Yusuf & Afolabi, (2010) did not find any difference in male and female students' performance.

However little is known about the use of CAI in Haryana. In addition very few empirical studies exist regarding the use of CAI in Biology. Therefore, the present study explores whether CAI is differentially effective for boys and girls in terms of their performance in Biology.

The study investigated the effect of Computer Assisted Instruction on the performance of elementary school students in Biology. Specifically the study examined:

i. The difference in performance in Biology, if any, of elementary school students exposed to individualized Computer Assisted Instruction (CAI) package and those exposed to Traditional Instruction (TI).

ii. Influence of students' gender on their performance in Biology, when they are exposed to individualized Computer Assisted Instruction package.

RESEARCH QUESTIONS

The study addressed following research questions:

1. Is there a statistically significant difference in the Mean achievement scores, on the standardized achievement test in Biology, of the group of students taught Biology in the traditional teacher oriented classroom and the group of students taught Biology through Individualized CAI package?
2. Is there a statistically significant difference in the Mean achievement scores, on the standardized achievement test in Biology, of boys and girl students taught Biology through individualized CAI package?

RESEARCH METHODOLOGY

SAMPLE

This research is a quantitative and experimental study with the real experiment model in the form of controlled pre-test and post-test design. In this research, there are two groups as experimental group, which follow the lesson with CAI and control group, which follow the lesson with traditional instruction (TI).

The target population of the present study was class VII students of Central Board of Secondary Education affiliated, English medium School situated at Karnal district of Haryana (India), during the session 2011 – 12. The nature of the study, however, required that the research sample was purposively selected because a research on CAI must necessarily be conducted in school where computers are available for students' use and where the students were computer literate.

Eighty students (equal number of boys and girls) equated on their scores of Science in previous class were randomly divided in to the control and experimental groups so that both groups have equal number of students of both the gender (20 boys and 20 girls).

RESEARCH INSTRUMENTS

The instruments for this research were the treatment instrument "Computer Assisted Instruction (CAI)" and the test instrument "Standardized Achievement test in Biology". The treatment instrument CAI on Biology, was a self-instructional, interactive package developed in "Visual Basic" computer language for Microsoft Windows XP and below. The text material of the three chapters of Biology (Organisation of the living world; Sustenance of the individual; and Reproduction) from the Science textbook of class VII was transformed into CAI software. To transform this text material into CAI software the text was divided into segments suitable for a tutorial. Unfamiliar terms and concept in the text were explained through hyperlinks and images. Multiple-choice items along with their feed-back followed each text segment so that student may keep track of their own learning. These questions also provided the students with a facility of drill and practice. Same text material was used in the traditional classroom teaching instructions.

The test instrument was developed by the investigator with the help of experienced Biology teachers and teacher educators. Final Standardized Achievement test in Biology was a 50 item multiple-choice objective test with four options. The reliability of the test was calculated by Kuder-Richardson method which came out to be 0.81. There are some measures whose validity is taken for granted for example, achievement test scores (Guilford, 1971). Therefore, the validity of the Achievement test prepared for the present study was taken for granted because this achievement test was constructed after preparing the blue print and ascertaining the weightage of different topics and items.

PROCEDURE FOR DATA COLLECTION

Both the groups (experimental and control) were subjected to standardized achievement test in Biology as pre-test. Then, the students in the experimental group were individually exposed to CAI which had been installed on the desktop computers. The students in the experiment group were introduced to the CAI format to make them familiar with the navigation buttons and use the package independently.

The control group students were exposed to the traditional teaching method on the same content used for experimental group. They were taught in conventional classroom format. The treatment for both groups lasted for six weeks. After the treatment the two groups were exposed to standardized achievement test in Biology as post-test. The achievement of the student was taken as the difference in the scores at pre-test level and the post-test level. This will eliminate the intervening factor of previous knowledge of the student.

RESULTS & DISCUSSION

To determine the effectiveness of CAI the students' achievement scores were analyzed using paired sample t-test and the results are shown in Table - 1.

TABLE 1: RESULTS OF THE PAIRED SAMPLE T-TEST BETWEEN THE SCORES AT PRE-TEST, POST-TEST AND ACHIEVEMENT SCORES OF THE STUDENTS OF EXPERIMENTAL GROUP AND CONTROL GROUP

Occasion	Treatment	N	Mean Score	sd	t-value	Sig. (2-tailed)
Pre-test	Control	40	9.82	2.42	1.109	0.274
	CAI	40	9.2	2.1		
Post-test	Control	40	38.95	4.29	2.061	0.046
	CAI	40	41.57	6.11		
Achievement	Control	40	29.12	4.37	2.395	0.022
(Post-test-pre-test)	CAI	40	32.37	6.05		

Table value at df = 39 is 2.71 at 0.01 level of significance and 2.02 at 0.05 level of significance.

An examination of the above Table - 1 shows that the difference between the Mean scores of Control and Experimental group at pre-test was insignificant (t-value = 1.109, p = 0.275). This is because the significance of p = 0.275 is greater than 0.05. After the experimentation the difference in the Mean scores at post-test of the control group (38.95 ± 4.29) and that of the experimental group (41.57 ± 6.11) was statistically significant at 0.05 level of significance in favour of the experimental group (t-value = 2.061, p<0.05). Also, the difference of the Mean achievement scores (difference between the pre-test score and post-test score) of control group (29.12 ± 4.37) and the experimental group (32.37 ± 6.05) was statistically significant favouring the experimental group (t-value = 2.397, p<0.05). Hence, the research question -1 can be answered that, individualized CAI has significantly positive effect on the achievement in Biology of the students at VII grade of schooling.

Table – 2 shows a summary of the results of Paired sample t-test performed over the scores of boys and girl students of the experimental group.

TABLE 2: DIFFERENCE IN THE MEAN ACHIEVEMENT SCORES OF BOYS AND GIRLS OF EXPERIMENTAL GROUP

Gender	N	Mean Score	Sd	t-value	Significance of Difference (two tailed)
Boys	20	32.40	6.15	0.039	0.97
Girls	20	32.35	6.11		

It was observed that the difference in the Mean achievement scores of the boys (32.40 ± 3.75) and Mean achievement scores of girls (32.35 ± 6.11) of experimental group was insignificant (t-value 0.039; p > 0.05). Hence, the research questions 2 can be answered that there is no difference in the Mean achievement score of boys and girls when exposed to individualized CAI. On an average, gender of the student does not interfere with the learning in Biology of the student.

The results of the analysis of paired sample t-test on the performance of students taught Biology using CAI and those taught with conventional classroom instructions indicated a significant difference in favour of students in the experimental group.

These findings are in agreement with the earlier findings of Yusuf and Afolabi (2010), Ali (2005), Gilani (2005), French & Russell (2001), Phillips & Moss (1993), Jegede, Okebukola & Ajewola (1992) who's studies were directly on Biology. Similar results were obtained by Kara & Kahraman (2008) on Physics of 7th grade Science; Siskos, Antoniou, Papaioannou and Laparidis (2005) on physical education; Onasanya, Daramola & Asuquo (2006) on Introductory Technology; Kulik, Bangert & Williams (1983), on Mathematics. Siskos, Antoniou, Papaioannou, & Laparidis (2005); Kolb, (1984) CAI suggested that multimedia computer assisted instruction promotes active learning by encouraging students to take an active role in learning process. Indeed Filipczak (1995) opined that CAI increases students' motivation to learn. The finding is also supported by Kim and Lee (2000) who claimed that CAI improves students' understanding. The present study on the other hand is in contradiction to findings of Adams, Kandt, Throgmartin & Waldrop (1991), Skinsley & Brodie (1990), which support the view that Computer Assisted Instructions is not consistently superior to the traditional instructions.

Influence of gender on achievement of students in Biology when taught with individualized CAI package was analyzed by comparing the achievement scores of the two genders after exposure to CAI. The results of the paired sample t-test showed no significant difference in the Mean scores of boys and girls of experimental group. These findings showed that both the genders perform equally well in Biology when taught through CAI. These finding are in agreement with

the earlier findings (Yusuf & Afolabi, 2010 and Jeyamani, 1991). Thus it can be concluded that CAI enhance the performance of the students in Biology irrespective of genders.

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