Full Length Research Paper

Using computer in science class: The interactive effect of gender

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The advantage of "computer-assisted instruction" is weakened by factors such as gender stereotyping. Therefore, this study was an attempt to investigate the effect of gender on the use of computer in science class and its effect on the students' academic performance. It was a quasi-experimental design that used pre-test, treatment-control, and post-test. Using computers, the experimental group was taught two Biology lessons on photosynthesis and digestion in mammals while the control group was taught without computer using conventional teaching method. The study was guided by two research questions and two null hypotheses. A 20-item multiple-choice questions was produced by the researcher and used for both pre-test and post-tests. Validation of the instrument was achieved through the contributions from two senior colleagues, and a reliability coefficient of 0.76 was realized using Kuder Richardson correlation analysis. Data collected were analyzed using both mean scores and t-tests. Results showed that gender had no significant effect on the use of computer, but the use of computer in teaching improved the academic performance of the students. It therefore, recommended continued use of computers in schools, and government with other stakeholders should provide more computers and train teachers to further enhance computer integration in classrooms.

Key words: Gender, computer-assisted Instruction, instructional technology, science instruction.

INTRODUCTION

The world is constantly changing and ways in which we function at home, work and school are also changing. The speed at which technology has developed plays a major role in these changes. From e-mail to on-line classes, computers are definitely influential in our lives, and can enhance the learning process in schools in various ways. With the increasing popularity of computer technology, it is essential for administrators to support and encourage computer technology in our education systems as it has become an important medium in instructional delivery and instructional management. The recognition of the value of computer in the teaching-learning process in the contemporary world engendered the introduction of computer education into the Nigerian school curriculum in 1989.

For meaningful teaching of computer education and dissemination of computer knowledge, the National Commission for Colleges of Education (NCCE) (1996) is of the opinion that there is need to produce seasoned professional teachers in computer education in order to accomplish the following objectives:

(i) To teach computer studies at the Primary and Secondary school levels.
(ii) To program and process given data with maximum speed and accuracy and
(iii) To demonstrate reasonably high level of competence for further studies in computer education and allied disciplines.

With the introduction of computer into the educational system, it has been discovered that teaching could be developed in a more flexible way through Computer-Assisted Instruction (CAI) in order to make it more responsive to student's learning. According to Babalola (1998), the most important feature in computerized instruction is that it permits a high degree of individualization. This in effect means that students can proceed at their own pace, following a path through the curriculum as suited to their particular interest and talent. However, the introduction of computer in the last couple of years has had little or no impact on the traditional daily activities within the school system (Yusuf, 1998).

According to Cotton (1997) in Yusuf and Afolabi (2010), the use of CAI as a supplement to conventional instruction produces higher achievement than the use of conventional instruction alone, research is inconclusive regarding the comparative effectiveness of conventional instruction alone and CAI alone, and that computer-based education (CAI and other computer applications) produce higher achievement than conventional instruction alone. In addition, students learn instructional content faster with CAI than with conventional instruction alone, they retain what they have learned better with CAI than with conventional instruction alone. Also Karper et al. (2005) in Yusuf and Afolabi (2010) show that CAI has been found to enhance students' performance than conventional method.

Accordingly, the full potentials of computer in assisting or managing instruction are yet to be exploited in Nigeria. Many factors have been identified as hindrances to the use of computer in schools. Among these are cost of purchase, epileptic electricity supply, computer illiterate teachers and gender attitudes. Studies have shown differences in the attitudes of male and female students to the use of computer in schools. According to the study carried out by Spotts et al. (1997) in USA on gender and use of instructional technologies males rated their knowledge and experience with some innovative technologies higher than did females. For frequency of use, no significant differences were found with the exception of video, where females indicated use that is slightly more frequent. Both rated technologies as important to instruction. The other factors influencing technology use include time to learn a technology, increased student learning, ease of use, training and available information in discipline.

Few decades ago, the computer was observed to be male dominated and its usage belonged to techies comprised mostly of men (Huynh et al., 2005). In their studies, they found that there is no statistically significance validating gender differences in pattern of online interaction between male and female students. The research conducted by Mitra et al. (2000) on gender and computer use in an academic institution explored the nature of the relationships between gender, categories of computer use and attitudes toward computers in a computer enriched environment where all students were provided with network access and laptop computers over a four year period. The results indicated that women were less positive about computers than men and the use level of computers by women were less frequent than for men. This change in the relationship is a throwback to the earlier days of computing when research had indicated that men were more positively disposed toward computers than women were.

Achuonye and Olele (2009), also, in their study on Internet using patterns of Nigerian teacher-trainees, found that more female students were personally connected to the internet than their male counterparts

were; but that male students surf the internet more than females. This indicated a male dominance in skills, which is more important than mere possession of computer. This study revealed a worry that gender barriers which have earlier been identified to hinder females in science and technology (Achuonye, 2006; Onwuegbuna and Onwuegbuna, 2006) may be persisting to this present era of information super-highway.

Shashaani (1997) using a sample of 202 College students also in USA, found that females were less interested in computers and less confident than males; males were more experienced. Further analysis of the students' responses showed that one semester of computer training improved their attitudes towards computers. Studies like those of Bello (1990) did not find any form of influence being exerted by gender on student's performance. Yusuf and Afolabi (2010) concluded that gender has no influence in the academic performance of male and female students exposed to CAI either individually or co-operatively. This study therefore investigated not only the effect of gender on the use of computer but also the effect of computer use on students' academic performance.

Research questions

Two research questions guided this study and they are:

(i) Does the use of computer instruction affect the academic performance of students in teaching-learning process?
(ii) Does gender affect the use of computer in the learning process?

Hypothesis

Two null hypotheses were also propounded thus:

$H0_1$: There is no significant difference between the academic performance of students in the experimental group and those in the control group.
$H0_2$: There is no significant difference between the academic performance of males and females in the experimental group.

METHODOLOGY

This was a quasi-experimental research because there was no randomization of sample, intact classes were rather used. It adopted a pre-test, treatment-control, post-test design. The experimental group was taught the Biology lessons on photosynthesis and digestion in mammals with computer while the control group was taught without computer. The study was conducted in Comprehensive Secondary School, Port Harcourt, Rivers State. Out of the four classes of SS2, two of them classes A and B were science classes and so selected for this study. SS2A

was used as the experimental group while SS2B was the control group. There were 30 students in each class. One researcher-made test instrument that was used for data collection in this research is a 20-item multiple choice questions. This was used for both the pre-test and post-test. The questions were drawn from the two topics taught in Biology. These topics were taught for two weeks. A test-retest method was used to ascertain the reliability of the instrument. SS2 students from Demonstration Secondary School, Ndele, were used. The scores were correlated using Kuder Richardson correlation analysis that yielded a coefficient of 0.76. Mean scores and t-tests were used for analysis of data collected. Mean scores were used to answer the research questions while t-tests were used to test the hypotheses.

RESULTS

Research question 1: Does the use of computer in instruction affect the academic performance of students in the teaching learning process?

From Table 1, students taught with computer had a mean score of 17.1 while those taught without computer had a mean score of 15.1. This shows that those taught with computer performed better than those taught without computer.

Research question 2: Does gender affect the use of computer in the learning process?

From Table 2, the mean score of the males (17.7) was higher than that of the females (16.5) showing that the males performed better than the females. But this difference in performance was not significant.

Hypothesis 1 ($H0_1$): There is no significant difference between the academic performance of students in the experimental group and those in the control group

From Table 3 the t-calculated was 7.38 which is more than the t- critical of 2.66. This shows that the experimental group performed better than the control group. Based on this, the null hypothesis was rejected meaning that there is a significant difference between the academic performance of the experimental group and the control group. This difference can be attributed to the use of computer in the teaching since all other conditions were same for both groups.

Null hypothesis 2 ($H0_2$): There is no significant difference between the academic performance of males and females in the experimental group

From Table 4, the t-calculated of 2.39 was less than the t-critical of 2.763 therefore the null hypothesis was

Table 1. Effect of computer on academic performance.

Group	No of students	Mean score (s)
Control	30	15.1
Experimental	30	17.1

Table 2. Effect of gender on use of computer.

Gender	No of students	Mean score (s)
Male	15	17.7
Female	15	16.5

accepted meaning that there is no significant difference between the academic performance of males and females in the experimental group. This study shows that gender has no effect on the use of computer in the learning process.

DISCUSSION

The results of this study showed that the use of computer in the teaching of Science - Biology enhanced the performance of the students. This was proved by the difference in the scores of the control and experimental groups with the latter group performing significantly better. This finding is in line with Miller (2002) in Eshiet (2009) who observed that computer aided learning ensures students motivation and differentiates between students' capability levels. In addition, the study carried out by Warschauer (2006) as cited by Akpan and Abia (2009) showed that students taught with new technologies did not regress on outcome assessments. He further asserted that when new technologies are integrated into teaching and learning, there is greater student engagement in learning, and greater engagement equals to higher achievement.

The study also showed that there is no significant difference in the performance of the boys and girls in the use of computer in the learning of Science - Biology. In other words, gender does not affect the use of computer in the learning process. This finding agrees with that of Anulobi (2009). In his study of Fine Arts with Video Compact Disc Instructional Package (VCDIP), he found out that gender did not have any impact because both the boys and girls performed the same. This also agrees with the findings of Yusuf and Afolabi (2010) on effect of gender on use of CAI. It, however, alienated from the findings by Achuonye and Olele (2009) which indicated male dominance in computer usage. This present study, therefore, tends to give a glimpse of hope erasing gender barriers against females in science and technology earlier highlighted by Achuonye (2006) and Onwuegbuna and Onwuegbuna (2006).

Table 3. Comparative academic performances two groups of students.

Group	No. of students	Mean score x	Df	Probability level	Std. deviation	t-cal	t-critical	Decision
Control	30	15.1	29	0.05	1.87	7.38	2.66	Reject
Experimental	30	17.1	29	0.05	1.17			

N-2=28.

Table 4. Comparative scores based on gender.

Gender	No. of students	Mean score x	Std. deviation	Df	Probability level	t-.cal	t-critical	Decision
Males	15	17.7	0.88	14	0.05	2.39	2.763	Accept
Females	15	15.9	2.95	14	0.05	2.39	2.763	

CONCLUSION AND RECOMMENDATIONS

The study showed that the use of computer just like any other new technologies improved the academic performance of students in the teaching and learning of science; and that gender has no effect in the use of computer among the students. Based on these findings the following recommendations were made:

(a) Since this study showed that computer can enhance academic performance, student should be encouraged to own their computers, possibly laptops, to enable them use it more even in their individual studies.
(b) Teachers, both in-service and pre-service teachers, should be trained to properly integrate computers in their daily classroom processes.
(c) The government and non-governmental agencies should equip both urban and rural schools with computers and new technologies for easy access by both teachers and students.
(d) There should also be provision for regular supply of electricity to schools at all times.
(e) Teachers in schools should be given free computer training by the government (State and Federal) to enable them use these new technologies when supplied to schools.
(f) There is the need to develop relevant "computer assisted instructional" packages for use within the Nigerian school systems.

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