

## The Use of Video and Cartoon Concepts in the Teaching and Learning of Secondary School Biology

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### Abstract

This study investigated the use of video and cartoon concepts in the teaching and learning of secondary school biology. A pretest, posttest non-equivalent groups quasi-experimental research design was adopted for the study. The sample comprised one hundred and fifty-one (151) Senior Secondary School Three (SSS III) students from intact classes in four schools in Epe Local Government Area of Lagos State. Results show that achievement of students exposed to video concepts increased significantly from  $7.17 \pm 2.62$  before to  $8.75 \pm 4.07$  after exposure ( $df_{64}$ ,  $P=0.09$ ) while the academic achievement of biology students exposed to cartoon concepts increased significantly from  $5.43 \pm 2.52$  before to  $8.63 \pm 3.58$  after exposure ( $df_{85}$ ,  $P=0.000$ ). Analysis of Covariance (ANCOVA) shows that teaching methods is significantly associated with students' academic achievement in biology ( $p < 0.001$ ) but the association is not adjusted by their pre-test scores ( $p > 0.05$ ). Therefore, it was concluded that biology teachers should continuously build the capacity to effectively use video or cartoon concepts to enhance the teaching and learning of complex ideas in biology.

**Keywords:** Video, Cartoon Concept, Students' Achievement, Biology

### Introduction

Biology as a unit of science deals majorly with things that have life, its morphology and physiology, how they function and grow, how living things began to exist, relate with the environment and interact with one another (Umar, 2011). Biology is a compulsory subject that has shaped the growth of technology of the nation.

According to Akinbadewa and Sofowora (2020), visuals (video) functions appropriately with the aid of electricity and helps in the stimulation of senses of sight and sound. When a video is to be used in teaching and learning in schools, it has to be instruction specific and for the right set of students; video, when used in the classroom settings, carries information in such a way that it combines both the visual and audio signals. The application of video into teaching and learning is organized so that multiple tasks can go on concurrently in the teaching sessions. Furthermore, these teaching sessions are organized so that the video clips that would be used present scenarios that pose problems to be solved, which triggers problem-solving skills in the students (Rasi & Poikela, 2016).

Thomas and Israel, in their 2014 study, examined the effect of video and animation the academic performances of students in sciences, and results showed a significant difference in the students'

performance taught with cartoon-style multimedia teaching and group of students taught conventional method of teaching.

Concept cartoons are one of the visual aid tools that can be prepared and used based on the constructivist approach to creating permanent learning by ensuring that students engage actively during the learning and teaching processes in Biology education (Akbas & Kilic, 2019). In addition, it is generally used in scientific and technical issues as it enables messages and information to be delivered efficiently and permanently (Al-Rabaani & Al-Aamri, 2017).

Therefore, cartoons should be used scientifically to ensure the permanence and effortless transfer of the information required for learning. While cartoons make individuals laugh, concept cartoons entertain students, question their knowledge, and direct them to think and discuss (Sengul & Uner, 2010). Özyay Köse (2013) determined the effect of cartoons as a teaching tool towards students' achievement and attitudes about the Endocrine System and Biology, and the result indicated that a positive change was observed on students' knowledge, understanding and attitude of Biology on the unit of the use of cartoons and endocrine system.

Visualization can be regarded as a fundamental aspect of cognitive ability that plays a significant function in children's imagery activities and abilities

ranging from creative problem solving to navigation and to memory (Eshach, 2006). Perceiving visualization as a fundamental aspect of cognition aligns with cognitive theory of multimedia learning postulated by Mayer (Mayer, 2001). Mayer in 2001 came up with three main assumptions that have to do with learning with multimedia. The first states that the dual coding theory has visual and auditory channels for processing information. The second states a limited capacity is seen by each channel. The third states that learning is an active process of selecting, organizing, integrating and integrating information based on previous knowledge. He also emphasized the relevance of learning with visualizations when novel ideas is incorporated with previous knowledge (Mayer, 2001).

The place of video and cartoon concepts in the teaching of secondary school biology cannot be overemphasized as it is essential to enhance biology students' academic achievement, both in internal and external examinations. This necessarily calls for action in a way that there should be effective planning on how to develop and incorporate video and cartoon concepts into the teaching and learning of biology at the senior secondary schools considering the effect it would have on the tertiary level of education. The state of biology teaching and learning is fast becoming worse as there are no adequate facilities like instructional videos and cartoon concepts to enhance learning, and this over the years, has led to poor performance of students in biology in terminal external examinations, e.g. West Africa Senior School Certificate Examinations (WASSCE). This study intends to investigate the impact of video and cartoon concepts on students' academic achievements in biology. To achieve this, these research questions were raised: (i) What is the difference in students' academic achievement in biology before and after exposure to video concepts? (ii) What is the difference in students' academic achievement in biology before and after exposure to cartoon concepts? (iii) What is the relationship between teaching methods and students' academic achievement in biology?

### Methodology

This research was designed to examine the use of video and cartoon concepts in the teaching and learning of secondary school biology. A pretest, posttest, non-equivalent groups quasi-experimental research design was employed for this study.

### Population and Sample

The population comprised all students in public senior secondary schools in Epe Local Government Area of Lagos State. Four schools were picked using simple random sampling from secondary schools in Epe Local Government Area, Lagos State. The sample size for this study was one hundred and fifty-one (151) Biology students who were offering biology in SS3 at the selected schools during this research. The sample was pooled from intact classes of all the students offering biology at SSS III in the four secondary schools. A total of 64 out of 151 (42%) participants were males, and 87 out of 151 (58%) were females. The students' average age was  $14.5 \pm 0.45$  years.

### Research Instrument and Procedure

Three research instruments were used in eliciting responses from the respondents, which are as follows. (1) Biology Achievement Test (BAT): The BAT consists of 20 multiple choice items, selected from West Africa Examination Council past questions (2000-2014) covering topics in areas of biology such as Population and Variation. During the pre-application stage, item analysis was conducted using 30 students drawn from the target population for the study. This item analysis was used to standardize the test items. Kuder-Richardson was employed to test the reliability of the 20-item, and it had a good internal consistency reliability coefficient of 0.727. (2) Lesson notes: Lesson notes on video concepts were designed to cover six weeks of lessons and two periods (80 minutes) per week. During the lessons, the teacher used pre-recorded video sessions involving the researcher teaching each topic as instructional material to aid the students' understanding. Lesson notes on cartoon concepts were designed to cover six weeks of lessons and two periods (80 minutes) per week. During the intervention stage of the research, the teacher used video and cartoon concepts as instructional material to aid the students' understanding of biology. Pretest questions were administered to the students to test their prior knowledge. They were then grouped into two groups to be taught the selected topics using video and cartoon concepts in the teaching and learning of biology. Post-test was administered after the teaching session to see if the teaching and learning were effective on their academic achievement.

### Statistical Analysis

Analysis of data generated was carried out using descriptive statistics of mean, frequency count and percentages. While a t-test was used to answer research questions one and two which involved single group design, Analysis of Covariance (ANCOVA)

was used to answer research question three, which involved a comparison between the means of the groups.

### Results

**Table 1 Mean Score of Students' Academic Achievement in Biology before and after Exposure to Video Concept**

		Mean	N	SD	SD error	T	Df	Sig
Video	Pretest	7.17	65	2.619	-.589	-2.690	64	0.09
	Posttest	8.75	65	4.066				

Table 1 shows the mean score of students' academic achievement in biology before and after exposure to video concept. The mean score is  $7.17 \pm 2.62$  and  $8.75 \pm 4.07$  before and after exposure, respectively. The result, however, showed that the academic

achievement of students taught with video improved significantly after exposure. The result showed a significant difference in the academic achievement of Biology students exposed to video before and after exposure

**Table 2 Mean Score of Students' Academic Achievement in Biology before and after Exposure to Cartoon Concept**

		Paired Sample T-test						
		Mean	N	SD	SD error	T	Df	Sig
Cartoon Concept	Pretest	5.43	86	2.518	0.484	-6.612	85	0.000
	Posttest	8.63	86	3.575				

Table 2 shows the mean score of students' academic achievement in biology before and after exposure to cartoon concept. The mean score is  $5.43 \pm 2.52$  and  $8.63 \pm 3.58$  before and after exposure, respectively. The result, however, showed that the academic achievement of students exposed to cartoon concepts improved significantly after exposure. In addition,

paired-samples t-test for academic achievement of Biology students exposed to cartoon concepts before and after exposure showed a significant difference in the academic achievement of Biology students exposed to cartoon concepts before and after exposure.

**Table 3 Analysis of Covariance of Students' Academic Achievement and Teaching Method in Biology**

Tests of Between-Subjects Effects						
Dependent Variable: Post						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	112.065 <sup>a</sup>	2	56.032	8.478	.000	.103
Intercept	964.356	1	964.356	145.919	.000	.496
Pre-test	.112	1	.112	.017	.896	.000
Teaching Group	112.039	1	112.039	16.953	.000	.103
Error	978.107	148	6.609			
Total	6855.000	151				
Corrected Total	1090.172	150				

a. R Squared = .103 (Adjusted R Squared = .091)

Table 3 shows an analysis of covariance of students' academic achievement in biology. The result of the

analysis of covariance shows that the covariate variable (pre-test scores) was not significant

( $p=0.896$ ), but the predictor variable (teaching group) was significantly associated with the academic achievement scores of students in biology. These results indicated that the pre-test score does not adjust the association between teaching method and students' academic achievement in biology. Pearson correlation was used to test the relationship between video and cartoon concepts, and the result shows a moderately positive correlation ( $r = 0.268$ ,  $p < 0.05$ ).

### Discussion

Investigation of the use of video and cartoon concepts in the teaching and learning of secondary school biology is a study that focused on analysing the impact these teaching strategies will have on students' learning outcomes in Biology.

In research question one, the analysis result showed a significant difference in students' academic achievement in biology before and after exposure to the video concept. Furthermore, it revealed that the students' performance significantly improved after exposure to video in the classroom. This is favourably supported by Sousa, Richter and Nel (2017) findings, who asserted that video (multimedia) is fundamental in the teaching and learning of science since it helps show different levels of abstraction, simulate complex contents and show different phenomena processes. This result is also supported by Saratu, Nzegwu-Ossayogi and Koroka (2020), who reported that instructional packages that are video-based improved students' achievement in Biology. In addition, the findings of Thomas and Israel (2014), who reported a significant difference in students' performance exposed to video, supported results of this study. This result also agrees with the studies of Hapsari and Hanif (2019) and Akinbadewa and Sofowora who discovered that instructional package in form of video for Biology, graphic animation and homework activity was fascinating and reliable. However, the result of this study does not agree with that of Evi-Colombo, Cattaneo and Bétrancourt (2020), who discovered adverse effects of video instructional packages on the academic achievement of students.

The result of research question two revealed a significant difference in students' academic achievement in biology before and after exposure to cartoon concept. There was also a significant increase and improvement in students' achievement after being exposed to cartoon concepts. Concept cartoons is a teaching, learning and assessment technique

employed in the teaching and learning of science (Naylor & Keogh, 2012). Furthermore, the findings of this research work are supported by the results of Ikwuka and Samuel (2017). They stated that cartoon concept (computer animation) had a significant effect on that academic achievement of students. Njoku and Eze-Odurukwe (2015) in their study showed that academic achievements of students are greatly improved if computer animations were used a media of instruction (cartoon concept) and the findings of Aiyedun (2020) stated that cartoon concept aids in the improvement of students' interest, retention and academic achievement.

The analysis of research question three revealed that the teaching method is significantly associated with students' academic achievement in biology. Still, the association is not adjusted by their pre-test scores. The result of this study is supported by the findings of Aslan, Engin, Kurmanbekova, Kayalar, Kayalar, Karagoz and Engin (2021), who stated that concept cartoons, as a teaching method had positive effect in helping students to learn and gain knowledge of Biology compared to other methods. Furthermore, the result of this study is corroborated by the findings of Awad and Kasaji (2018), who reported that animation had a positive effect on students' achievement in biology in general, and aid in the realization of higher and lower levels of thinking in biology. They also stated that students taught with animation have better achievement in biology than those taught with conventional method. In addition, the findings of Kareem (2018) that students under Multimedia Aided Instructions had better achievement than their counterparts in conventional teaching method supports the findings of this study.

### Conclusion

It can be concluded that students' academic achievement with video and cartoon concepts improved significantly after exposure. This implies that introducing these learning strategies would improve academic achievement of students in Biology. These groups of students also showed that the covariate variable (pre-test scores) was not significant, but the predictor variable (teaching group) was significantly associated with students' academic achievement scores in biology. This implies that the pre-test score does not adjust the association between teaching methods and students' academic achievement in biology.



## Recommendations

It is recommended that since the use of video and cartoon concepts in teaching improves students' achievement in Biology, it should be adopted by Biology teachers to facilitate effective learning and teaching of the subject. There is a need for Biology teachers' to continuously build capacity on how to effectively integrate video and cartoon concepts in teaching complex concepts in Biology.

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