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Effect of Video Instructional Package (VIP) on Secondary School Students' Achievement in Biology in Makurdi Metropolis, Benue State, Nigeria

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Abstract

This study was designed to determine the effect of Video Instructional Package (VIP) on secondary school students' achievement in Biology in Makurdi Metropolis, Benue State, Nigeria. Two research questions were asked and two hypotheses were formulated and tested. The study adopted a quasi-experimental design of non-randomized pretest posttest control group type. The population of the study is 2100 while the sample of 138 SS2

students was drawn from four secondary schools using multistage sampling technique. In each of the schools intact classes were randomly assigned to VIP and lecture method. Biology Achievement Test (BAT) was used to collect data, validated by five experts, trial-tested and used for the study. Kuder-Richardson formula 20 (K-R20) was used to determine the reliability of BAT and the reliability coefficient was found to be 0.89 implying that the instrument was reliable enough for the study. Descriptive statistics of mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the research hypotheses at 0.05 level of significance. The findings revealed that there is a significant difference in the achievement of students taught Biology using VIP and those taught using lecture method. Furthermore, there was no significant difference in the achievement of male and female students taught using VIP. It was therefore recommended that textbook writers and publishers should take advantage of the relatively new use of VIP and incorporate it into their textbooks for secondary schools so that the students will benefit.

Keywords: Video Instructional Package, Academic Achievement, Biology Education, Senior Secondary Education, Biology

Introduction

Biology is one of the science subjects offered at the senior secondary school levels in Nigerian secondary schools. Biology is a very important science subject and a requirement for higher learning in a number of science-related professional courses like medicine, agriculture, pharmacy, engineering, among others (Umoke & Nwafor, 2014). Biology is a core subject in Nigeria secondary schools that is introduced to students at senior secondary school level. Biology is a science subject that enables students to acquire the knowledge to live effectively in the modern age of science and technology (Ityokyaa & Adejoh, 2014). In modern-day Nigeria, more emphasis is placed on scientific and technological growth and as an outcome students are being encouraged to take up science subjects like Biology.

The objectives of teaching Biology at secondary school level in Nigeria according National Policy on Education as stated by the Federal Republic of Nigeria (2008) includes; ability of the learners' to develop awareness of the environment, to have meaningful and significant knowledge in Biology required for effective living in a scientific and technological world and to make room for technological development.

However, for several years now, the achievement of students in Biology has been unspeakable. Biology student appears to be failing as many see Biology to be uninteresting, and also observe some content in Biology to be abstract in nature (Cimer, 2012; Etobro & Fabinu, 2017). This problem has been identified by researchers as instrumental to the poor achievement of students in Biology, thereby making it tough to achieve the objectives of Biology as stated in the National Policy of Education (FRN, 2008).

Many researchers have revealed that poor achievement in public examinations is traceable to instructional strategy adopted by teachers in teaching Biology (Ahmed & Abimbola, 2011; Umar, 2011; Oladejo, Olosunde, Ojebisi & Isola, 2011; Wanbugu, Chaneigwo, & Ndiritu, 2013; Manalanga & Awelani, 2014). The need to know the cause

for the poor academic achievement of Biology students has been the concern of many researchers for some decades now.

The use of poor instructional strategies for the teaching and learning of Biology is the main cause of student failure in Biology (Ahmed & Abimbola, 2011; Umar, 2011; Oladejo, Olosunde, Ojebisi & Isola, 2011; Wanbugu, Chaneigwo, & Ndiritu, 2013; Adadoga & Lakpini, 2013; Manalanga & Awelani, 2014). Most Biology teachers still have a preference using the chalk and talk (lecture) method in educating Biology students (Kola & Langenhoven, 2015). The lecture method is often used to convey a large amount of material to the students in a short period (Berry, 2008). The lecture method is one of the oldest methods of teaching, in this method, Biology teachers talk to the students and write on the chalkboard. The students simply listen and are not given the chance to give their ideas. Although, According to Gehlen-Bauum and Weinberger (2014), lectures are designed to deliver new information to a large group of students. This method is known to be effective in dealing with a large class. However, it could also be used for a small class. Moreover, the use of Lecture method encourages memorization of facts and concepts, thereby making the topic uninteresting and difficult, which may results to poor learners' academic achievement in Biology (Al-Rawi, 2013; Njoku & Ezinwa, 2014).

However, in order to overcome learning difficulties and poor achievement in Biology, innovative strategies should be adopted by teachers (Oren, Ormana, Karatekin & Erdem, 2010; Cimer, 2012). The teaching method of the 20th century should contrast with the teaching method of the 21st century. Since the commencement of the 21st century, there have been significant changes in the teaching and learning of science including Biology (Mynbayeva, Sadvakassova & Akshalova, 2017). The obvious visible change is the incorporation and the dissemination of technology into the teaching and learning of Biology. In this 21st century, the word “technology” is a significant issue in several fields including education. This is because, the use of technology in education contributes a lot in the pedagogical aspects in which the application of technology will lead to effective learning with the help and supports from technology elements and components (Jamieson-Procter, Albion, Finger, Cavanagh, Fitzgerald, Bond, & Grimbeek, 2013).

Technology-based teaching and learning of Biology offer various interesting ways which include Video Instructional Package (VIP), stimulation, storage of data, the usage of databases, mind-mapping, guided discovery, brainstorming, music, World Wide Web (www) that will make the learning process more fulfilling and meaningful (Finger & Trinidad, 2002). Video Instructional Package (VIP), is a medium of conveying information in a verbal and visual form to be displayed. The utilization of Video Instructional Package (VIP), is the foundation to meet the needs of today's and tomorrow's learners. VIP can assist Biology educators to deal with the confrontation of diverse learning styles and boost the way children of today and youth access, understand, interpret processes and utilize information.

The use of VIP in the teaching and learning of Biology has some natural attributes that make them very relevant for carrying on instruction. These are; the use of VIP helps the learner interacts with content, interaction with content help in the cognitive

development of the learner (Lasisi and Daniel, 2009), commitment and involvement occur when the learner connects to the visual content, becoming drawn in by video, it is one of the universal, inexpensive and uncomplicated to control amongst ICT devices and can be afforded by schools for the teaching and learning process (Fowoyo, 2006), it improves information transfer and the development of scientific and technological skills in learners since learners can view the package over and over again till he/she masters the skills (Lasisi and Daniel, 2009). Ibode in Ofem (2016) explained that video instruction reduces abstractions as well as boredom among students in the classroom. In addition, with video instruction, the students can view and hear presentations at the same time.

Therefore, a well-developed video instructional package may enhance students' understanding of Biology concepts, acquisition of skills and improve their achievement in Biology. It is against this background that the present study seeks to test the effect of VIP on secondary school students' achievement in Biology.

Objectives of the Study

The purpose of this study is to determine the effect of VIP on secondary school students' achievement in Biology. Specifically, the study seeks to;

- i. Determine the difference in the mean achievement scores of students taught Biology using VIP and those taught using lecture method.
- ii. Find out the difference in the mean achievement scores of male and female students taught Biology using VIP.

Research Questions

The following research questions were raised to guide the study:

- i. What is the difference in mean achievement scores of students taught Biology using VIP and those taught using lecture method?
- ii. What is the difference in mean achievement scores of male and female students taught Biology using VIP?

Hypotheses

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

- i. There is no significant difference between the mean achievement scores of students taught Biology using VIP and those taught using lecture method.
- ii. There is no significant difference between the mean achievement scores of the male and female students taught Biology using VIP.

Methodology

A quasi-experimental design, specifically the non-equivalent control group design was employed in this study. The study was carried out in Makurdi Metropolis in Benue State, Nigeria. The population of the study is 2,100 Senior Secondary School II (SS II) students in Makurdi Metropolis (Benue State Ministry of Education, 2020). The sample of this study is 138 SS II students. A multi-stage sampling technique was employed to select the

sample for this study. Firstly, Purposive sampling was used to select four schools from the twenty-five schools. The schools was chosen based on the following criteria;

- a. They are co-educational,
- b. They have a projector that is made available for teachers' use,
- c. The students and teachers are computer literate,
- d. The willingness of the school management to permit the use of school facilities and students.

Also, the simple random sampling technique was used. Four schools were randomly picked from the secondary schools in Makurdi Metropolis. In each of the schools, an intact SS II class was used for the study. Two of these intact classes were assigned by balloting as the experimental groups and were taught using the VIP while the other which is the control groups were taught using the lecture method.

A researcher-constructed Biology Achievement Test (BAT) was used for data collection. The BAT content was taken from the Federal Government of Nigeria-approved curriculum for the SS II class. The BAT is 40 items test on the genetic concept. The 40 items are multiple-choice objective questions with four options (A, B, C, D). Each correct answer in the test was scored one mark (1mark). The BAT was administered to students as pre-test and post-test. BAT was designed to assess students' achievement in the Biology topics used for the study.

The treatment instrument, Video Instructional Package (VIP) on genetic, was a self-instructional package (contained buttons placed on the bottom of each page, such as **Play**, **Stop**, **Pause**, **Next** and **Previous** to provide easier control of the package) that lasted for four weeks. The videos used are in the form of an educational video Package from YouTube that is stored in a CD-ROM and was shown to students with the aid of a projector. The package contained six lessons based on topics in genetic.

The instrument was validated by five specialists. The experts were asked to check for appropriateness of the items, construction and structure of the questions, clarity of the questions and option and scope/coverage of the questions. A trial test was carried out and analyzed using Kuder-Richardson 20 formula (K-R20). The reliability coefficient of the BAT was 0.89. To effectively test the hypotheses for this study, BAT was administered in each of the two schools used for the study. The researcher and the research assistants administered the pretest BAT to all SS II Biology students in the four schools before the treatments, thereafter, the four research assistants taught the genetic concepts. The teaching period lasted for four weeks after which a post- BAT was administered.

The mean and standard deviation of the students' scores in the test was used to answer the research questions, to determine the level of observed differences while the hypotheses were tested at 0.05 level of significance using analysis of covariance (ANCOVA).

Results

Research Question One

What is the difference in mean achievement scores of students taught Biology using VIP and those taught using lecture method?

The answer to this question is presented in Table 1.

Table 1: Mean and Standard Deviations of Achievement Scores of Students Taught Biology Using VIP and Lecture Method

Group	N	Pre-BAT \bar{X}	S.D	Post-BAT \bar{X}	S.D	Mean Gain
VIP	78	20.99	4.21	34.65	3.17	13.66
Lecture method	60	19.17	4.14	23.99	5.27	4.82
Mean diff.		1.82		10.66		8.84
Total	138					

In Table 1, the mean achievement scores in post-BAT of the experimental and control group are 34.65 and 23.99 respectively with their standard deviation of 3.17 and 5.27. The mean difference between the mean achievement scores of the experimental and control group from pre-BAT and post-BAT is 1.82 and 10.66 respectively while the mean gain is 8.84. The result shows that the students taught Biology using VIP had a higher mean achievement score than the students taught Biology using lecture method. However, hypothesis two will be tested to determine if this difference is significant.

Hypothesis One

There is no significant difference between the mean achievement scores of students taught Biology using VIP and those taught using lecture method.

The result of this hypothesis is presented in Table 2.

Table 2: Result of ANCOVA of Achievement Scores for Students Taught Biology Using VIP and Lecture Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3875.858 ^a	2	1937.929	109.185	.000	.618
Intercept	4352.255	1	4352.255	245.212	.000	.645
PREVIPCO	14.524	1	14.524	.818	.367	.006
METHODS	3589.334	1	3589.334	202.228	.000	.600
Error	2396.113	135	17.749			
Total	130592.000	138				
Corrected Total	6271.971	137				

Table 2 presents ANCOVA report on the effect of VIP on students' achievement in Biology. The Table revealed $p=0.00 < 0.05$. The study revealed that the difference found between the VIP and lecture method group in Table 1 was significant in favour of the VIP group. The null hypothesis of no significant difference in the mean achievement scores attained by the students exposed to VIP and lecture method in Biology was rejected. This means that there is a significant difference between students mean achievement scores in Biology in the VIP and lecture method groups. This implies that the students taught Biology using VIP had higher mean achievement scores than those taught using lecture method.

Research Question Two

What are the mean achievement scores of male and female students taught Biology using VIP?

The answer to this question is presented in Table 3.

Table 3: Mean and Standard Deviations of Achievement Scores of Male and Female Students Taught Biology Using VIP

Gender	N	Pre-BAT \bar{X}	S.D	Post-BAT \bar{X}	S.D	Mean Gain
Male	42	21.38	4.36	34.53	3.17	13.15
Female	36	20.53	4.05	35.14	3.03	14.61
Mean diff.		0.85		-0.61		-1.46
Total	78					

The mean achievement scores and standard deviations as measured by the Biology achievement test of the experimental group are computed as presented in Table 3. The Table indicates that the mean achievement scores of male and female students in post-BAT of the experimental group are 34.53 and 35.14 respectively with their standard deviations of 3.17 and 3.03. The mean difference between male and female students in pre-BAT and post-BAT is 0.85 and -0.65 respectively, while the mean gain is -1.46. The result showed that female students taught Biology using VIP had higher mean achievement scores than their male counterparts. However, hypothesis 5 will be tested to determine if the result is significant.

Hypothesis Two

There is no significant difference between the mean achievement scores of the male and female students taught Biology using VIP.

The result of this hypothesis is presented in Table 4.

Table 4: Result of ANCOVA of Achievement Scores for Male and Female Students Taught Biology Using VIP

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	34.053 ^a	2	17.027	1.731	.184	.044
Intercept	4084.789	1	4084.789	415.346	.000	.847
PREVIP	18.324	1	18.324	1.863	.176	.024
GENDER	12.324	1	12.324	1.253	.267	.016
Error	737.601	75	9.835			
Total	94441.000	78				
Corrected Total	771.654	77				

From Table 4, $p = .267$. Since $p > 0.05$, the null hypothesis of no significant difference was not rejected. Thus, the result shows that there is no significant difference between the achievement scores of male and female students taught Biology using VIP. The result revealed that both male and female students improved on their achievement in Biology when taught using VIP.

Discussion of Findings

Results in Table 1 showed that students in the experimental group had a higher post-test achievement score of 34.64 in Biology than their control counterparts with a post-test of 23.99. This is evidenced by the mean difference of 10.66 and the mean gain of 13.66 for the experimental group which is higher than 4.82 of the control group. This result is further confirmed in Table 2, which indicates that method is a significant factor in the achievement of students in Biology. This is shown by the rejection of the null hypothesis of no significant difference in the achievement scores of students taught using VIP and those taught using the lecture method. This indicates that students taught with VIP achieved better than those taught using lecture method of teaching. The reason for the higher achievement of the experimental group is that the students were motivated to learn by the use VIP, which made them to be more engaged in the learning process. These results also affirm the fact that the use of innovative and technological base teaching strategies such as VIP aids students' learning; improves their achievement and enhances their performances. This is because VIP foster the visualization and active cognitive processing of abstract information due to its feature that combine word, text, pictures, and videos. The finding of this study is supported by earlier findings of Omiola, Enuwa, Awoyemi, and Bada, (2012), Chinna and Dada (2013) and Nwobasi & Nwani (2020) who carried out investigations on students' achievement using videos and conventional method and found out that, students taught using videos performed better than those in conventional method group. This indicates that high achievement in a subject could be achieved through the instructional strategies adopted by the teacher. Also, Gialenn, Lawrence, & Juanjose (2015); Gambari, Shitu, Daramola & Jimoh (2016); Mynbayeva,

Sadvakassou & Akshalova, (2017) buttressed this fact in their study and posited that the use of video enhances students understanding of concepts than the conventional/traditional method of teaching. This implies that the use of VIP can be adopted as a strategy for effective teaching of Biological concepts since the students are actively engaged in the learning process.

The result of achievement based on gender is presented in Table 3. The descriptive analysis of mean and standard deviations on gender revealed that female students performed better than their male counterparts in the experimental group. This showed a higher dispersion of scores from the mean in the female students than in the male students whose mean score was 34.53 whereas the standard deviation of the male is 35.14. The result was further subjected to inferential statistics of ANCOVA and it revealed that no significant difference in the achievement of male and female students. This could be because all the students were given equal opportunities and were actively involved in the instructional process. The use of video instructional package allowed both the male and female students to actively find out facts by themselves on the same level ground. The findings from this study disagreed with the findings of Okwara, Anyagh and Ikyaan (2017) who found out that there is a significant difference between male and female students' achievement. This finding also agreed with that of Gambari, Gbodi, & Olumba (2012), Oludipe (2012), Dania (2014), Gambari, Shittu, Daramola, and James (2016), Nonyelu & Anikweze (2019) who found out that gender is not a significant factor in the mean achievement score of students in Biology.

Conclusion

Based on the findings, the following conclusion was drawn. That using VIP in teaching Biology concept was found more effective than the lecture method. This is because the use of VIP improved students' achievement and are permitted to actively engage in the learning process than the lecture method which was passive and teacher-centered. Analysis of data again showed that there was no significant difference in students' achievement across gender on exposure to VIP, this means that VIP is a gender-friendly way of teaching.

Recommendations

The following are the recommendations made based on the findings of this study:

- i. Students' gender should be taken into cognizance during teaching especially when teaching biology. The findings of this study revealed that gender was not a significant factor in the mean interest, achievement and retention scores of students; hence, teachers should use VIP that can streamline gender differences in Biology classrooms
- ii. Textbook writers and publishers should take advantage of the relatively new use of VIP and incorporate it into their textbooks for secondary schools so that the students will benefit.

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