

EFFECTS OF ANIMATION-BASED CAMSTUDIO PHYSICS INSTRUCTION ON SECONDARY SCHOOL STUDENTS' PERFORMANCE IN MINNA, NIGERIA

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Abstract

This study was carried out to determine the effect of Animation-based CamStudio Physics Instructional Package (ACPIP) on secondary school physics students' performance in Minna, Nigeria. Two research hypotheses were formulated and tested at 0.05 level of significance. Purposive sampling technique was employed in selecting two co-educational secondary schools in Minna, metropolis from where eighty (80) senior secondary school two (SS II) Physics students were sampled for the study. Students in the experimental group ((20boys & 20girls)) were taught physics using ACPIP while their counterparts in the control group ((20boys & 20girls)) were taught using the conventional lecture method. Animation-based CamStudio Physics Instructional Package (ACPIP) which contains three secondary school Physics concepts in Waves and the Physics Achievement Test (PAT) were the two research instruments used for the study. The PAT comprises 30-item multiple-choice Physics questions. The Kuder-Richardson (KR=21) formula used to determine the reliability coefficient of PAT yielded 0.89, while mean and t-test statistics were used to test the two hypotheses in SPSS 16.0. Findings revealed that students taught Physics using Animation-based CamStudio Instructional Package performed significantly better than those taught using conventional lecture method ($t_{cal}=6.043$, $df = 78$, $p = 0.000$), but there was no significant difference between the mean achievement scores of male and female students taught Physics using ACPIP ($t_{cal}= 0.604$, $df = 38$, $p = 0.550$). Based on the findings, it was recommended that Animation-based physics instruction should be used to

supplement conventional classroom instruction and for revision purposes in order to improve students' performance in physics.

Keywords: Animation, CamStudio, Instruction, Secondary School, Performance, Physics

Introduction

The use of Information and Communication Technology (ICT) has seen tremendous growth in the recent past because of its significant impact on all areas of human endeavors. The field of education is not left out as technology has positively affected teaching, learning, and research in many ways (Fisseha, 2011). Yusuf (2005) opined that ICTs have the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate school experience to work practices, create economic viability for tomorrow's workers, as well as strengthening teaching and helping schools change.

As a result of this impact, the Nigerian government gave priority to science and technology with policies that are favorably disposed to science and technology education and this is reflected in the National Policy on Education (FRN, 2007) where government stated its' commitment to provide necessary infrastructures and training that will boost the integration of ICTs in the secondary school system in the country.

The increasing availability of a wide range of free or low cost software allows for the rapid generation of a wide variety of types of reusable learning objects such as podcasts or screen casts. The Computer Language Company Incorporation (2010) defined screen cast as a screen recording software that turns screen output into a video to teach an application or to promote a product by demonstrating features. Seery (2010) defined it as audio files coupled with a video stream such as a PowerPoint presentation, video of a whiteboard, video of the speaker or a combination of these. A typical example of screen casting software is Cam Studio. It is a free released software program for Microsoft Windows, able to record all screen and audio activity on computer and create industry-standard AVI video files (Ogwueleka, 2012).

Screen casts have many educational benefits. For instance, Ogwueleka, (2012) opined that they help trainers demonstrate and teach the use of software features, they help educators integrate technology into school curriculum, they allow students record video and audio as they demonstrate the proper procedure to solve a problem on an interactive whiteboard and they allow teachers create tutorials for lectures. Screen casts enable the incorporation of audio, diagram, video, photographs which allow for a much

fuller explanation or discussion of a concept than a PDF or PowerPoint slideshow might allow (Seery, 2010; Winterbottom, 2007).

Science comprises basic disciplines such as Physics, Chemistry, Biology and Mathematics. Essentially, science and technology would be incomplete without Physics. According to Gambari (2010) Physics has proven its benefits to mankind as almost every human activity and virtually every profession involves some elements of Physics.

Physics education is aimed at training students to acquire proper understanding of basic principles as well as their applications and is taught at the senior secondary school level of the educational system in Nigeria.

However, in spite of the importance of physics as a requirement for many specialized science and engineering courses in the universities and other tertiary institutions, students' performance in the subject in secondary school certificate examinations (SSCE) is not beyond average (Gambari, 2010) as shown in table 1.

Table 1: Secondary school students' performance in physics conducted by WAEC (May/June 2006-2011)

YEAR	TOTAL SAT	(%)	TOTAL CREDIT	(%)	TOTAL FAIL	(%)
2006	375824	97.40	218199	58.05	149144	39.67
2007	418593	97.93	180797	43.19	228652	54.61
2008	415113	97.69	200345	48.26	207892	50.07
2009	465636	98.05	222722	47.83	221514	47.57
2010	463755	97.55	237756	51.27	207133	44.67
2011	563161	98.28	360096	63.94	181394	32.21

Source: WAEC (2012), Research and Statistics Unit, WAEC Lagos

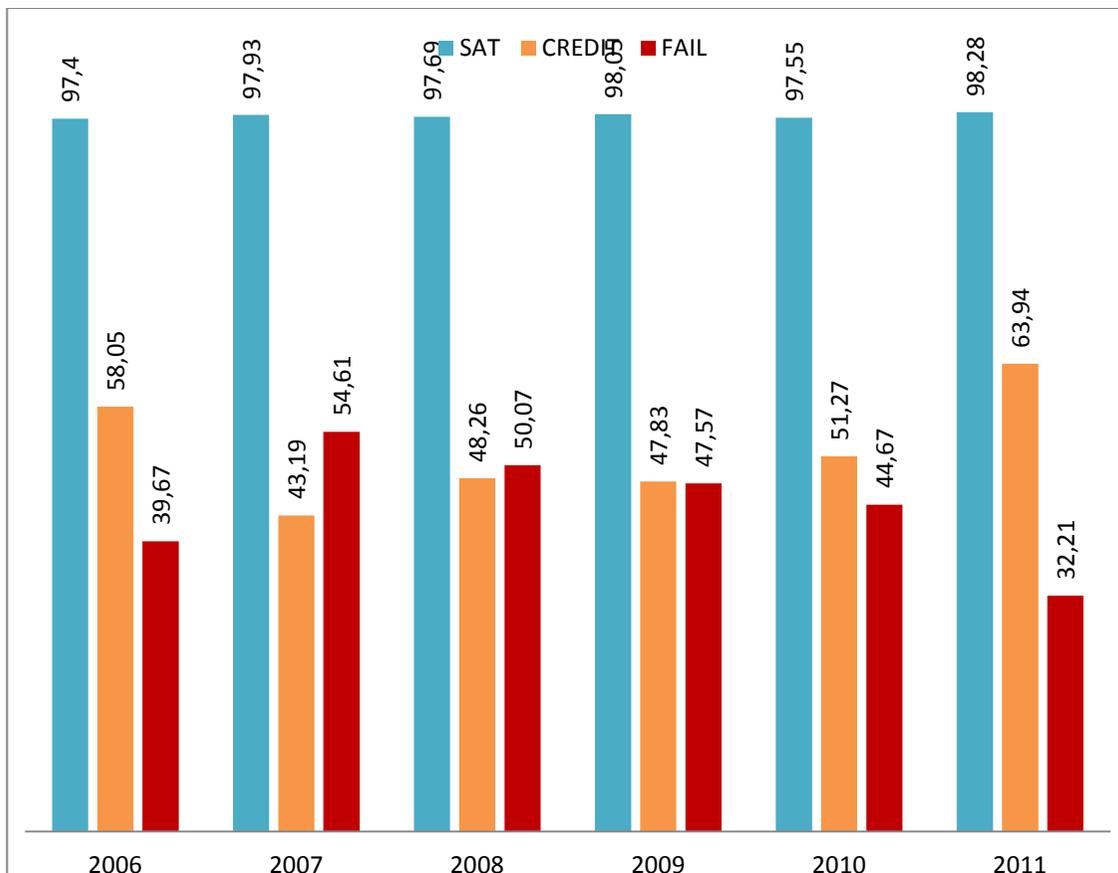


Figure 1: Graphical representation of Nigeria secondary school students' performance in physics conducted by WAEC (May/June 2006-2011)

Table 1 and figure 1 reveal secondary school students' performance in physics conducted by West Africa Examinations Council (WAEC) from 2006 to 2011 in Nigeria. From the chart, it can be observed that students' performance in the examination in each year was consistently about average. Gambari (2010) and Bajah (2000) attributed poor performance of students in science, particularly in physics to lack of qualified teachers, poor instructional strategies, poor infrastructure, non-availability of standard laboratory, non-availability of equipment, poor utilization of instructional materials and abstract nature of some topics in physics. For instance, effective teaching of the concept of Waves fundamentally requires a Ripple Tank which is not available in nearly all the secondary schools in Nigeria.

Onasanya, Daramola & Asuquo (2006) in another study found and reported that students taught using CAI package performed better than those taught using the conventional method. However, Hall (2000) and Bayrak, Kanlı and KandilIngeç (2007) did not find any difference between the

performance of students taught with computer assisted instruction and those taught with traditional lecture method.

Gender issues have been linked with students' achievement in science subjects but without any definite conclusion. Some studies revealed that male students performed better than the female in science courses. For instance, Kost, Pollock and Finkelstein (2009) found that male students performed better than female in interactive Physics, while Anagbogu and Ezeliora (2007) found that female students performed better than their male counterparts using science process skills method of teaching. However, Gambari, Falode, Fagbemi and Idris (2012) reported that gender had no effect on students' academic performance.

Purpose of the Study

The study aims at determining the effects of animation-based camstudio physics instruction on the achievement of secondary school students in physics in Minna, Nigeria. Specifically, the study determined the:

- i. effect of Animation-based Physics Camstudio Instructional Package (APCIP) on the achievement of secondary school students in Waves.
- ii. influence of gender on students' achievement in Waves when taught using APCIP.

Research Questions

The study provided answers to these research questions:

- i. Is there any difference in the post-test mean achievement scores of secondary school two (SSII) physics students taught Waves using APCIP and those taught using conventional lecture method?
- ii. Is there any difference in the post-test mean achievement scores of male and female secondary school two (SSII) physics students taught Waves using APCIP?

Research Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

- H_{O1} : There is no significant difference between the post-test mean achievement scores of secondary school two (SSII) physics students taught Waves using APCIP and those taught using conventional lecture method.
- H_{O2} : There is no significant difference between the mean achievement scores of male and female secondary school two (SSII) physics students taught Waves using APCIP.

Research Method

Research Design

A pretest, post-test experimental and control groups design was adopted. The senior secondary class II (SS II) Physics students were first pretested followed by administration of treatment using Animation-based Physics Camstudio Instructional Package and conventional lecture method and immediately after the treatment, post-test was administered to both experimental and control groups.

Sample and Sampling Techniques

The target population for the study comprises senior secondary school two (SSII) Physics students in Minna metropolis, Nigeria. The sample for the study was made up of eighty (40 males and 40 females) students from two public co-educational schools owned by Niger State. Three stages of sampling technique were adopted. Firstly, two secondary schools were purposively selected based on equivalent in terms of ICT facilities, manpower, gender composition and enrolment of students for SSCE Physics examinations for a minimum of ten years. Secondly, the two schools were randomly assigned to each of the experimental group (taught the concept of waves using Animation-based Physics Camstudio Instructional Package) and control group (taught the concept of waves using convectional lecture method). Thirdly, stratified random sampling procedure was employed to select 40 (20 males and 20 females) students from each school.

Research Instruments

Animation-based CamStudio Physics Instructional Package (ACPIP) and Physics Achievement Test (PAT) were the two research instruments used for the study. ACPIP was developed by the researchers using CamStudio software, Macromedia Flash, Microsoft Word and Microsoft PowerPoint. The package treated three Physics lessons on the concepts of waves. The necessity for researcher-made Animated Physics CamStudio Instructional Package was based on the fact that most schools in the study area are not equipped with needed ripple tank required for effective teaching and learning of the concept of waves. The PAT comprises 30-item multiple-choice Physics items based on the content of APCIP and was adapted from past examination questions of West African Examination Council (WAEC, May/June, 2002-2011). Each of the items of the PAT had four options (A - D) as possible answers to the question. And students were required to indicate the correct answers by ticking one of the letters (A - D). The two instruments were validated by two instructional design experts, two computer specialists and three Physics instructors. The Kudar-Richardson

(KR=21) formula used to determine the reliability coefficient of PAT yielded 0.89 which was considered adequate for the study.

Data Collection Analysis Technique

At the commencement of the experiment, PAT was administered on students in the sampled schools as pre-test. Thereafter, treatment (which lasted for three weeks) was administered followed by administration of PAT as post-test. The experimental group was taught using APCIP while the control group was taught using conventional lecture method. Data gathered were analyzed using mean and t-test statistics in SPSS 16.0 to test the hypotheses at 0.05 alpha level.

Result

To analyze the pretest data, the mean scores of the experimental and control groups were computed and compared using t-test. Table 2 presents the mean, standard deviations and the result of the t-test for the two groups.

Table 2: t-test comparison of pretest mean achievement scores of students in experimental and control groups

Variable	N	Mean	Df	t	Sig.(2-tailed)
Experimental	40	24.98	78	1.340 ^{ns}	0.465
Control	40	25.70			

ns: Not Significant @ 0.05 level

Table 2 shows the t-test comparison of mean achievement scores of students in both the experimental and control group at the commencement of the study. The table reveals that the calculated t-value ($t=1.340$, $df=78$, $p>0.05$) was not significant at 0.05 alpha level. This indicates that there was no significant difference in the achievement scores of the two groups at pretest. Hence, the two groups are equivalent at the commencement of the study.

H₀: There is no significant difference between the post-test mean achievement scores of secondary school two (SSII) Physics students taught Waves using APCIP and those taught using conventional lecture method.

Table 3: t-test comparison of posttest mean achievement scores of students in experimental and control groups

Variable	N	Mean	Df	T	Sig.(2-tailed)
Experimental	40	54.80	78	6.043*	0.000
Control	40	33.15			

*Significant @ 0.05 level

Table 3 shows the t-test comparison of the post-test achievement scores of students in the experimental and control groups. The table reveals that the calculated t- value ($t=6.043$, $df=78$, $p<0.05$) was significant at 0.05 alpha level. This indicates that students taught waves using APCIP performed significantly better than those taught using the conventional lecture method. Hence, the hypothesis is rejected.

HO₂: There is no significant difference between the mean achievement scores of male and female secondary school two (SSII) Physics students taught Waves using APCIP.

Table 4: t-test comparison of post-test mean achievement scores of male and female students taught waves using APCIP

Variable	N	Mean	Df	t	Sig.(2-tailed)
Male	20	54.00	38	0.604 ^{ns}	0.550
Female	20	57.60			

ns: Not Significant @ 0.05 level

Table 4 shows the t-test comparison of the posttest achievement scores of male and female students taught waves using APCIP. The table reveals that the calculated t-value ($t=0.604$, $df=38$, $p>0.05$)a was not significant at 0.05 alpha level. This indicates that there was no significant difference in the mean achievement scores of students taught waves using APCIP based on gender. Hence, the hypothesis was not rejected.

Summary of Findings

The following is the summary of the findings of the study:

- i. Animation-based Physics instruction improves students' achievement scores in Physics.
- ii Students taught Physics using APCIP performed significantly better than their counterparts taught Physics using the conventional lecture method.
- iii Male and female students taught Physics using APCIP did not perform significantly different from the others.

Discussion of Findings

The findings of this study on the effect of Animation-based Physics Camstudio Instructional Package on students' performance in Physics revealed that students taught Physics using APCIP performed significantly better than their counterparts taught Physics using conventional lecture method. This finding is in agreement with the earlier findings of Blanche et al, (2011) that podcasts can replace lecture with no detrimental effects on students' achievement in science subjects. This finding also agrees with the findings of Olusi (2008) and Onasanya, et, al. (2006) that found that

computer assisted instruction significantly improves students' academic performance in science subjects than the tradition method of instruction. However, Hall (2000) and Bayrak, Kanlı and Kandilİngeç (2007) did not find any difference between the performance of students taught with computer-assisted instruction and those taught with traditional laboratory method.

The findings of this study on influence of gender on the academic achievement of students taught Physics using APCIP revealed that there was no significant difference between the performance of male and female students taught Physics using APCIP. This finding is in agreement with the earlier findings of Gambari et al. (2012) and Yusuf (2006) that found and reported that there was no significant difference in performance of male and female students in science subjects. However, the finding disagrees with the findings of Kost, Pollock and Finkelstein (2009) who reported that male students performed better than female students in interactive Physics. The finding contradicts the findings of Anagbogu and Ezeliora (2007) that found and reported that girls performed better than boys using science process skills method of teaching.

Conclusion

Based on the findings of this study, it can be deduced that Animation-based Physics Camstudio Instructional Package (APCIP) has positive effects on students' academic achievement in Physics and is gender-friendly. The approach is therefore suitable for teaching secondary school Physics in Nigeria especially topics that require illustrations. Through the use of APCIP, Physics instruction can be easily delivered to learners in motivating, understandable and exciting ways. This will undoubtedly improve students' performance in Physics in Nigeria.

Recommendations

Based on the findings of this study, the following recommendations were made:

- i. Teachers should develop and expose students to animation-based physics instruction so as to motivate and improve students' performance in physics.
- ii. Learning packages that are gender-friendly should be developed by programmers, instructional design experts and subject specialists for secondary school physics students to ensure equity in their learning outcomes.
- iii. Innovative learning approaches such as APCIP should be integrated in the curriculum of teachers' education programme in

Nigerian tertiary institutions to prepare teachers for effective teaching in secondary schools.

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