



Efficacy Test of Use of Computer Animations on Student's Achievements and Attitudes in Biology

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ABSTRACT

In this study, the efficacy of the use of computer animations on achievements and attitudes of students in Biology related to sexual reproduction were investigated. The study employed a quasi-experimental design involving College of Education students, Warri; 30 each in both experimental and control groups. Two research instruments namely; Sexual Reproduction Achievement Test (SRA T) consisting of 20 questions and the Biology Attitude Scale (BAS) consisting of 20 items were the data collection tools used. The research instruments were administered in the form of a pre-test and post-test. After the treatment, academic achievements in SRAT increased in favour of experimental group at $p < 0.05$ significant level. Students had a positive attitude towards the use of computer animations while learning. By inference, the use of computer animations for teaching and learning of topics in biology is efficacious. Implications of the results were discussed and suggestions were put forward about the direction for future studies.

Keywords: Attitude; Sexual Reproduction; Computer animations, Academic performance.

INTRODUCTION

The introduction of the use of ICT in schools has become panacea in education. To improve the quality of education, there is need for teachers to develop pedagogical skills as they are the key to using ICT to enhance teaching and learning thereby raising educational standards (Cepni, Tas & Kose, 2004).

Over the years, the use of traditional teaching methods in teaching science subjects has made students to learn how to memorize the science concepts without understanding the real meaning. As a result, they do not conceptualize the science concepts well as intended. Thus, their attitudes and academic achievements as well as other factors are influenced in science and science education. Difficulties encountered in teaching abstract topics in subjects like biology can be overcome by science teachers seeking for alternative teaching approaches (Cepni, Tas & Kose, 2004).

Computer-assisted instruction materials are ICT technologies which can be applied to science education. One of such materials is computer animation. Computer animations play an important role in contemporary teaching and learning of science concepts (Chang, 2001). Many findings show that Computer animations have had some impact in developing student's ability, achievement, affinity and some other personality traits when employed in an effective way in science lessons (Baki, 2000; Lee, Sexual reproduction is a topic in biology that can find its way into the hearts of students if taught using computer animations. Sexual reproduction is a type of reproduction involving two parents namely; male and female. The union of these parents give rise to new offspring. To produce new offspring, gametes are involved, produced in the genital organs. The testes (male reproductive organ)

produce sperms (male gametes) while the ovaries (female reproductive organ) produce eggs (female gametes). The fusion of these gametes results in zygotes (Umeh, 2007; Robert et al., 1991; Ademola, 1998; Beck et al., 1991).

Teachers play an important role in the use of computers in classrooms (Baki, 2000). The literature on computer-assisted learning, largely within the setting of the developed countries, indicates the positive effect of the use of computers — in promoting students achievement (Choi and Gennaro, 1987; Wainwright, 1989). In Nigeria, Dauda, Mwanse and Dung (2003) in a research study reported that attitudinal improvement towards computer-assisted learning rested upon the use of the computer. Although there have been many CAI materials prepared for biology teaching, but the specificity of the use of computer animations for biology teaching has not yet been elaborated on; hence, the need for this study.

Research Questions

1. Is there any significant difference in using computer animations and traditional methods of teaching on academic achievements of students in biology related to sexual reproduction?
2. Is there any significant difference in using computer animations and traditional methods of teaching on attitudes of students in biology related to sexual reproduction?

Research Hypotheses

1. There is no significant difference in using computer animations and traditional methods of teaching on academic achievements of students in biology related to sexual reproduction.
2. There is no significant difference in using computer animations and traditional methods of teaching on attitudes of students in biology related to sexual reproduction.

MATERIALS AND METHOD

Computer software

The following were the steps as shown below during the development process of CAI materials:

- The content analysis of sexual reproduction at College of Education level was made with science teachers, biologists at the College of Education and science educators at the school of education.
- A detailed plan of the topic was done through reviewing the current literature and the researcher's experiences.
- The presentation of the material was made by using PowerPoint (Cepni et al., 2004)

Research Design

A quasi-experimental design was employed to assess the effect of computer animations on academic achievements and attitudes of students in biology related to sexual reproduction.

Sample and Sampling technique

A sample of sixty students was selected from a population of biology students in College of Education, Warri, by stratified random sampling. The sample was randomly assigned into two groups namely; experimental (n=30) and control (11=30) groups. While the experimental group was taught with CAI materials, the control group used the traditional teaching method.

Instruments for Data Collection

The sexual reproduction achievement test (SRAT) and the biology attitude scale (BAS) were developed and used in the study. The SRAT achievement test consisting of 20-item multiple choices test and biology attitude scale comprising of fifteen (20) items occurred in a four-point Likert scale were developed by the researchers. The content validity and reliability were checked as guided by other researchers. The reliability of the test was 0.792 determined by using Cronbach alpha technique.

Procedure

This study was done during the first semester of 2013—2014 academic year at College of Education in Warri, Nigeria for two-weeks. A quasi experimental research design involving SRAT and BAS were administered at the beginning and end of the research as pre-test and post-test measures. Computer animations on sexual reproduction were introduced and presented to the students through the computer and students were given the opportunity to work on the same program in the experimental group while the other group was taught using the didactic method (teacher-centered method).

Data analysis

For the analysis of SRAT and BAS data, a benchmark of 2,50 was used to make decisions relative to the group mean values obtained for answering the research question posed in the study. A mean score of below 2.50 was indicated 'negative attitude', while above 2.50 as 'positive attitude', In order to compare the differences in means between control and experimental groups for the SRAT and BAS, ttest was used.

RESULTS

Student's achievement

As seen in Table 1, the pre-test means of experimental group and Control group were 58.60 and 57.22, respectively. These results indicated that the samples did not differ significantly in their levels of academic achievement ($t = 0.41, 1 > 0.05$). The post-test means of experimental group and Control group were 80.53 and 69.05 respectively. These results indicated that the samples differed significantly in their levels of academic achievement ($t = 3.11, p < 0.05$). By implication, CAI materials were more efficacious in the academic achievements in the experimental group than in the control group.

Table 1: Means, standard deviation, t value in SRAT

Tests	Groups	No of students	Means	Standard deviation	t-test
Pre-test		30	58.60	17.01	0.41
	CG	30	57.22	12.83	3.11
Post-test		30	80.53	19.38	
	CG	30	69.05	16.38	

Value significantly different at the 0.05 level of significance

4.2 Student's attitude

In Table 2, the pre-test means related to biology attitudes of experimental group and Control group were 2.30 and 2.22 respectively. There was no statistical significant difference between the two groups ($t=0.08, 1 > 0.05$). The post-test means were 2.67 and 2.72 respectively. A statistical difference was observed between experimental group and Control group ($t=2.31, p < 0.05$). The results obtained indicated that the CAI materials positively influence student's attitudes towards science lessons.

Table 2: Means, standard deviation, t value in BAS

Tests	Groups	No of students	Means	Standard deviation	t-test
Pre-test		30	2.30	0.19	0.08
	CG	30	2.22	0.21	
Post-test		30	2.67	0.30	2.31
	CG	30	2.72	0.19	

Values significantly different at the 0.05 level of significance.

5. DISCUSSION AND CONCLUSION

Research Hypothesis one states that there is no significant difference in using Computer-assisted instruction materials and. traditional methods of teaching on academic achievements of students in biology related to sexual reproduction. Evidence provided by the analysis carried out shows that the experimental and control groups differed significantly after the treatment in student's academic achievements during science lessons as shown in Table 1.

The findings of this study are in consonance with numerous research works which have shown that using CAI materials have proven to be more efficacious than traditional teaching approaches on

student's academic achievements and argued that student's achievements increases with the use of computers in science education (Bayraktar, 2000; Chang, 2001; Lee, 2001; Tsai & Chou, 2002).

In dissonance with the findings of this study, Morrell, (1992) and Wainwright, (1989) advocated that the traditional learning method is more useful than CAI materials in science teaching and that CAI materials negatively influences the student's academic achievements. Other researchers did not find an important difference between the methods (Coye & Stonebraker, 1994; Tjaden & Martin, 1995).

Research Hypothesis two states that there is no significant difference in using computer animations and traditional methods of teaching on attitudes of students in biology related to sexual reproduction. The analysis carried out shows that the experimental and control groups differed significantly after the treatment in student's attitudes during science lessons as shown in Table 2.

Selwyn (1999) averred that students taught using CAI materials developed a positive attitude towards science education. Ertepar, Demircioglu, Geban and Yavuz (1998) also alluded to this fact. Notwithstanding, student's attitudes toward science education are negative using traditional teaching methods during science lessons (Colletta & Chiappetta, 1989).

Conversely, Shaw and Marlow (1999) said that students taught using CAI materials exhibit a negative attitude towards science education.

The researchers expected that there would be no significant difference in student's academic achievements and attitudes toward using computer animations and traditional method of teaching during science lessons. The results of the analysis are not in conformity with the expectations of the researchers. It could be speculated that students have poor background knowledge on the use of ICT, teachers are unwilling to use CAI materials, and show inconsistency in using the appropriate methods of teaching during science lessons. By implications, using computer animations could improve student's achievement and their attitudes toward science lessons.

Conclusively, the analysis of data from this study supports the use of computer animation over the use of traditional method for science since it results in the improvement of the student's academic achievements and contributes to positive attitudes of students toward learning.

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