
Effect of Advance Organizers on Senior Secondary Students' Interest in Biology in
Makurdi Metropolis

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ABSTRACT

The study investigated the effect of advance organizers on students' interest in Biology Two research questions were raised as guide for the study while two research hypotheses were formulated and tested at 0.05 level of significance. Purposive and simple random sampling technique was employed in drawing a sample size of 287. Quasi experimental design of non-randomized pre-test and post-test control group type was employed. The experimental group was taught photosynthesis using advance organizers for a period of seven weeks while the control group was taught the same topic using convectional lecture method within the same period. A Biology interest inventory (BII) was used for data collection. Descriptive statistics of Mean and Standard deviation was used to answer the research questions while Analysis of covariance (ANCOVA) was used to test the formulated hypotheses at 0.05 level of significance. The results indicated that students in the experimental group developed positive interest towards Biology than those taught using conventional teaching method. Further result indicates that there was no significant difference in students' interest based on gender. The study concluded that application of advance organizer strategy by teachers improved students' interests in Biology. Hence, the study recommended that teachers and teacher educators should be encouraged to use advance organizers in teaching Biology so as to improve students' interest in Biology.

INTRODUCTION

Science and technology have become crucial factors for sustainable development worldwide. This is because Science and technology contribute significantly to the quality of life in diverse areas such as; health, agriculture, nutrition, transportation and energy production. (Adejoh, 2010). It is a known fact that, for an individual to function effectively in the society, he/she must be scientifically developed and such a person

must go through Science programmes of which Biology is not an exception. Hence, the need for Biology education. Biology being the study of life has contributed immensely to the development of the society in various ways.

The importance of Biology in the development of any nation cannot be over emphasized. This could be as a result of the numerous roles played by the subject and it also serves as a core subject in the Senior

Secondary schools curriculum for all Science and Science related careers such as medicine, pharmacy, biochemistry etc. thereby making it relevant in the field of science. Biology covers the study of all living things and their interactions in the biosphere. The knowledge acquired from the subject has also enabled man to understand the behavior and functioning of each population when he/she comes across other individuals from other populations or communities and how these populations of the biosphere are affected or benefitted by that behavior or functioning of the populations in a community.

Despite the enormous roles played by Biology to man and the society, students' interest and achievement in the subject over the years seem unsatisfactory as observed by researchers (Akinolu, 2006 and Yusuf, 2010). This low interest could be linked to the approaches used by teachers in the instructional process. Commenting on approaches used in teaching the subject by teachers, Ndioho (2007) stated that, if they are not carefully selected they make the subject uninteresting and inappropriate for the students. By so doing, students shy away from the subject and try as much as possible to avoid it since they already harbour a lot of mixed feelings concerning the subject.

Literature review showed that the conventional teaching method appears overstressed by science teachers; hence they are characterized by researchers as poor method of teaching Biology (Sweller, & Clark, 2006 and Sawa, 2011). Mbajiorgu (2003) pointed out that, in using conventional method, students tend to lose interest in the subject matter since teachers talk most of the time while students listen passively to the teacher and read about the

content thereby making the classroom teaching environment teacher dominated, textbook bound and examination oriented without recognizing the level of understanding among the students as this could lead to loss of interest in the subject. Other Science educators (Olatoye & Adekoya, 2010; James & Olajide, 2011 and Abimbola, 2013) in previous studies relating to methods of teaching science in Nigerian secondary schools opines that the conventional method of teaching Science is ineffective. In a quest for seeking for better ways of improving students' interest in Biology, educators such as Nwachukwu and Nwosu (2007) identified various strategies that are presently used by teachers to teach students namely; concept mapping, problem solving, constructivist approaches amongst others. Constructivism is a philosophy of learning founded on the premise that by reflecting on our experiences we can construct our own ideas and understanding. This theory gave birth to some other instructional models and strategies like advance organizer.

Theoretically, an advance organizer is anchored on the works of Ausubel. Ausubel (1968) in his work, defined advance organizer as devices which represent and connect areas of knowledge to create better understanding. Simply put, it is evidenced based pedagogical strategies that promote learning in a traditional classroom. To Woolfolk (2001) advance organizer is a statement of inclusive concepts to introduce and sum up materials that follow. According to Daniel (2005) Advance organizer are usually presented ahead of a learning task at a higher level of abstraction, generality and inclusiveness to act as a conceptual bridge between the old information and the new

information. Advance organizer can generally be viewed as a cognitive strategy that helps to make complex concepts or tasks clear and they relate known information to unknown information. Advance organizer can be used as a cue tool, collaborative activity or informal assessment tool. There are various types of advance organizers namely: expository, narrative, skimming, graphic organizers and concept mapping. Specifically, this study used expository type of advance organizer. Commenting on the importance of advance organizer, Zaman, Choudhary and Qamar (2015) stated that advance organizer is a pedagogical strategy that helps to increase students' interest in subjects. Thus, enhance the learning and retention ability of students

Interest is a non- intellectual variable that affect students' achievement in subjects. Ajai (2008) defined interest as a psychological factor that has a tendency to make or mar students' participation and achievement in a subject. It has been revealed that students are usually attentive towards a certain subject or topic that appeals to them but show apathy towards other ones that they do not fancy. This degree of attentiveness or apathy goes a long way in shaping their level of participation and subsequently achievement in the subject matter (Nnaka & Anaekwe, 2005).

Many factors have been identified by researchers (Obioma 2005 & Okereke, 2006) as being responsible for students' low interest in subjects. These factors include poor school background, incompetency of teachers and poor instructional approach amongst others. In view of the cardinal roles played by interest in the teaching and learning processes as well as motivating students towards desirable outcomes, it has

become pertinent for the researchers in this study to explore ways of engendering students' interest in Biology using advance organizers as an instructional strategy.

Gender issues have been a major focus in Science education (Biology inclusive) as a result of conflicting views regarding it over the years. Researchers seem not to agree on gender influence on students' interest in science. For instance, Anaekwe (1997) stated that gender has no influence on students' interest in subjects while on the contrary, Njoku and Nwachukwu (2008) maintained that there are gender related differences on students' interest and achievement in chemistry. Though, a lot of works have been conducted on ways of improving gender interest and achievement in science using several approaches. Yet, students' low interest and achievement in the subject is still prevalent (Nwagbo & Chikelu, 2011 and Samba& Iortim, 2014). This situation has created the need for an alternative teaching approach to ascertain if students' interest and subsequently achievement could be improved. Hence, the study.

Photosynthesis plays important roles in understanding of processes in the cycling of matter and energy flow through the ecosystem. Russell (2004) revealed that photosynthesis is one aspect of Biology students find difficult to understand because they feel that it deals with abstract concepts and it is hard to understand. In the same light, Yenilmez and Tekkaya (2006) in another study on photosynthesis submitted that photosynthesis has been judged to be abstract and a difficult concept to learn in Senior Secondary one Biology curriculum as a result of the use of conventional teaching method. In view of the aforementioned, it

has become imperative for the quest and need to use alternative teaching approach different from the present one in usage by teachers to determine students' interest in photosynthesis and subsequently achievement.

Purpose of the study.

The purpose of this study was to investigate the effect of advance organizers on students' interest in photosynthesis. Specifically the study sought to;

- a) Determine the mean interest scores of students taught photosynthesis using advance organizers and those taught using conventional lecture method.
- a. Ascertain the mean interest scores of male and female students taught photosynthesis using advance organizers.

Research Questions

The following research questions were posed to guide the study:

- a) What are the mean interest ratings of students taught photosynthesis with advance organizer and those taught using the conventional method?
- b) What are the mean interest ratings of male and female students taught photosynthesis using advance organizer?

Research Hypotheses

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

- a) There is no significant difference in the mean interest ratings of students taught photosynthesis using advance organizer and those taught using conventional method.
- b) There is no significant difference in the mean interest ratings of male and female

students taught photosynthesis using advance organizer.

RESEARCH METHODOLOGY

The researchers employed a quasi-experimental non-randomized pre-test post-test control group design to measure the effect of advance organizers on SS₁ students' interest in Biology. The design was suitable since it was not possible to have a complete randomization. Intact classes were used for the study. Four schools were selected from 21 secondary schools within Makurdi metropolis using the purposive random sampling technique. The choice for this sampling technique was because of the need for gender and schools with examination center for WAEC. Hence, the researcher chose only those schools that met the criteria. The experimental group was taught with the use of advance organizer for a period of seven weeks while the control group was taught using conventional method within same period too. Two hundred and eighty seven SS₁ students were drawn out of the population of one thousand eight hundred and eighty students. Biology teachers in the four intact classes were drawn for the study to serve as research assistant to carry out the experiment.

The instrument for data collection was Biology Interest Inventory (BII) which was developed by the researchers and administered to the students. The BII was a four-point rating scale of strongly agreed(SA), agreed(A), disagreed(D), strongly disagreed(SD) with respective numerical values of 4, 3, 2, and 1. The questionnaire contained twenty items. The questions raised were directed towards helping the students to express their feelings towards Biology. To establish the validity and reliability of the instrument, the

instrument was given to a panel of experts made up of three experience science educators and to ensure its face and content validity. The study was trial tested to ascertain the reliability coefficient of the instrument using Cronbach's alpha formulae which gave a reliability co-efficient value of 0.81. Data collected were analyzed using descriptive statistics of mean and standard deviation for the research questions while inferential statistics of ANCOVA (Analysis of

covariance) was used for the hypotheses at 0.05 level of significance.

RESULTS

The results are presented based on the research questions and hypotheses

Research question 1: What are the mean interest scores of students taught photosynthesis with advance organizer and those taught using the conventional method?

Table 1: Mean interest and standard deviation scores of students in the experimental and control groups

GROUP	N	PRE-BII		POST-BII		Mean Difference
		X	δ	X	δ	
Experimental	139	48.95	13.89	68.17	8.08	19.22
Control	148	50.04	12.48	51.76	11.54	1.72
Mean difference		1.09		16.41		17.50

The results of Table 1 shows that the pre-BII mean interest scores of the experimental group was 48.95 with standard deviation of 13.89, while the control group had a mean of 50.04 with standard deviation of 12.48. The pre-BII mean difference of the two groups was 1.09, which suggests that the groups were almost at the same level of interest prior to the treatment. While the post-BII mean of the experimental group is 68.17 with standard deviation of 8.08, the control group has a mean interest scores of 51.76 with standard deviation of 11.54. The results further showed that the experimental group gained interest more than the control group, after the treatment.

The mean difference in interest gained by experimental group after treatment is 19.22, while the control group gained mean interest of 1.72. The post-BII mean difference between the two groups is 16.41 in favour of the experimental group. The implication of these results is that the method of teaching employed for the experimental group stimulated the students to gain more interest in the learning of photosynthesis than those in the control group.

Research Question 2: What are the mean interest scores of male and female students taught photosynthesis using advance organizer?

Table 2: Mean interest and standard deviation scores of male and female students.

Gender	N	PRE-BII		POST-BII		Mean DIFF
		X	δ	X	δ	
Male	74	51.96	12.67	67.59	7.28	15.63
Female	65	45.52	14.52	68.83	8.91	23.31
Mean diff		6.44		1.24		7.68

Table 2 above shows the post-BII mean interest score of 67.59 and standard deviation of 7.28 for male in experimental group. The female students in the experimental group had a post-BII mean interest score of 68.83 and standard deviation of 8.91. This shows a mean difference of 1.24 in favour of the female students in the experimental group. The pre-BII/post-BII gains showed that the female subjects had a gain of 23.31, while the male subjects had a gain of 15.63. This means that both subjects gained substantially in interest. However, the pre-BII mean difference of subjects (male & female) was 6.44, the treatment (method), reduced it to 1.24.

The analysis further showed that the mean post-BII score of 51.05 and standard deviation of 11.58 for male is less than that of

female students in the control group. The female students in the control group had a post-BII mean score of 52.70 and standard deviation of 11.51. This shows a mean difference of 1.65 in favour of the female students. The pre-BII/post-BII gains of the control group showed that the male subjects gained 0.78, while the female subjects gained 2.97. The pre-BII mean difference between the subjects in the control group was 0.54 and post-BII mean difference is 1.65. This means that though both sexes gained interest after treatment, the gain is not substantial. More so, instead of reducing the pre-BII/post-BII mean difference between the sexes as with the experimental group, the pre-BII/post-BII mean difference between the sexes increased from 0.54 to 1.65 in the control group.

Hypotheses Testing

Table 3: 2-Way ANCOVA on the post-test interest scores of students in photosynthesis (POST-BII)

Source of Variation	Sum of Squares	df	Mean Squares	F	Sig.	Decision at P < .05
Corrected Model	34350.674 ^b	4	8587.668	179.038	.000	S
Intercept	19545.859	1	19545.859	467.497	.000	S
Pre-BII	14897.822	1	14897.822	310.593	.000	S
Group	799.116	1	799.116	16.660	.000	S
Method	20535.307	1	20535.307	428.125	.000	S
Sex*Method	143.467	1	143.467	2.991	.085	NS
Error	13526.323	282	47.966			
Total	1071141.00	287				
Corrected Total	47876.997	286				

The results of Table 3 indicate that method is a significant factor on students' interest in photosynthesis at $P < 0.05$. The calculated F-value 428.125 is greater than the

critical value. Thus, the hypothesis 2 of no significant difference in the mean interest scores of students taught using advance organizers and those taught using

conventional lecture method is therefore rejected. Hence, the use of advance organizers enhanced interest in photosynthesis.

Hypothesis 2: There is no significant difference in the mean interest scores of male and female students taught photosynthesis using advance organizers

Results from Table 3 revealed that difference in the interest of male and female students in photosynthesis when taught using advance organizer is not significant. This is shown by the calculated F-value of 2.991, which is less than the critical value. Thus, hypothesis 2 of no significant difference in the male and female students' interest is therefore, upheld. That is, though there is a mean difference (1.24), in the mean interest of male and female students, it is not significant to have any appreciable impact on their interest.

DISCUSSION OF FINDINGS

The results of Table 1 revealed that students taught using advance organizer gained interest more than those taught using conventional lecture method. This is evidenced by the mean interest score gain of 19.22 for the experimental group, which is higher than 1.72 for the control group. This was further confirmed in Table 3, which also revealed that method is a significant factor on students' interest in photosynthesis. This is shown by rejecting the null hypothesis of no significant difference in the interest of students taught using advance organizer technique and those taught using conventional lecture method. Thus, the use of advance organizer enhanced students' interest. The implication of these findings is

that the adoption of relevant instructional strategies will enhance meaningful learning and interest of learners in Biology. This finding complies with Zaman, Choudhary and Qamar (2015) who earlier posited that advance organizers helps to increase students' interest in science encourage their participation in lessons and help them to retain what they learn for longer time.

Similarly, the findings on Table 2 revealed that female students gained interest more than the male students did with post-test mean interest scores of 23.31 and 15.63, for female and male respectively. However, their male/female post-test interest mean difference is 1.24. Table 3 confirmed that the difference is not statistically significant. This findings agrees with Anaekwe (1997) who stated that gender has no significant influence on students' interest in learning of subjects. On the other hand, the finding is in conflict with Njoku and Nwachukwu (2008) which maintained that there are gender related differences on students' interest.

CONCLUSION

Based on the findings of the study, the following conclusions were drawn;

- a) Advance organizer is an effective strategy in enhancing students' interest in Biology.
- b) A significant difference exists between the mean interest scores of Biology students taught with advance organizer and conventional method in favour of the advance organizer group.
- c) There exist no significant differences between the interest of male and female Biology students taught with advance organizer.

RECOMMENDATIONS

- a) Secondary school Biology teachers should be encouraged to explore the application of advance organizer in their classroom instructions in other to sustain students' interest in Biology.
- b) Teacher trainers should integrate advance organizer among other instructional strategies to be inculcated into the students.
- c) Seminars and workshops should be organized for serving teachers to keep abreast with principles and implementation process of advance organizer.

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