Effects of Advance Organizer teaching strategy on Students' Academic Achievement in Biology in Senior Secondary School in Ikere Local Government Area of Ekiti State, Nigeria

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ABSTRACT   *The study investigated the effects of Advance Organizer teaching strategy on students' academic achievement in Biology in Senior Secondary School in Ikere local government area of Ekiti State, Nigeria. The study was a pretest, posttest, control group quasi-experimental design. Purposive and stratified random sampling techniques was used to select a total sample of 100 SS II Biology students (this sample was divided into experimental and control groups in ration 1:1 i.e 50 in each group) from two Senior Secondary Schools in Ikere Local Government Area, Ekiti State. Three null hypotheses were formulated and tested at 0.05 level of significance. The instrument for this study was Biology Achievement Test (BAT) and the treatment package used for the study was tagged: Advance Organizer Instructional Package (AOIP). The data collected were analysed using t-test and ANCOVA statistical analysis packages. The results of the analyses showed that no significant difference existed between the performances of students in experimental and control groups involved in the study at pretest. However, students' achievement in the experimental group at post-test level was found to be significantly better than that of the control group. This showed that Advance Organizer teaching strategy significantly influenced students' academic performance in Biology in senior secondary school. The implications of the results on students' academic performance in Biology are discussed. Based on the findings of the study, conclusion and recommendations were made..*

Key words: *Biology, Biology students, Advance Organizer, Advance Organizer instructional package.*

Introduction

The teaching- learning process is as old as human being on the earth. It has been carried out by human beings and even by animals, to teach their young ones for successful adjustment to existing conditions in their environments (Owoeye, 2016).

Biology is a natural science subject consisting of contents from microscopic organisms to the biosphere general, encompassing the earth's surface and all living things (Okwo, 2004). Considering its characteristics and importance, Biology is a standard subject of instruction at all levels of our educational system, from primary to tertiary levels. It is one of the core subjects at Secondary School Certificate Examination

(SSCE) whose study is very relevant to man's successful living (Akindele, 2009).

Araoye (2009) opined that, exposure to Biology education offers the learners a wide range of relevance to all aspects of life. Most of the students in the senior secondary schools in Nigeria opt for Biology in their senior secondary schools. Biology is quite popular at all levels of Nigerian education. Despite the utilitarian value of Biology in the scientific and technological development of nations, Nigerian students' performances in the subject have not been encouraging (Adekunle and Femi-Adeoye, 2016).

In spite of the importance of Biology as enumerated above, it is pertinent to note that most students still see and learn Biology as an

abstract subject. This is confirmed by the poor performance of students over the years at Senior School Certificate Examination (SSCE) conducted by WAEC as shown in table 1. below:

Table 1: Summary of trends of performance in Biology in the West African Senior Secondary School Certificate Examination, Ekiti State (between 20010-2015)

Year	No. Examined			A1 to C6				D7 to E8				Failure			
	M	F	Total	M	F	Total	%	M	F	Total	%	M	F	Total	%
2010	7726	6862	14588	4280	3412	7692	52.70	3520	3241	3762	25.80	2042	1720	3134	21.50
2011	8883	8249	17132	3889	3564	7453	42.50	3327	3417	6126	35.80	3264	2862	3553	20.70
2012	3358	3317	11527	919	1542	2461	21.35	1664	1691	4175	36.20	1459	1432	4891	42.40
2013	3647	3692	7339	175	210	385	5.25	2272	2364	4636	63.17	1145	1173	2318	31.60
2014	3531	3630	7161	1822	1812	3634	50.74	954	1002	1956	27.32	755	816	1571	21.94
2015	3190	3501	6691	1836	2136	3972	59.36	789	868	1657	24.77	567	495	1062	15.87

Source: Ekiti State Ministry of Education, Science and Technology (2016).

This recent statistics from West African Examination Council WAEC 2010-2015 as shown in table 1 indicates a fluctuation trend in the performance of Nigerian Secondary school students in Biology compared with other science subjects. For instance in 2010, out of 14,588 candidates examined on Biology, only 7,692 (52.70%) score A1 to C6 grade, 3,762 (25.80%) got pass and 3,134 (21.50%) failed. In 2011, 17,132 candidates were examined, only 7,453 (42.50%) recorded A1 to C6 grade, 6,126 (35.80%) scored pass and 3,553 (20.70%) candidates failed. Also, in 2012, out of 11,527 candidates that were examined on Biology, only 2461 (21.35%) candidates had A1to C6 grade, 4,175 (36.20%) scored pass and 4,891 (42.40%) failed. In 2013, out of 7,339 candidates that were examined, only 385 (5.25%) had A1 to C6 grade, 2,272 (63.17%) candidates scored pass and 2,318 (31.60%) failed. In 2014, out of 7,161 Biology candidates that were examined, only 3,634 (50.74%) had A1 to C6 grade, 1,956 (27.32%) candidates had pass and 1,571 (21.94%) failed. Finally, in 2015,

6,691 Biology candidates were examined, 3,972 (59.36%) candidates had A1 to C6 grade, and 1,657 (24.77%) candidates scored pass and 1,062 (15.87%) candidates failed.

The analysis further revealed that not very many of the candidates had credit pass in Biology over the period of observation. In addition, over 40% of the candidates that were examined over the period of observation scored below passes level (i.e. A1 to C6) grade required for admission purpose to read Biology based courses in the tertiary institutions. This situation is disturbing and not in the best interest of the science and technological growth and development of the country.

This poor result calls for serious concern and this concern has been expressed by parents, teachers, employers of labour and the entire society. Several researchers have also pointed out different reasons for students' poor performance, some of which are due to the abstractness of certain aspects of Biology, lack of understanding on the students' part of

certain biological concepts such as ecology (Nzelum, 2010).

The use of Advance Organizer to ensure effective teaching as well as learning in education was advocated by Ausubel (1960) in his advance organizer learning theory. Ausubel (1960) defined an advance organizer as a cognitive instructional strategy used to promote the learning and retention of new information. According to Mayer (2003) Advance organizers is information that is given prior to teaching any concept, and it helps the students to organize and interpret new information. At the start of the lesson, presentation of the advance organizers can be used in the form of probing questions, story or any other way that may help in connecting the new ideas with the previous concepts or ideas which must be learnt by the students.

In explaining meaningful learning, Ausubel (1960) introduced the concept of a sub-sumption model as a pedagogic device in which central and highly unifying ideas are stated in terms of being familiar to the learner, to which the learner can relate new ideas by sub-sumption. The organizer is introduced in advance of learning itself, and is also presented at a higher level of abstraction (Ausubel, 1960). According to Adebola (2011), advance organizer prepares the learners for the materials they are set to learn. Advance Organizers are the means of strengthening the cognitive structure and enhancing the retention of new information. It provides concept and principles to the students themselves as it helps students to develop intellectual skills to raise reasonable questions, concerning the problems for finding out answers.

Araoye (2009) affirmed that students taught using Advance Organizer had higher scores in Biology achievement test than those taught in a conventional way. According to Woolfolk (2001), there are two categories of advance organizer: expository and comparative. Expository organizer functions to provide the learner a conceptual framework for unfamiliar materials, and comparative organizers are used when the knowledge to be acquired is relatively familiar to the learner.

In the same way, Hudson and Fred (2009) cited Novak (1980) that an advance organizer is a kind of cognitive bridge, which teachers use to help learners make a link between what they know and what is to be learnt. Advance organizers are therefore frameworks that enable students learn new ideas or information and meaningfully link these ideas to the existing cognitive structure.

There are two broad categories of advance organizers. One of them is Expository organizers' which are used whenever the new material is totally unfamiliar; they emphasize context and link the essence of the new material with some relevant previously acquired concepts. The other one is "Comparative organizers" which are used when the material to be learnt is not entirely new. They are intended to point out ways in which that material resembles and differs from that which is already known (Curzon, 1990). All the advance organizers were presented to learners before actual classroom instruction took place.

Effects of the use of advance organizers on learning Research into the use of advance organizers suggests that they are of considerable value where the learner may not

be able to recognize his or her prior knowledge as relevant and where the teacher wishes to focus students' attention on relationships among linked parts of an idea and on connections between parts and the whole (Curzon, 1990). Curzon further points out that Ausubel's own research suggests that the use of advance organizers can enhance the relationship between cognitive structure and new material, thus facilitating teaching and learning. A study by Nyabwa (2005) has demonstrated the effectiveness of using advance organizers in the teaching of mathematics in secondary schools.

The general desire to improve teaching performance and students' academic achievement in sciences (particularly, Biology) should be a concern of all stakeholders in education in Nigeria. Emphasis should be among others on the use of innovative teaching strategy such as the use of Advance Organizers. Therefore, this study intends to ascertain whether the use of Advance Organizer teaching strategy would facilitate students' academic achievement in Biology.

Research Hypotheses

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

1. There is no significant difference in the achievement mean scores of students in experimental and control groups before treatment.
2. There is no significant effect of Advance Organizer strategy on students' achievement in Biology in experimental and control groups after treatment.

Results and Discussion

Methodology

The design for this study was two-group pretest-posttest quasi-experimental design. The sample for the study was 100 Senior Secondary Two (SSII) Biology students (this sample was divided into the experimental and control groups in ratio 1:1 i.e. 50 in each group), selected through purposive and stratified random sampling techniques from two public senior secondary schools in Ikere Local Government Area, Ekiti State.

The instrument used to collect relevant data from the subjects was Biology Achievement Test (BAT). The reliability of the instrument was determined through the split-half method with the reliability coefficient of 0.84.

The administration of the instrument was in three stages: the pre-treatment stage (two weeks), the treatment stage (four weeks) and the post-treatment stage (two weeks). Eight weeks altogether were used for the whole study. The experimental group was treated with Advance Organizers instructional package *(AOIP)* (i.e. the students were taught using Advance Organizers package) while, the control group were taught with the same concepts but through the conventional teaching approach.

Two null hypotheses generated for the study were tested at 0.05 level of significance. The data collected were analysed using inferential statistics of t-test and Analysis of Covariance (ANCOVA).

Hypothesis 1

There is no significant difference in the achievement mean scores of students in experimental and control groups before treatment.

Table 2: t-test analysis of achievement mean scores of students in experimental and control groups before treatment

GROUP	N	$\underline{X}$	SD	df	t_{cal}	t_{tab}	Result
Experimental	50	4.61	2.83	98	0.37	1.65	NS
Control	50	4.44	2.94				

P > 0.05 (Result Not significant at 0.05 level),   NS = Not Significant.

As shown in table 2, when the mean score of students in the experimental and control groups before the treatments (pre-test) were statistically compared,   a *t-value* (t_{cal} = 0.37)   with p> 0.05 alpha level was obtained, which was not significant at 0.05 level. This implies that there in no significant difference between experimental and control groups in pretest achievement mean score. Consequently, the null hypothesis which states that there is no significant difference in the achievement mean scores of students in experimental and control groups before treatment was accepted.

Hypothesis 2

There is no significant effect of Advance Organizer strategy on students' achievement in Biology in experimental and control groups after treatment.

In testing the hypothesis, achievement scores of Biology students exposed to Advance organizer strategy and conventional strategy of teaching were computed and compared for statistical significance using Analysis of Covariance (ANCOVA) statistics at 0.05 level of significance. The result is presented in Table 3.

Table 3: ANCOVA showing the effect of Advance Organizer strategy on students' achievementin Biology

Source	*SS*	*df*	*MS*	F_{cal}	F_{tab}
Corrected Model	6946.535	2	3473.267	581.759	3.07
Covariate (Pretest)	2.483	1	2.483	.416	3.92
Group	6423.469	1	6423.469	1075.907	3.92
Error	638.820	107	5.970		
Corrected Total	7585.355	109			
Total	46201.000	110			

*p<0.05

Table 3 showed that the computed F-value (F_{cal} = 1075.907 > F_{tab} = 3.92) with a P-value (P< 0.05 alpha level) obtained from the analysis of the effect of Advance Organizer strategy on students' achievement in Biology at 0.05 level. The null hypothesis was, therefore, rejected. This

implies there is significant effect of Advance Organizer strategy on students' achievement in Biology.

Since the ANCOVA analysis shows a significant effect, Multiple Classification Analysis (MCA) was used to determine the effect of the Advance Organizer on students' achievement in Biology. The result is presented in Table 4.

Table 4: Multiple Classification Analysis (MCA) showing the effect of Advance Organizer strategy on students' achievement in Biology

Grand Mean = 18.74					
Variable + Category	N	Unadjusted Devn	Eta	Adjusted for Independent + Covariate	Beta
Advance Organizer	50	8.70	.92	8.00	.26
Conventional	50	-7.26		-6.68	
Multiple R Multiple R^2					.263 .069

Table 4 showed that, with a grand mean of 18.74, students in the Advance Organizer group had a higher adjusted mean score of 26.74 (18.74+8.00) in Biology than those subjected to conventional method who had an adjusted mean score of 12.06 (18.74+(-6.68). This implies that the use of Advance Organizer strategy is a potent instructional strategy for enhancing students' achievement in Biology.

Discussion

The first finding of this study revealed that the performance of students in both experimental and control groups in pretest were low and do not differ statistically. This finding established the homogeneity of the two groups involved in the study prior to the experiment. In other words, it could be said that the knowledge baseline for the two groups involved in the study are equal. Consequently, any significant difference recorded afterwards would not be ascribed to chance, but to the specific treatments applied. It also revealed that the mean scores was very low for the two groups (experimental and control), this may probably be due to the possible ineffectiveness of the conventional method of instruction generally adopted by Biology teachers in the nation, which might not

have been potent enough to help students in solving their learning problem in Biology.

Another major finding of this study was that the academic performance means scores of students in experimental and control groups were statistically different after the treatment. By implication, therefore, the Advance Organizers teaching strategy was more effective in improving students' performance in Biology than the conventional mode of teaching. This finding is consistent with that of Hudson and Fred (2009) and others, who reported that teaching with Advance Organizers can give both the teacher and students a new outlook and improve the academic performance of the students.

Conclusion

Based on the findings of this study, it can be concluded that Advance Organizers teaching strategy is more potent in improving students' academic performance in Biology in secondary schools than the conventional method in vogue in the nation.

Recommendations

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

➢ Since the hitherto commonly used conventional method of instruction in formal schools had been empirically discovered in this study to be less potent and less effective than Advance Organizers mode of teaching in improving secondary school students' academic achievement in Biology, the conventional method presently in use by Biology teachers should ether be improved upon, modified or replaced with an activity- based teaching strategy (as appropriate).

➢ Biology teacher should be encouraged to adopt Advance Organizers teaching strategy in the teaching of Biology to encourage and stimulate the students' interest in Biology.

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