Effect of Developed Video Instructional Package on the Performance of Senior Secondary School Physics Students in Ilorin Metropolis

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Abstract

The purpose of this study was to find out the effect of developed video instructional package on the performance of Senior Secondary School students in Physics in Ilorin Metropolis. The study also investigated the influence of gender and ability levels on the performance of students' taught with developed video instructional package. The quasi-experimental design, which involved the pre-test, post-test, non-randomised, non-equivalent control group design was employed for the study. Research sample was drawn from two randomly selected secondary schools. One intact class each from the sampled schools was also randomly selected for the study. Students from the sampled class were further stratified along gender and ability levels. The instruments used for collecting data were Physics Performance Test (PPT) and developed video instructional package as a treatment. Physics performance test was pilot tested for reliability using the test-retest method of three weeks interval and Pearson Product Correlation analysis revealed a reliability coefficient value of 0.76. The four hypotheses were tested using Analysis of Covariance. In addition, Scheffes test was used as post hoc analysis to test the direction of difference along ability levels. Findings indicated that, students taught with developed video instructional package were not significantly better than those taught without the use of the package. It was revealed that the gender of student was not a factor in the performance of students when they were taught using developed video instructional package. Based on the findings, it was recommended that, the use of developed video instruction should be encouraged in teaching Physics.

Keywords: Video Instruction, Ilorin Metropolis, Physic Education, Physics Curriculum etc.

1. Introduction

The importance of Physics in science and technology instruction cannot be over emphasised. Physics is applied to almost every human activity and virtually every profession involves some element of Physics. Abbott (1997) defined Physics as a study concerned with matter, energy and relation between them. Physics provides the theory behind technology and it is the foundation of many fields of theoretical and applied technology. Also, Okoro (2003) viewed Physics as a systematic study of nature, the behaviour of materials and physical universe based on observation, experiment, measurement and formulation of laws to describe these facts in general terms. Today, more than ever before, the study and application of Physics is essential to the scientific, industrial, technological and social advancement of societies or nations. Physics is one of the science subjects taught at the Senior Secondary School level of Nigeria Educational System. After the Junior

Secondary School three (JSS III) examination, all students found suitable to study Physics in SSS class are compulsorily enrolled to study Physics at least during the first year of the three year duration. The National Policy on Education (FRN, 2004) stated that Physics can be taken as one of the 'core' among science subjects with other one vocational elective and two non-vocational elective subjects. Physic education is aimed at training the students to acquire proper understanding of basic principles as well as their applications. It also aimed at developing in students appropriate scientific skills and attitudes as a pre- requisite for a country like Nigeria, which is still struggling to join a world where science and technology has become a way of life. It is further said that, Physics plays the following roles among others: (1) Physics generates openness to new ideas in a world of rapid changes; (2) Physics illustrates cumulative character of scientific thought; and (3) Physics is concerned with identifying and arriving at solutions to problem.

Allotey (2005) recognised Physics as an integrated discipline which concerns itself with other disciplines that seem to be uniquely associated with manpower development. In addition, Michael (2006) stressed that, Physics has an obvious relevance to workers in many fields. For examples technicians, engineers, doctors, pharmacists, agricultural officers and other need Physics. Based on these facts, Nigerian government in the revised National Policy on Education (FRN, 2004) place greater emphasis on practical applications of knowledge necessary for future employment and for building a technological oriented nation. It is against this background that, Physics cuts across and also closely related to other sciences such as Astronomy, Geology, Chemistry and Biology. Jolayemi (2002) and Olohunfoworaye (2005) opined that, the application of the knowledge of Physics has led to the invention of laboratory and office equipment, domestic, industrial and medical appliances. Technologists use the information of science to design electric dynamos and motors, radio, television radar installations, artificial satellites, spacecraft, nuclear power generators and a lot of others, all of which have helped to make life easier for present generation than for the people of old generation. According to Javed (2005) scientist of different nationalities are today engaged in research in Physics and as a result of their researches many useful things have been invented.

Among these invention are computers, sewing machines, mobile phones, measuring devices, microscopes, telescopes and many others. This implies that, technological advancement is backed up by discoveries and researches in Physics. For this reason, technological progress of any nation will therefore depend on the quality of physics instruction in Secondary Schools and Higher Institutions of learning. Ikwa (2003) added that physics education has been and will continue to be of tremendous importance to humanity for its ability to explain natural phenomena and everyday occurrence as well as its central role in the world's current technological development. Probably it is on this ground that Physics is given a place of prominence in the Nigerian school curriculum. The secondary school physics curriculum developed by the Federal Ministry of Education, in conjuction with Comparative Education Study and Adaptation Centre (FME and CESAC, 1985) has the following objectives:

(1) To provide basic literacy in physics for functional living in the society;
(2) To acquire basic concepts and principles of physics as a preparation for further studies;
(3) To acquire essential scientific skills and attitudes as a preparation for the technological application of physics; and
(4) To stimulate and enhance creativity.

In order to achieve these objectives in the Senior Secondary School level, very rich and varied methods and instructional materials need to be employed. Developed video instructional package could be used by teachers to assist students to learn at their own pace. The Latin word for video means 'I see'. Any electronic media format that employs 'motion pictures' to present a message can be referred to as video. Thus, there are videocassettes, videodiscs, DVD, interactive video, video games and so on. Video can be used to provide baseline knowledge for all learners. The package media can serve as an alternative to lectures. Students can

view assignment before coming to class. Class time can then be available for hands-on experiences, discussion, or application of knowledge.

2. Statement of the Problem

The performance of students in science generally and Physics in particular has been quite unsatisfactory over the years according to Olorukooba (2007). The external examining bodies such as the West African Examinations Council (WAEC) and National Examinations Council (NECO) have repeatedly reported poor performance in Physics. This particular problem according to Chukwu (2000) has prevented the educational system in Nigeria from producing required number of qualified scientists and technologists. The researchers in this study therefore developed video instructional package that could be used to assist students and thereafter check its effectiveness on their performances. Gambari and Gana (2005), Okebukola (1999), Shalw (2003) and Yusuf (2004) reported that, poor infrastructure, non-availability and non-utilisation of instructional materials are contributing factors for poor performance of students in sciences.

2.1 Purpose of the Study

The purpose of the study was to investigate the effect of developed video instructional package on the performance of Senior Secondary School students in Physics. Specifically, the study examined:

(1) The performance of the senior secondary school students taught using developed video instructional package and those taught using conventional method.
(2) The performance of male and female students taught using developed video instructional package.
(3) The influence of the types of school on the performance of students taught using developed video instructional package.
(4) The influence of learners' scoring levels on their performances when they are exposed to developed video instructional package.

2.3 Research Questions

The following research questions were generated to guide the conduct of the study:

(1) Is there any difference in the performance of students taught using developed video instructional package and those taught with conventional method?
(2) Does the gender of students influence their performances in Physics when they are taught using developed video instructional package?
(3) What is the influence of school types on the performance of students exposed to a developed video instructional package?
(4) Is there any difference in the performances of high, medium and low scorers exposed to a developed video instructional package?

2.4 Research Hypotheses

The following four hypotheses have been formulated to guide the research study in line with research questions:

(1) There is no significant difference in the performance of students taught using a developed video instructional package and those taught using conventional method.
(2) There is no significant difference in the performance of male and female students taught using a developed video instructional package.
(3) There is no significant difference in the performance of students in the public and private owned schools taught using a developed video instructional package.

(4) There is no significant difference in the performance of low, medium and high scorers taught using a developed video instructional package.

2.5 Scope of the Study

The study was carried out in two sampled secondary schools in Ilorin Metropolis, Kwara State, Nigeria. The topics chosen for the research were friction and principles of electricity (current, voltage, power and resistance) which are meant for SSII students in Physics.

3. Research Methodology

3.1 Research Design

The research design employed in this study was the quasi-experimental design of which the pre-test, post-test, non-equivalent, non-randomised control group design, which enable the researchers to collect suitable and relevant data that provided meaningful and unbiased answer to the research questions. This was a 2×2×2×3 factorial design. There were the treatment and control groups, gender (male and female), school types (private and public), and three achievement levels (high, medium and low).

3.2 Research Instrument

The instruments employed to carry out this study were the developed video instructional package and the test instrument Physics Performance Test (PPT). The treatment was developed by the researchers with assistance of a professional video non-linear editor. The course content of the curriculum in Physics on friction and principles of electricity formed the basis for learning outcome contained in the programme. Physics performance test was a 20 items multiple-choice objective test with four options each. Physics Performance Test was pilot tested for reliability using the test – retest method of three weeks interval and Pearson Products Correlation analysis revealed a reliability coefficient value of 0.67.

3.3 Validation of Research Instrument

The developed video instructional package was given to an experienced video editor and one senior physics teacher in Ilorin Metropolis to check its face and content validity. For the reliability of the test instrument was administered to SSII students in a secondary school equivalent to the research sample, but which was not sampled for the study and also not used for pilot study in Ilorin Metropolis. The test items were re-administered after three weeks to test its reliability. The data collected from the two administrations were analysed using the Pearson Products Moment Reliability Coefficient formula.

3.4 Procedure for Data Collection

After obtaining permission from the selected secondary schools to be used for the study, for the experimental group, multimedia projector was used to teach the lesson after the school hours in the physics laboratory. The researchers taught the students with assistance of physics teachers in the school and the control group were taught the same content using conventional method. However, before the content was delivered both groups were pre-tested. After the treatment a post-test was conducted for the two groups.

4. Data Analysis Technique

For the achievement test, the total scores of each of the students at pre-test and post-test were calculated and the post-test scores were found and a t-test was used to determine the significant difference for the hypotheses. In testing the hypotheses stated for the study Analysis of Co-variance (ANCOVA) statistic was used to test hypotheses 1-4.

4.1 Data Analysis and Results

The analyses were guided by each of the hypotheses stated:

4.2 Hypothesis One

(1) There is no significant difference in the performance of students taught using a developed video instructional package and those taught using conventional teaching method.

To test this hypothesis, ANCOVA statistic was used to compare the post test mean score of the experimental and control groups with the pre-test score serving as covariates. The result is as reported in table I.

Table 1: Analysis of Covariance (ANCOVA) on the post-test performance score of experimental and control groups.

Source	Type III Sum of Square	DF	Mean Square	F	Sig.
Corrected model	2151.606g	2	1075.804	8.583	.001
Intercept	6834.865	1	6834.865	54.532	.000
Pre-test	2007.208	1	2007.208	16.014	.000
Treatment	13.163	1	13.163	.105	.748
Error	4637.492	37	125.338		
Total	1444382.000	40			
Corrected total	6789.100	39			

Significant at 0.05 alpha levels.

Table I showed the comparison of post-test mean score of the experimental and control groups. The calculated F value of 0.05 is not significant because the significant value of .105 is not significant because the significant value of .784 is greater than 0.05 alpha levels. This result implies that there is no significant difference between the post-test mean scores of the experimental and control groups. That is, the score did not differ significantly from the experimental and the control groups. Therefore, the null hypothesis is accepted.

4.3 Hypothesis Two

(2) There is no significant difference in the performance of male and female students taught using a developed video instructional package.

This hypothesis was tested using ANCOVA statistic method to compare the means scores of the students in experimental group (stratified into male and female) with the pre-test serving as covariates. The result is shown in table 2.

Table 2: Analysis of Covariance (ANCOVA) on the post-test mean score of male and female students in experimental group.

Source	Type III Sum Of Square	DF	Mean Square	F	Sig.
Corrected model	2138.779 g	2	1069.390	8.509	.001
Intercept	7795.180	1	7795.180	62.022	.000
Pre-test	2136.170	1	2136.170	18.995	.000
Gender	.334	1	.334	.003	.959
Error	4650.321	37	125.684		
Total	144382.000	40			
Corrected total	6789.100	39			

Significant at 0.05 alpha levels.

Table 2 indicated that the calculated F value of .003 is not significant because the significant value of .959 is greater than 0.05 alpha levels. The result implies that there is no significant difference between post-test

mean score of male and female students. That is, male students' score did not differ significantly from female students' score when both were taught using developed video instructional package. Therefore, null hypothesis is accepted.

4.4 Hypothesis Three

(3) There is no significant difference in the performance of students in the public and private owned schools taught using a developed video instructional package.

To test this hypothesis, ANCOVA statistic was used to analyse the mean scores of students in the school I and II taught in experimental and control groups. The result is shown in the table 3.

Table 3: Analysis of Covariance (ANCOVA) on the post-test performance score of experimental and control groups of school I and school II.

Source	Type III Sum of Square	DF	Mean Square	F	Sig.
Corrected model	1668.388	2	834.194	6.763	.003
Intercept	7655.606	1	7655.606	62.064	.000
Post-test	1637.763	1	1637.763	13.277	.001
Treatment	56.495	1	56.495	.458	.503
Error	4637.492	37	125.338		
Total	144382.000	40			
Corrected total	6232.375	39			

Significant at 0.05 alpha levels.

Table 3 revealed the comparison of the post-test mean scores of school I and II taught with developed video instructional package and those taught with the conventional teaching method. The calculated F value of .458 is not significant because the significant value of .503 is greater than 0.05 alpha levels. This result implies that there is no significant difference between the post-test mean scores of the experimental and control groups. That is, the scores did not differ significantly from the experimental and control groups. Therefore, the null hypothesis is accepted.

4.5 Hypothesis Four

(4) There is no significant difference in the performance of low, medium and high scorers taught using a developed video instructional package.

To test this hypothesis, ANCOVA was used to analyse the mean score of students in the experimental group (stratified into high, medium and low scorer levels) with the pre-test scores serving as a covariates. This result is shown in the table 4.

Table 4: Analysis of Covariance (ANCOVA) on the performance of high, medium and low ability levels students in the experimental group.

Source	Type III Sum of Square	DF	Mean Square	F	Sig.
Corrected model	3061.100g	3	1020.367	36.947	.000
Intercept	16359.700	1	2759.738	99.934	.000
Pre-test	3.683	1	3.683	.133	.720

Ability	1663.305	2	831.652	30.115	.000*
Error	441.850	16	27.616		
Total	76829.00	20			
Corrected total	3502.950	19			

Significant at 0.05 alpha levels.

Table 4 indicated that the calculated F value of 30.115 is a significant difference because .000 significance level is less than 0.05 alpha levels. This shows that there is a significant difference in the post-test mean score of high, medium and low achievers. Therefore, the null hypothesis is rejected. A follow up Scheffe Test was conducted to locate where the significant difference existed among the three treatment mean scores of the three treatment groups as indicated in the table 4 in the appendix.

Since it was established that there is significant difference in the performance of the students at the ability levels. Scheffe test was used to compare cell mean for those significant F-ratios. The report is shown in table 5. When high and medium ability level students performance was compared, it was revealed the high level ability students perform better than the medium ability level students. Similarly, when the performance of high and low ability level students was compared, it was noted that the high ability level students perform better than the low ability level ones. When the medium and low ability level students' performance was compared, the medium ability level students performed better than the low scoring level ones.

Further analysis was done to consider the interactive influence of the primary independent variables (treatment) and the secondary independent variables (gender and ability levels) of students taught using developed video instructional package, and those taught using conventional methods. The result is shown in table 5.

Table 5: Analysis of interactive influence of the primary independent variables (treatment) and secondary independent variables (gender and ability levels) of students taught using developed video instructional package and those taught using conventional methods.

Source	Type III Sum of Square	DF	Mean Square	F	Sig.
Corrected model	9495.069g	12	791.256	12.861	.000
Intercept	26231.933	1	26231.933	426.384	.000
Pre-test	1 61.206	1	161.206	2.620	.109
Treatment	1446.149	1	1446.149	23.506	.000
Gender	96.683	1	96.683	1.572	.213
Ability	2290.814	2	1145.407	18.618	.000
Treat +	16.598	1	16.598	.270	.605
gender	243.465	2	121.732	1.979	.144
Treat +	897.103	2	448.552	7.291	.001
ability	355.149	2	177.575	2. 886	.061
Gender +					
ability	5413.921	88	61.522		
Treat +	320324.000	101			
gender +	14908.990	100			
ability					
Error					

Total	
Corrected	
total	

Significant at 0.05 alpha levels.

As it is reflected in table 5, when gender interacts with treatment, the calculated F value of .27 is not significant because the significance of F .061 is greater than 0.05. Therefore, there is interactive influence of treatment and gender. This implies that, there is no significant influence on the students' performance when treatment and gender was combined, treatment and ability as shown in table 5, the calculated F value of .109 is not significant because significance value of .144 is greater than 0.05. This indicates that, there is no interactive influence between treatment and ability levels. Therefore, there is no significant influence on student performance when the different ability levels are exposed to treatment on gender and ability levels as it is shown in table 5. The calculated F value of 7.29 is significant because the significance value of F.001 is less than 0.05. Therefore, there is interactive influence between gender and ability. When the variables of treatment, gender and ability were interacted as it is shown in table 4, the calculated F value of 2.8 is not significant because the significant of F that is, .061 is greater than 0.05. Therefore, there is no interactive influence between treatment, gender and ability levels of students.

5. Discussion of Findings

There seems to be similarity in the findings of this research with those of some researchers. The study indicated that the developed video instructional package had no significant effect on students' performance in Physics. This result did not agree with the findings of previous researchers who asserted that visual aids do not only enhance communication between learners and teachers but also aid retention (Afolabi, 2006). Similarly. Studies have confirmed that video instructional package and computer assisted instructional package have been effective in enhancing students' performances in other subjects like Social Studies, and Geography (Ajelabi, 1998 and Egunjobi, 2002). Literature also abounds in the efficacy of CAI for science and other subjects in the elementary schools (Chang, 2000) and in the secondary schools (Dunn, 2002). The result gather revealed that gender did not have any significant effect on students' performance in Physics even with the use of developed video instructional package. These results are in consonance with the findings of Tunde-Awe (2003). Earlier findings of Lovell (1959) have revealed that students' performance, whether boys or girls is determined by their will and their ability to achieve. The result indicated that students' ability levels influence their performance when they were taught with or without developed video instructional package.

5.1 Conclusions

The following conclusion were derived from the findings of the study:

Developed video instructional package can enhance students' understanding of Physics concepts and acquisition of skills and improve their performances in the subject. Gender of learner is not a factor in learning with a developed video instructional package, as both male and female students exposed developed video instructional package perform equally well. Also, the ability levels of learners (high, medium and low) can influence their performances in Physics when developed video instructional package is used in instruction, but disparity levels may be lowered.

5.2 Recommendations

The following recommendations arose from the findings of the study:

(1) Developed video instructional package should be encouraged in teaching Physics concepts. This could be done through government and private individuals' support to schools.

(2) Educational Technologists should be encouraged to develop varieties of video instructional packages on topics outlined for students in secondary schools Physics curriculum.

(3) Seminars, workshops and in-service training should be organised for teachers to enable them acquire necessary skills and also update their knowledge about the development and proper use of instructional materials for classroom instruction.

(4) Physics authors or textbook writers should be advised to develop video instructional packages to complement the textbooks used in the schools.

References

Abbot, A. F. (1997). *Ordinary level Physics*. (3rd ed.), London: Heinemann Educational Books.

Afolabi, A. O. (2006). *Effect of a computer assisted instructional package on secondary school students performance in Biology, in Oyo, Nigeria*. Thesis presented to the Department of Science Education, University of Ilorin.

Ajelabi, A. (2000). *Essentials of educational technology*. Lagos. Raytel communication Ltd.

Allotey, F. K. (2005). Physics in Africa. Retrieved on 24 April, 2011 from *http://www.physics 2005.org*

Chang, J. C. (2002). A field test CAI software: magic tree. *Master Abstracts International, 38 (6), 1438 (Unni No. 1399856).*

Dunn, C. A. (2002). *An investigation of computer assisted reading instruction versus traditional reading instruction on selected high school freshmen*. Thesis presented to the Loyola University, Chicago.

Egunjobi, A. O. (2006). The efficacy of two computer assisted instructional modes on learner practical Geography achievement at the secondary school level in Ibadan Metropolitan, Nigeria. *Paper delivered at NEAMT conference, 20-23rd Non., 2002.*

FME & CESAC (1985). *Physics curriculum for senior secondary schools*. Lagos: Federal Government Press.

Gambari, A. I. & Gana, E. S. (2005). The role of instructional media in enhancing teaching of engineering education. Book of proceedings, 6th Annual Engineering conference of School of Engineering. FUT, Minna between 15th-17th June, 2005.

Ikwa, E. O. (2000*). Compentency of physics students in mathematics and their performance in Physics: Focus on difficult concepts.* M.Sc (Ed) project presented to University of Uyo, Nigeria.

Javed, A. (2005). *Importance of physics highlighted in the international seminar on physics in developing countries: past, present and future*. 27-28 July 2003. Inslambord, Pakistan.

Jolayemi, J. (2003). *Improvisation of a beam balance for physics instruction in senior secondary schools*. B. Tech project submitted to the Department of Science Education, Federal University of Technology, Minna, Nigeria.

Lovell, K. (1959). *Educational psychology and children*. London: Hodder and Stoughton.

Michael, P. (2006). The importance of physics: breakthroughs drive economy, quality of life, world leaders, public increasingly take scientific advances for granted. Retrieved on 29 April, 2011 from *http://www.physics.org*

Ohwofahworaye, P. (2005). Utilising science, technology and mathematics as a veritable tool for sustainable development. *A paper presented at a National Conference on Science and Technology in Resource Utilisation, Productivity and Self-sustenance at College of Education, Ekiadolor-Benin.*

Okebukola, P. (1999). An assessment of laboratory facilities in Nigeria schools and its effect on students' achievement. *Journal of Science Teacher's Association of Nigeria. (STAN) special edition, 21-43.*

Okoro, D. (2003). Physics, technology and sovereignty: the journey so far. *In STAN proceeding of the 14th Annual Conference, 250-253.*

Olarinoye, R. D. (2000). Strategies for effective teaching of modern physics. *Keynote address delivered at STAN National Workshop held at Government College, Kastina 24-29 April in Nigeria*.

Shawl, A. (2003). An adoption of problem based teaching and problem-based to improve the teaching of radioactivity. *Chinese Journal of Elementary Science 3 (1), 14-18.*

Tuned, A. (2003). Effect of visual illustrations of difficult words on secondary school students' performance in reading comprehension tests. *Thesis presented to the Department of Curriculum Studies and Educational Technology, University of Ilorin.*

Yusuf, A. (2004). Effects of cooperative and competitive instructional strategies on junior secondary school students performance in social studies in Ilorin Nigeria. *PhD. thesis presented to the Curriculum Studies and Educational Technology Department. University of Ilorin, Nigeria.*

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