

EFFECTIVENESS OF COMPUTER ANIMATION INSTRUCTIONAL PACKAGE ON ACADEMIC ACHIEVEMENT OF SENIOR SECONDARY SCHOOL AGRICULTURAL SCIENCE STUDENTS IN ANIMAL PHYSIOLOGY IN MINNA, NIGERIA

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Abstract. The study was carried out to determine the effectiveness of Computer Animation Instructional Package (CAIP) on academic achievement of senior secondary school agricultural science students in animal physiology in Minna, Nigeria. Influence of gender was also examined. Quazi-experimental procedure of pretest, posttest, and non-randomized, non-equivalent design was adopted. Two research questions were raised while two null hypotheses were tested at 0.05 level of significance. The sample of the study was made up of 88 senior secondary school students selected from intact classes of two co-educational public schools within the study area. The two schools were randomly assigned to experimental and control groups. The experimental group which comprised 48 students (30 male and 18 female) was taught through CAIP while their counterparts in the control group which com-

prised 40 students (26 male and 14 female) was taught using lecture method. A 30-item animal physiology achievement test which was validated by experts and whose reliability coefficient of 0.85 was obtained was administered as pretest and posttest on both groups. Data gathered were analyzed using t-test statistics. Findings revealed that there was significant difference between the mean achievement scores of the two groups in favour of those taught with CAIP. Also, the package improved the achievement of both male and female students taught. It was therefore recommended among others that, computer animation instructional package should be adopted in secondary schools to complement lecture method of teaching in order to improve students' achievement in agricultural science.

Keywords: achievement, agricultural science, animal physiology, computer animation instruction

Introduction

The use of technology has made the process of teaching and learning more enjoyable through Information and Communication Technology (ICT) tools. Today, such tools provide both students and teachers with more opportunities in adapting learning and teaching to individual needs and the society at large (Mikre, 2011). Ainsworth (2008) and Watson (2001) opined that ICTs have revolutionized the way people work and have transformed educational systems by giving easy access to information, creating greater interest in learning content, increasing retention of information, and have made information sharing easier.

Computer animation is considered as one important ICT tool available for teachers to promote effective learning. It helps learners visualize something which cannot be seen easily in the real world; it helps to clarify relationships through visual means; and it helps students to understand the inner life and movement of an object (Ainsworth, 2008; Weiss et al., 2002). The view

expressed by Bada et al. (2012) is such that, animated pictures provide additional information and give external support for mental simulations thereby allowing the learner to perform a higher amount of cognitive processing. Generally, computer animation is useful in facilitating teaching and learning of science subjects.

Agricultural science is a science subject taught in Nigerian secondary school which aims at increasing the manpower need, provide employment opportunities, sustain and stabilize the economy, thereby building a dynamic, strong and self-reliant nation. Owing to the role agriculture can play in nation building, it is very important for the subject to be well understood by students so as to maximize the benefit it has to offer.

Students' performance in the subject over the years has not been very encouraging. Inability of teachers to explain some concepts with appropriate illustrations and examples, lack of standard agricultural science laboratory, the use of only lecture method of teaching which is teacher-centred in nature have been attributed to poor performance in agricultural science. From the Chief Examiner's Report, 2006 of National Examination Council in Agricultural Science, it was observed that students had difficulty in animal physiology which was attributed to the fact that the content was largely abstract in nature.

Achievement is defined as something accomplished successfully, especially by means of exertion, skill, practice, or perseverance (Umoren & Ogong, 2007). It can be referred also to measurable changes in students' behaviour in academic as a result of exposure to a given concept. Different findings have emanated from researches carried out on effects of animation-based instructional packages on students' achievement. Yisa (2014) in a study discovered that the performance of students taught biology through computer animation instructional package was statistically different in favour of the former and also discovered that the package is gender friendly. Gupta & Lata (2014)

discovered that ICT-enabled instructional package led to improvement in students' achievement in science better than conventional lecture method. Bada et al. (2012) discovered that students taught agricultural science performed better than their counterparts taught conventional lecture method. Aremu & Sangodoyin (2010) also discovered that computer animation was effective in improving students' achievement in Biology, so also, Dasedmir et al. (2008) reported that animation technique improved students' achievement in chemistry better than lecture method.

It has been argued that gender is one of the factors that influence students' academic achievement at senior secondary school level (Eze, 2007). Researches carried out on gender-related differences in the academic achievement of students in science subjects revealed that while some studies reported no significant gender difference like Falode (2014) and Yisa (2014), others discovered that gender influences student's achievement in science subjects like Ezeliora (2004) in favour of female students, and also Iwende (2007) and Ifamuyiwa (2004) in favour of male students.

The need to provide solution to secondary school students' poor performance in agricultural science especially on concepts relating to animal physiology science prompted these present researchers to develop, validate and determine the effectiveness of Computer Animation Instructional Package on secondary school agricultural science students' achievement in animal physiology. The study also examined whether gender has any influence on students' achievement when taught through the package.

Research questions

The following research questions were raised to guide this study: (1) what is the difference in the mean achievement score of agricultural science students taught animal physiology using Computer Animation Instructional Package and those taught with lecture method; (2) does gender has any influ-

ence on agricultural science students' achievement in animal physiology when taught using Computer Animation Instructional Package.

Research hypotheses

The following null hypotheses were formulated and tested at 0.05 significant levels:

Ho₁: There is no significant difference in the mean achievement scores of agricultural science students taught animal physiology using Computer Animation Instructional Package and those taught with lecture method.

Ho₂: There is no significant difference in the mean achievement scores of male and female agricultural science students taught animal physiology using Computer Animation Instructional Package.

Methodology

The design adopted for this study was Quazi-experimental design. It was a pretest, posttest, non-randomized and non-equivalent experimental design. The independent variable was computer animation instructional package, students' achievement score was the dependent variable while gender served as the moderating variable.

The population of the study comprised all the 6,653 senior secondary school students of the 2014/2015 academic session in Minna metropolis. The target population are agricultural science students in class one (SSI students) of the secondary school senior section. SSI students were chosen as the target based on the fact that agricultural science concepts selected were contained in the syllabus and scheme of work of the class.

The sample for the study was 88 students from intact classes of two co-educational public schools in Minna, Niger State capital. The two schools were purposively selected based on availability of manpower, equivalence in terms of curriculum, ICT facilities, examination mode and students' exposure

to electronic learning. The schools were randomly assigned to experimental and control groups. The experimental group taught with computer animation instructional package was made up of 48 students (30 male and 18 female) while the control group taught with lecture method was made up of 40 (26 male and 14 female) students.

Two research instruments were used for the study. They are the treatment instrument (Computer Animation Instructional Package, CSIP) (Fig. 1) and test instrument (Animal Physiology Achievement Test, APAT). CSIP was developed by the researchers using DigiCel's Flip Book animation software and it contains introductory page, lesson objectives section, formative evaluation questions, animated-images, with narration as well as structured agricultural science topics on concept of animal physiology; types, components and functions of circulatory system; open and close circulation in farm animals; blood composition of farm animals; systolic and diastolic phases of heartbeat; respiratory system and types of respiration in farm animals; and breathing process in farm animals.

APAT was made up of 30 multiple choice items constructed by the researchers. Each item was provided with four possible options out of which a student is expected to indicate the correct answer. One mark (1mark) was awarded for every correctly answered question while no mark was awarded to each question answered wrongly. The score obtained out of 30 was later converted to percentage.

Computer Animation Instructional Package (CAIP) was validated by two Computer experts, two Educational Technology specialists at Federal University of Technology, Minna and two secondary school teachers currently teaching agricultural science. Also, Animal Physiology Achievement Test (APAT) was validated by two Agricultural science experts and two test and measurement experts. Based on experts' suggestions and recommendations, the instruments were modified and re-structured.

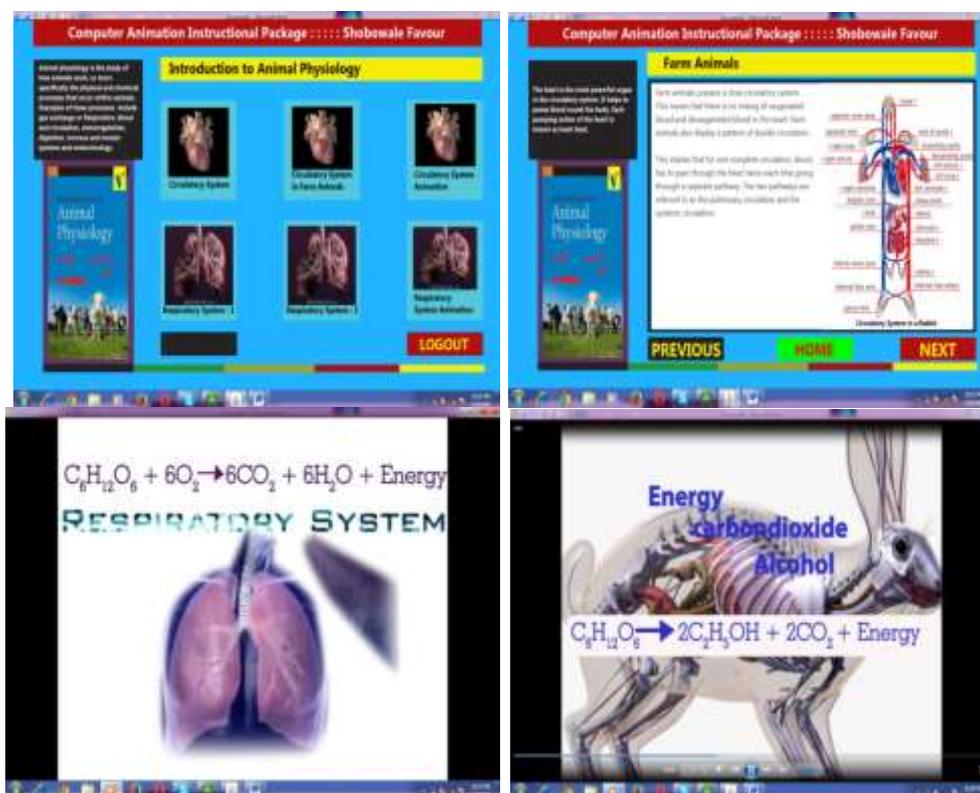


Fig. 1. Selected screen shot pictures of computer animation instructional package

Trial testing and pilot study of CAIP and APAT were carried out in a secondary school within the study area but outside the school selected for the main study using 56 SSI students and ICT facilities in the school computer laboratory. After a single administration of the test instrument, split-half method was used and the reliability co-efficient of 0.85 was obtained using Spearman Brown Correlation Coefficient formula.

After the research instruments were validated and found reliable, they were administered on students selected for the main study in their respective schools using facilities in computer laboratory for students in experimental group and lecture room for students in the control group. APAT was administered as pre-test and post-test on both groups while computer and lecture

method were used to present the selected agricultural science topics to respective groups in-between the administration of the achievement test. The data collection procedure lasted for twelve weeks. The data gathered were analyzed with descriptive and inferential statistics. The hypotheses were analyzed using t-test statistics (in Statistical Package for Social Sciences, version 20) at 0.05 alpha level of significance.

Results

H₀₁: There is no significant difference in the mean achievement scores of Agricultural Science students taught animal physiology using Computer Animation Instructional Package (CAIP) and those taught with lecture method.

Table 1. t-test analysis of achievement score of students taught agricultural science through CAIP and lecture method

Test	Group	N	Df	\bar{X}	SD	t	p
Pre-Test	Experimental	48	86	31.35	6.69	-0.63	0.53 ^{ns}
	Control	40		30.50	5.86		
Post-Test	Experimental	48	86	82.83	7.19	-15.21 ^{NS}	0.00*
	Control	40		68.55	4.08		

*: Significant at 0.05 alpha level

ns: Not Significance at 0.05 alpha level

Table 1 shows the t-test analysis of achievement score of students in animal physiology when Computer Animation Instructional Package (experimental group) and lecture method (control group) of instruction is used. The table shows that the two groups were equivalent before the administration of treatment since there was no significant difference between their mean achievement score at pretest ($t = -0.63$, $df = 86$, $p > 0.05$).

At posttest, the table revealed significant difference between the mean achievement scores of the two groups ($t = -15.21$, $df = 86$, $p < 0.05$). Hence,

hypothesis one was rejected. This implies that students taught agricultural science through Computer Animation Instructional Package (average mean score = 82.83) achieved better than their counterparts taught the same concept through lecture method (average mean = 68.55).

H₀₂: There is no significant difference in the mean achievement scores of male and female Agricultural Science students taught animal physiology using Computer Animation Instructional Package (CAIP).

Table 2. t-test analysis of achievement score of male and female students taught agricultural science through CAIP

Test	Group	N	df	\bar{X}	SD	T	p
Pre-test	Male	30	46	47.67	9.67	0.63 ^{ns}	0.74
	Female	18		45.56	11.78		
Post-test	Male	30		83.83	5.95	0.27 ^{ns}	0.46
	Female	18		81.83	7.87		

ns: Not Significance at 0.05 alpha level

Table 2 shows the t-test analysis of achievement score of male and female students taught animal physiology through Computer Animation Instructional Package. The table shows that both male and female students were equivalent before the administration of treatment since there was no significant difference between their mean achievement score at pretest ($t = 0.63$, $df = 86$, $p > 0.05$).

At posttest likewise, the table revealed that there was no significant difference between the mean achievement scores of the two groups ($t = 0.27$, $df = 86$, $p > 0.05$). Hence, hypothesis two was not rejected. This implies that Computer Animation Instructional Package improved the achievement of both male (average mean score = 83.83) and female (average mean = 81.83) students in agricultural science.

Discussion of findings

Finding of this study revealed that there was significant difference between the achievement of students in agricultural science when Computer Animation Instructional Package (CAIP) and lecture method of instruction are used in favour of the former. This finding is supported by the earlier finding of Bada et al. (2012) who found that students exposed to animated agricultural science instructional package performed significantly better than those exposed to the conventional lecture method. This present finding is also in agreement with the findings of Aremu & Sangodoyin (2010) who in a previous study found that computer animation was effective in improving students' achievement in biology; Yisa (2014) who discovered that computer animation led to progressive learning achievement of students in biology; and that of Nsofor (2004) who found that the use of instructional media enhanced students' academic achievement in biology.

Also, finding of this study revealed that there was no significant difference in the mean achievement scores of male and female students taught Agricultural science through CAIP as the package improved the achievement of both male and female students. This finding is supported by earlier findings of Aremu & Sangodoyin (2010) who found that computer animation was effective in improving male and female students' achievement in biology; Yisa (2014) who discovered that computer animation was gender-friendly to students progressive achievement in biology and that of Gupta & Lata (2014) who discovered that ICT-enabled instructional package was beneficial to the achievement of both boys and girls.

Conclusion

The findings that that emanated from this study indicated that computer animation instructional package is effective in teaching and learning of Agricultural science. It is also found to be gender-friendly. Students will benefit

from its' usage in teaching and learning process, so also teachers will be more efficient if computer animation instructional package is used to complement conventional lecture method of teaching Agricultural science in Nigerian secondary schools.

Recommendations

Based on the findings that emanated from this study, the following recommendations are made: (I) Computer animation instructional package should be adopted to complement lecture method of teaching Agricultural science in Nigerian secondary schools. This will help to improve students' understanding of concepts and improve their academic achievement; (II) Students should explore the opportunities offered by computer animation instructional package to engage in individualized study. The package is found effective and capable of improving both male and female students' achievement in Agricultural Science; (III) Government and other relevant school management should equip secondary schools with needed computer facilities. This will help in facilitating teaching and learning of Agricultural science through the use of ICT facilities; (IV) Workshops and seminars on ICT usage and development of computer-assisted instructional programmes should be frequently organized for teachers and students. This will improve their efficacy in the use of ICT facilities in teaching and learning process.

NOTES

1. <http://education.usm.my/images/docs/MEDC/VOL4/the%20impact%20of%20computer%20animation%20learning%20-%20usm%20journal.pdf>
2. http://treeves.coe.uga.edu/Bertlesmann_Impact_Report.pdf

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