

**EFFECT OF ADVANCE ORGANIZER ON STUDENTS' ACHIEVEMENT IN
SECONDARY SCHOOL BIOLOGY IN DEKINA LOCAL GOVERNMENT AREA
OF KOGI STATE**

By

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Abstract

The paper focuses on the effect of advance organizer on students' achievement of secondary school biology in Dekina Local Government Area of Kogi State. The study used a quasi-experimental design. The study was guided by two objectives, two research questions and two hypotheses. The population of the study includes all Senior Secondary School two (SSSII) students from the area of study. A total of one hundred nine (109) students in their intact classes from two schools (one experimental and one control schools) that were involved in the study. The instrument used for the study was a Biology Achievement Test (BAT). Mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypothesis at 0.05 level of significance. Findings from the study revealed that students taught biology using advance organizer did better in achievement than those taught using conventional method. The result further revealed that there was no significant difference in the mean achievement of male and female students taught using advance organizer in biology. It is recommended that basic science teachers should use innovative strategies like advance organizer to foster teaching and learning in biology in order to enhance students' achievement in the subject.

Keywords: Advance organizer, Achievement, Biology, Students

Introduction

Science is a tool for national development and growth of nations. The economic and political strength of a country is always assessed in term of her achievement in science and technology. Also, the level of technological know-how of a nation determines the developmental level and viability of the nation (Nwosu & Nnabuenyi 2005). This is why the National Policy on Education (FRN, 2019) emphasized on the provision of science education at all levels of education in Nigeria. The emphasis placed alongside with the important role it plays towards national development make it pertinent and practically necessary for science to be taught in an organized and well-structured pattern involving activities for both teachers and students. Science and Technology are used to solve human problems. Science is an active pursuit of empirical knowledge via the scientific method (Reeves, 2015),

Biology is a life science that involves the study of plants and animals. The content ranges from microscopic organism to the biosphere in general, encompassing the earth's surface and all living things. Some of the branches of biology include anatomy, morphology, cytology, genetics, entomology, parasitology among others. Yong (2019) opined that the teaching and learning of biology is very important to the development of any nation. Developing a nation involves the preparation of the populace for important careers in medical, paramedical, agricultural, industrial, population, wildlife control and environmental management, to mention but a few.

Biology is the science that contributes to most of the major discoveries of 20th century and still will continue to do so in the 21st century as emphasis moves towards understanding of biological approaches and more eco-friendly synthetic systems such as forensic, environmental, soil and water biology. Biology as a discipline has contributed tremendously to financial, physical and aesthetic benefits of mankind and to nation building (Jensen, 2018). Despite the importance of biology as a science subject, statistics of grades obtained by candidates in the West African Examination Council (WAEC) especially in Biology examination in 2019 have not been encouraging (Chief Examiner's Report, 2019; Ige, 2019; Nwagbo, 2019)

Ryder (2019) defined achievement as the accomplishment of a desired goal. In this case, educational goals or learning outcome or objectives. Previous studies by Ibe (2014) and Obiekwe (2018) have shown that there is a relationship between teaching method and students' achievement. Some of the reasons for low achievement in biology among students in examination is to due factors such as; lack of laboratory facilities, inadequate qualified teachers, and teachers' use of inappropriate teaching methods such as lecture method in teaching biology among other things (Alexander, 2012; Bilgin, 2019).

Lecture method entails one way flow of communication from the teacher to the students and it is teacher - centered approach where by most of the talking is carried out by the teacher while the students remain passive listeners taking notes, thereby denying the students the opportunity to develop the required manipulative skills needed in learning science (Isah, 2007; Kirshner (2016). In order to remedy the problem of students' poor performance in biology, educators like Samba, Achor and Ogbeba, (2010).have called for teachers' use of innovative teaching strategies such as concept mapping, flip style instructional strategy, constructivists' instructional strategies and advance organizer among other things.

Atomatofa, (2013) considers advance organizer as a tool to introduce the lesson topic and illustrate the relationship between what the students are about to learn and the information they have already learned. Mayer in Mshenga (2013) also described an advance organizer as information that is presented prior to learning and that can be used to organize and interpret new incoming information. Thus, advance organizer refers to the process of communicating well in advance, the way in which a lesson will be organized to improve students' comprehension and ability to recall and apply what they learnt. It is an instructional mode in which what to teach is communicated by the teacher to the students in advance of the actual teaching session to guide them obtain facts or information related to the learning content. It is designed to cue the relevant prior knowledge of a learner and it is usually presented at a higher

level of abstraction, generality and inclusiveness than that of the planned lesson (Muiruri, 2016; Omotade, 2016).

Advance organizer refers to a material that is introduced before an unfamiliar content so as to facilitate its assimilation. This could serve as an anchor for the reception of new content. For instance, a film, a chart and text handouts on pollution can be used as a bridge to help learners link between what they knew about pollution and what was to be learnt. Identified common features of an effective advance organizer include the following: It serves as a bridge that links between similarities of the unknown and know; used as an introduction to new material; and an abstract outline of new information and a restatement of old knowledge among other things (Ausubel, 1978; Kapri, 2017).

Students' achievement should be considered not only in terms of teaching method but also in terms of gender. Webster (2018) referred to gender as a socio-cultural construct of ascribing character and roles to sex such as male and female. Gender bias has been prevalent across several segments of our society including academic. While males are considered to be good achievers the reverse is for the female especially in science based discipline. Thus, there is the need to investigate whether the use of advance organizer will have any significant differential effect on male and female achievement in biology among students in secondary schools in Dekina LGA of Kogi State.

Purpose of the Study

The following objectives guided the study.

- i. To determine the effects of advance organizer and conventional method on students' achievement in biology in secondary schools in Dekina LGA.
- ii. To find out the effects of advance organizer on achievement of male and female students in biology in secondary schools in Dekina LGA.

Research Questions

The following research questions guided the study.

1. What is the effect of advance organizer and conventional method on students' mean achievement in biology in secondary schools in Dekina LGA?
2. What is the effect of advance organizer on mean achievement of male and female students in biology in secondary schools in Dekina LGA?

Research Hypotheses

The following hypotheses were formulated to guide the study and were tested at a probability level of 0.05.

Hypothesis One: There is no significant difference in the mean achievement scores of students taught biology using advanced organizer and those taught using conventional method.

Hypothesis Two: There is no significant difference in the mean achievement scores of male and female students taught biology using advanced organizer.

Methodology

The design for the study is quasi-experimental. Specifically the study applied pre-test, post-test Non-equivalent control group design. The population of the study consists of the all

Senior Secondary School Two (SSS II) students in secondary schools in Dekina Local Government Area of Kogi State. Dekina Local Government Area is mainly populated with Igala speaking people whose major occupation is farming with few traders. The Local Government shared boundaries with Bassa, Omala, Ankpa, Ofu and Ajaokuta Local Government Area. A total of one hundred and nine (109) Senior Secondary School Two (SSSII) students from two co-education secondary schools in their intact classes were involved in the study. That is, fifty six (56) students from one experimental and fifty three (53) students from one control school.

The instrument used for the study was Biology Achievement Test (BAT). The BAT instrument consisted of 30 multiple choice objective questions developed by the researcher. The multiple choice question items were developed based on topics in biology curriculum that were taught in the lesson. After trial testing of BAT items, the reliability co-efficient obtained using Kuder Richardson formula (k-R-20) was 0.82. The instrument for data collection was validated by two experts who are biology bias in the Department of Science Education, Kogi State University, Anyigba.

Biology teachers (Research assistants) in sampled schools assisted in two weeks of teaching topics in biology using advance organizer in experimental school and conventional method in control school. Pre and post-test were conducted for SSSII students in both experimental and control schools. The scores obtained from the pre and post-test were analyzed using mean and standard deviation for research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results

The research questions were answered using mean and standard deviations while Analysis of Covariance (ANCOVA) was used to test the hypotheses at $P < 0.05$ level of significance.

Research Question One: What is the effect of advance organizer and conventional method on students' mean achievement in biology in secondary schools in Dekina LGA?

Table 1

Mean Achievement Scores of Experimental and Control Groups

Group	Method	Pre-Test			Post-Test		Gain Scores
		No.	X	SD	X	SD	
Experimental	Advance organizer	56	15.95	4.34	36.13	1.34	20.18
Conventional	Conventional	53	13.08	3.84	30.85	1.21	17.77
Mean Difference			2.17	0.50			

Data in Table 1 shows that the pre-test mean achievement scores for experimental group and control groups were 15.95 and 13.08 with standard deviation of 4.34 and 3.84 respectively and mean difference of 2.17 at pre-test. While the post-test achievement mean scores for experimental groups and control groups were 36.13 and 35.85 respectively with standard deviation of 1.34 and 1.21 and mean difference of 0.50. The achievement gain score for experimental group (20.18) over that of control group (17.77). The higher achievement gain score of experimental group over control group shows that the use of advance organizer had better enhanced students' achievement in biology more than conventional method.

Research Question Two: What is the effect of advance organizer on mean achievement of male and female students in biology in secondary schools in Dekina LGA?

Table 2

Mean Achievement Scores of Male and Female Student Taught Biology using Advance Organizer

Group	Method	Pre-Test				Post-Test		Gain Scores
		Sex	No.	X	SD	X	SD	
Exp.	Advance organizer	Male	32	36.34	1.33	36.69	1.18	0.15
Exp.	Advance organizer	Female	24	35.83	1.31	36.00	1.17	1.14
Mean Difference					0.02		0.01	0.01

Data in Table 2 shows that the pre-test achievement means scores for male and female students taught using advance organizer were 36.34 and 35.83 with standard deviation of 1.33 and 1.31 respectively with gain of 0.02. On the other hand, the post-test achievement mean scores for male and female students taught using advance organizer were 36.69 and 36.00 with standard deviation of 1.18 and 1.17 respectively with gain score of 0.01. This shows that advance organizer enhanced achievement in favour of male than female students in biology.

Test of Research Hypotheses

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught biology using advance organizer and those taught using conventional method.

Table 3

Analysis of Covariance (ANCOVA) of Effect of Mean Achievement Scores of Students Taught using Advance Organizer and Conventional Method

Source	Type III sum of Squares	Df	Mean square	F	Sig.	Decision
Corrected Model	23.810 ^a	2	23.810 ^a	2.43	.028	
Intercept	1492.94	1	1492.94	9135.32	.000	
Pre-test	0.13	1	0.13	0.08	.776	
Method	7.75	1	7.75	2.371	.007	Sig.
Error	256.50	107	1.63			
Total	214339.00	109				
Corrected Total	280.31	108				

a. R Squared = .424 (Adjusted R Squared = .409)

Data in Table 3 shows that the calculated value of F (2.371) for the effect of method on the achievement of students is 0.007. Since the value (0.007) is less than the 0.05 level of significance, the null hypothesis is rejected. Hence there is a significant difference in the mean achievement scores of students taught biology using advance organizer than those taught using conventional method. Thus, achievement was enhanced in favour of students taught using advance organizer than students taught using conventional method in biology lesson.

Hypotheses two: There is no significant difference in the mean achievement scores of male and female students taught using advance organizer in biology.

Table 4

Analysis of Covariance (ANCOVA) of Mean Achievement Scores of Male and Female Students' Taught Biology using Advance Organizer

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	3.608 ^a	2	3.608 ^a	1.012	.371	
Intercept	4904.314	1	4904.314	2750.075	.000	
Pre-test	0.35	1	0.35	0.20	.889	
Method	452.876	1	.000	.000	.000	
Gender	3.580	1	3.580	2.008	.162	Not Sig.
Method * Gender	.000	0	.000	.000	.	
Error	94.517	53	1.783			
Total	73179.000	56				
Corrected Total	98.175	55				

a. R Squared = .438 (Adjusted R Squared = .408)

Data in Table 4 shows that the calculated value of F (2.008) for the effect of gender on students' achievement is 0.162. Since this value is greater than 0.05 level of significance. The null hypothesis is not rejected. Thus, gender has no significant effect on the students' achievement in biology. Thus, there is no significant interaction effect between teaching methods (advance organizer) and gender on students' achievement in biology.

Discussion

Data in Table 3 shows that the calculated value of F (2.371) for the effect of method on the achievement of students is 0.007. Since the value (0.007) is less than the 0.05 level of significance, the null hypothesis is rejected. Hence there is a significant difference in the mean achievement scores of students taught biology using advance organizer than those taught using conventional method. Also, advance organizer enabled the biology teacher to help students develop the spirit of enquiry as well as stimulate their curiosity in biology content. This finding is in agreement with findings in related study by Babu and Reddy (2013) that teachers' use of advance organizer affects students' achievement in mathematics in secondary schools. The findings of the study revealed that there was significant achievement among students when taught using advance organizer compared to those taught using conventional teaching methods.

Therefore, there is need for the use of advance organizer to enhance students' achievement in biology

Data in Table 4 shows that the calculated value of F (2.008) for the effect of gender on students' achievement is 0.162. Since this value is greater than 0.05 level of significance. The null hypothesis is not rejected. Thus, gender has no significant effect on the students' achievement in biology. This finding is in agreement with findings previous studies by Wachanga, Arimba and Mbugua (2013) and physics by Omatade (2016) that knowledge acquired by the students previously was applied in learning which made a tremendous contribution towards learning biology. Students enjoyed biology class when being taught with advance organizer. This is because the use of advance organizer by biology teachers encouraged the students to participate actively in biology lesson. Thus, biology teachers should intensify the use of advanced organizer in order to promote teaching and learning in biology lessons.

Conclusion

The focus of this paper is the effect of advance organizer on achievement of students in biology in secondary schools in Dekina LGA of Kogi State. The findings from the study implies that if biology teachers will employ advance organizer in their lessons, it will go a long way in improving teaching and learning biology thereby leading to better achievement among students in biology in secondary schools.

Recommendations

The following recommendations are made based on the findings of the study;

1. Biology teachers should employ advance organizer in biology lessons promote achievement in biology.
2. Gender achievement in biology can be fostered if teachers are encouraged to use innovative strategies like advance organizer.
3. Teachers should be exposed to the innovative strategies like advance organizer through workshops and seminars in order to improve their teaching skills.

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