

Effects of Advanced Organizer Instructional Strategy on Secondary School Biology Students' Interest and Academic Achievement in Abia State

Ajuobi, Chinenye Christiana & Anidu, Innocent Chibuzor

Department of Science Education, Michael Okpara University of Agriculture, Umudike, Abia State
Email: chinnychris90@gmail.com

Abstract

The study investigated effects of advance organizer instructional strategy on secondary school Biology students' interest and academic achievement in Abia State. The need for the study arose from concerns expressed by stakeholder's, committed scholars and researchers on the poor academic achievement and interest of students in Biology, and the need to employ innovative teaching-learning strategies towards ensuring continuity and flexibility in teaching-learning delivery. The study adopted quasi experimental design. The population of the study comprised 14,257 senior secondary school two (SS 11) students, the sample size is 82 SS2 students. Two research questions and two hypotheses guided this study, the instruments used for the study include a Biology Achievement Test (BAT) adapted from WAEC past questions in Biology (2013-2023) and a Biology Interest Rating Scale (BIRS) adapted from Duruaku (2019). Data obtained from trial testing was subjected to a test of reliability analysis using Kuder-Richardson (K-R₂₀) test statistics for Biology Achievement Test and Cronbach's Alpha for Biology Interest Rating Scale. Reliability index of 0.68 was established for Biology Achievement Test and 0.82 for Biology Interest Rating Scale. Mean and standard deviation scores were used to answer the research questions while the Analysis of Covariance (ANCOVA) was used in testing the hypotheses at .05 level of significance. Results showed that students taught Biology using Advanced organizer instructional strategy had higher mean interest scores than students taught Biology using Lecture Method (control group) and it was statistically significant; It is therefore recommended that Biology teachers should use Advance organizer instructional strategy to enhance students' academic achievement and sustain their interest in learning Biology.

Keywords: Academic achievement, Advance organizer, Biology, Interest.

Introduction

The objectives of Biology as stipulated in Biology curriculum for secondary schools, derived from the National Policy on Education of 2014 are to prepare students to acquire adequate laboratory and field skills in Biology, meaningful and relevant knowledge in Biology, the ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture and reasonable and functional scientific attitudes. These objectives, explicitly reveal the indispensable nature of the subject. In view of the importance of Biology, various science educators have expressed concern over the poor academic achievement and interest of students in the subject in senior secondary schools for the past decades (Njoku, 2019). Many factors have been attributed to students' poor achievement and lack of interest in Biology. Ibe (2015) presents the following as prominent factors contributing to the noticed poor performance and interest in Biology: the teaching method used by Biology teachers; learning methods adopted by students, difficult nature of the

topics/concepts, lack of equipment and instructional materials for teaching Biology. Many Biology concepts in the senior secondary school curriculum are perceived to be broad, abstract and difficult to understand by the learners. West African Examination Council (WAEC) Chief Examiner's reports (2016, 2017, 2018) have consistently enumerated some of the weaknesses of the candidates to be poor answers to questions bordering on descriptions, inability to adhere to instructions, poor interpretation of questions, poor definitions amongst many others.

Similarly, Ibe (2015) observed that poor preparation of the students due to weak instructional strategies and dearth of instructional facilities account for students' poor performance at public examinations in Biology. The inability of students to engage actively in the learning process tends to dispose the students to constant rote learning and examination misconduct leading to poor academic achievement and retention.

Okarter (2018) also attributed students' poor achievement in science subjects to poor instructional and learning methods, involving excessive copying of notes, rote-learning as encouraged by expository method of instruction. Since the traditional method of teaching and learning Biology does not seem to be yielding much result, Okebukola (2013) suggested a shift beyond the conventional approaches to teaching and learning Science, Technology, Engineering and Mathematics, (STEM) for an improved performance and interest in STEM. Interest, an aspect of affective response, is a construct that has to do with the level to which one likes or dislikes something. It could be aroused in an individual by activity that tends to satisfy the individual's needs. Since a lot of Biology concepts are adjudged uninteresting, students' interest in the subject can easily be at low ebb (Kuru, 2019). Ibe (2017) revealed three views of students which contribute directly to low interest in science: i) science teaching is mostly transmissive; (ii) the content of school science has an abstractness that makes it irrelevant and (iii) learning science is relatively difficult, for both successful and unsuccessful students. Okarter (2018) maintained that students' interest in learning science subjects of which Biology is one of them could be achieved through carefully choosing the most appropriate instructional strategy.

Interest is a subjective feeling of concentration or persisting tendency to pay attention and enjoy some activity or content (Abakpa, 2011). Interest can also be described as a persistent tendency to pay attention and enjoy some activities or contents (Nworgu, 2015). Though some students may be intellectually and physically capable of learning, they may never learn until their interest is stimulated. Once the students are stimulated, they will come to learn as long as the teacher is capable of sustaining their interest in the subject matter. This is because interest is a sign of attention, once there is direct interest, attention is guaranteed and learning is assured (Nworgu, 2015).

Accordingly, Ugwuanyi (2013) pointed out that the type of interest a student brings into the classroom is a very important factor for his/her achievement or otherwise. According to Ibe (2016), teachers need to arouse the learners' interest in learning activities to obtain optimum performance from learners. This, they can do through positive motivation, use of a variety of instructional materials, using a variety of questioning skills, especially higher order and divergent questions as well as active participation by the learners in class activities which includes the use of an advanced organizer. An advance organizer intends to structure student

thinking and make the new information easier to understand. This tool in lesson organization helps students avoid information overload during expository instruction. An advance organizer directly links previously learned knowledge to the information contained within the lesson to make memorization easier. The three primary purposes of advance organizers are to: Provide information organization; Tie in previously learned information to new information; and aid in the learning process (Barkley, 2018).

Advanced Organizers can take a variety of forms from brief expository overviews to help students make meaning of subject content to graphic representations that provide a framework for information (Dawson, 2023). One important way in which expert and novice learners differ is in the density of connections among concepts, facts and skills. In addition to giving students a framework within which to fit new information, advance organizers help students focus during lessons, whether given in-person or delivered in a pre-recorded format. The duration of a student's attention span will vary for a variety of reasons, but research suggests that we should anticipate attention lapses and intersperse listening to videos or lectures with frequent activities to bring attention back to the content, integrate low stakes opportunities for students to self-assess understanding and highlight key points and takeaways (Drury, 2023).

Academic achievement is defined by Umo (2013) as the measure of students' learning acquisition of certain skills at the end of teaching and learning activities. The academic achievement of a child could also be seen as the educational learning outcomes of the child in a school setting (Echetama, 2019). Ekwebelem (2012) defines academic achievement as a measure of knowledge gained in formal education usually indicated by test scores, grades, grade points, average and degrees. Here, the achievement level of the student is judged by the marks that the students have scored in the quarterly examinations. Students spend most of their time in schools which exerts an influence on performance through curricula and teaching techniques. Students' academic performance can increase or decrease by the learning styles of individuals. There is a close relationship between academic achievement and teaching and learning techniques used in the class. Academic achievement encompasses the knowledge, skills and ideas gained and maintained through the course of study within and outside the classroom situations (Abakpa, 2011). Determination of students' academic achievement is done using an achievement test. It is designed to determine the extent to which

testees have achieved mastery of specified objectives of lessons, which they have been taught as at the time of testing (Abakpa, 2011). It can also be referred to a test, designed to determine the extent learners have mastered what they have been taught. In the view of Nworgu (2015), the essence of achievement test is to determine the degree of attainment of individuals in tasks, courses or programmes to which the individuals were sufficiently exposed.

Umo (2013) stated that if at the end of a course, a test is given covering the areas taught in the course, the test is an achievement test. When we talk of the end of course, it could mean the end of a programme, end of year, term, week, or lesson. The important thing is that somebody is taught and after the teaching a test is given based on the instructional content. If after a lesson, the teacher administers a test covering the lesson, it is an achievement test.

Research Questions

The following research questions guided the study:

1. What are the mean interest scores of students taught Biology using Advance organizer instructional strategy and lecture teaching method?
2. What are the mean achievement scores of students taught Biology using Advance organizer instructional strategy and lecture teaching method?

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

HO₁: There is no significant difference in the mean interest scores of students taught Biology using Advance organizer instructional strategy and those taught using lecture teaching method.

HO₂: There is no significant difference in the mean achievement scores of students taught Biology using Advance organizer instructional strategy and those taught using lecture teaching method.

Research Methods

The study adopted a pre-test -post-test quasi-experimental research design that involves one experimental group and one control group. This study used intact classes for the study. The students in the experimental group were taught using advanced organizer instructional strategy while the students in the control group were taught the same topic using the lecture teaching method. The population of this study is 14,257 senior secondary school two (SS 11) Biology students in all the 253 public secondary schools in Abia State. The total number of students in the two intact classes formed the sample size of 82, 40 males and 42 females respectively. Simple random sampling technique was used to select an education zone from the three education zones in Abia state. The simple random sampling technique by balloting was used to select two (2) local government areas from the selected education zone. One public co-educational school from each of the two sampled local government areas was drawn using purposive sampling because schools that have functional ICT facilities for the utilization of graphic organizer were considered. Assignment of the schools to experimental and control groups was through balloting. The instruments used for the study include: a Biology Achievement Test (BAT) adopted from WAEC past questions in Biology (2013-2023) and a rating scale titled Biology Interest Rating Scale (BIRS) adapted from Duruaku (2019). The BIRS contain 18 items in a "tabular form". The respondents were advised to tick [✓] appropriately as they wish, using the four point rating scale of Very High Extent (VHE), High Extent (HE), Moderate Extent (ME), Low Extent (LE) and they are rated as 4 points, 3 points, 2 points and 1 point respectively. Mean and Standard deviation were used to answer the research questions while Analysis of Co-Variance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. This implies that any p-value that is less than .05 is significant and therefore, the null hypothesis was rejected. Any p-value that is equal to or greater than 0.05 is not significant and therefore, the null hypothesis was not rejected.

Results

Table 1: The Mean Interest Scores of Students taught Biology using Advance organizer instructional strategy and Lecture Teaching Method

Variables	N	Pre-Test Mean	Post-Test Mean	Gain Score	SD of Pre-Test	SD of Post-Test
Advance organizer	42	50.12	65.43	15.31	8.21	7.15
Lecture Method	40	49.63	59.38	9.75	9.68	8.49

Table 1 above shows the mean interest scores of students who were taught Biology with Advance organizer instructional strategy and Lecture Method. It shows that the pre-test and post-test mean interest scores of students taught with Advance organizer instructional strategy are 50.12 and 65.43 respectively with a gain interest score of 15.31. This indicates an enhanced interest on the students.

Similarly, the table presented the pre-test and post-test mean interest scores of students taught Biology with Lecture Method as 49.63 and 59.38 with gain score of 9.75. The gain interest scores of students taught with Advance organizer instructional strategy were higher than the gain interest scores of students taught with Lecture Method.

Table 2: Analysis of Covariance on the Mean Interest Scores of Students taught Biology using Advance Organizer Instructional Strategy and those taught Biology using Lecture Method.

Source	Sum of Squares	Df	Mean Square	F	Sig.	Remarks
Corrected Model	753.090 ^a	2	376.545	6.062	.004	S
Intercept	11778.056	1	11778.056	189.606	.000	
Pretest	2.299	1	2.299	.037	.848	
Treatment	643.148	1	643.148	10.354	.002	
Error	4907.361	79	62.118			
Total	325723.000	82				
Corrected Total	5660.451	81				

R Squared = .133 (Adjusted R Squared = .111) S=significant

Table 2 shows that the F-ratio is 10.354 with (1,79) degree of freedom. However, since the P-value of .002 is less than the associated alpha level of .05 ($p < 0.05$), the null hypotheses which states that there is no significant difference in the mean interest scores of students taught Biology with Advance organizer

instructional strategy and those taught Biology using Lecture method is rejected. This implies that there is a significant difference in the mean interest scores of students taught Biology using Advance organizer instructional strategy and those taught Biology using Lecture Method.

Table 3: The Mean Achievement Scores of Students taught Biology using Advance Organizer Instructional Strategy and Lecture Teaching Method

Variables	N	Pre-Test Mean	Post-Test Mean	Achievement Gain	SD of Pre-Test	SD of Post-Test
Advance Organizer	42	43.24	83.14	39.90	5.60	5.59
Lecture Method	40	43.25	66.45	23.20	5.79	5.88

Table 3 above shows the mean achievement scores of students who were taught Biology using Advance organizer instructional strategy and Lecture method. It shows that the pre-test and post-test mean scores of students taught Biology with Advance organizer instructional strategy are 43.24 and 83.14 respectively with a gain score of 39.90. Similarly, the

table presented the pre-test and post-test mean scores of students taught Biology with Lecture method to be 43.25 and 66.45 with gain score of 23.20. The mean achievement score of students taught Biology with Advance organizer instructional strategy was higher than the mean achievement score of students taught with Lecture method.

Table 4: Analysis of Covariance on the Mean Achievement Scores of Students taught Biology with Advance Organizer Instructional Strategy and those taught Biology using Lecture Method.

Source	Sum of Squares	df	Mean Square	F	Sig.	Remarks
Corrected Model	5784.156 ^a	2	2892.078	89.463	.000	S
Intercept	9217.386	1	9217.386	285.128	.000	
Pretest	75.199	1	75.199	2.326	.131	
Treatment	5707.565	1	5707.565	176.556	.000	
Error	2553.844	79	32.327			
Total	469588.000	82				
Corrected Total	8338.000	81				

a. R Squared = .694 (Adjusted R Squared = .686)

S=significant

Table 4 shows that the F-ratio is 176.556 with (1,79) degree of freedom. However, since the P-value of .000 is less than the associated alpha level of .05 ($p < 0.05$), the null hypotheses which states that there is no significant difference in the mean achievement scores of students taught Biology with Advance organizer instructional strategy and those taught Biology using Lecture method is rejected. This implies that there is a significant difference in the mean achievement scores of students taught Biology with Advance organizer instructional strategy and those taught Biology using Lecture Method

Discussion

Results as regards to The Mean Interest Scores of Students taught Biology using Advance Organizer Instructional Strategy and Lecture Method showed that students who were taught Biology using Advanced organizer instructional strategy had higher mean interest scores than students taught using Lecture Method (control group) and it was statistically significant maybe because of the teaching method used and also the students taught using advanced organizer performed better than their counter parts. The results of this study is in agreement with the report of Mehar (2018) who carried out a research work to compare the effectiveness of Graphic Organizer Model and traditional method of teaching in high school Geography. The result of his study shows that the mean difference in scores of students is higher when taught with the help of Graphic organizers model. This could be because Advance organizer ignites the learning curiosity of students to find out more about the topics being treated, thereby, increasing their interest. In the course of this study, it was observed that the use of Graphic organizers in the classroom made the class to be calm and fascinating. The findings of this research showed that male students taught Biology using Advanced organizer instructional strategy have

slightly higher mean interest scores than their female counterparts but was not statistically significant. This could be due to the graphic organizers on some of the Biological videos which they watched that could have probably attracted them and stirred up their interest positively. Again, since there was no statistically significant difference, it also shows that the instructional strategy is gender-friendly.

The result of the analysis with respect to The Mean Achievement Scores of Students taught Biology using Advance Organizer Instructional Strategy and Lecture Teaching Method showed that students taught Biology using Advanced organizer instructional strategy achieved higher than students taught using Lecture Method (control group) and it was statistically significant. The findings of this study is in agreement with the results of Omondi, Keraro and Anditi (2018) who investigated the effects of using advance organizers on students' academic achievement in Biology in secondary schools in Kilifi County. The findings of their study show that there was statistically significant difference in academic achievement between learners in favour of those taught using advance organizers compared to those taught using conventional teaching methods. The reason why the group taught with Advanced organizer instructional strategy achieving higher than their counterparts taught with lecture method could be because of the graphic organizers which ignited and stirred up their interest positively, hence, leading to higher academic achievement.

Conclusion

Based on the findings of this study, the following conclusions are made. The study has shown that the use of Advance organizer instructional strategy have significant effect on students' interest, academic achievement and retention in Biology more than the lecture method. Also, Advance organizer instructional strategy is gender-friendly, meaning that

it does not discriminate among any gender and therefore, should be encouraged.

Recommendations

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

1. Biology teachers should use Advance organizer instructional strategy to enhance the interest and academic achievement of students since it is more effective than using lecture method.
2. Seminars and workshops should be organized by federal and state ministries of education; professional bodies like Science Teachers Association of Nigeria (STAN) and private individuals or organizations for training and re-training of new and old teachers where they will be taught the use of Advance organizer instructional strategy. This will ensure continuity and flexibility in teaching-learning delivery.

References

- Abakpa, B. O. (2011). Effects of mastery learning approach on senior secondary school students' achievement and interest in geometry. *Unpublished Ph.D. Thesis*; University of Agriculture, Makurdi, Nigeria.
- Barkley, E. F. (2018). *Interactive Lecturing: A Handbook for College Faculty*. John Wiley & Sons, Incorporated.
- Dawson, D. (2023). Advance Organizers: Setting the Stage for Learning and Retention. <https://teaching.temple.edu/edvice-exchange/2022/04/advance-organizers-setting-stage-learning-and-retention>.
- Drury, M. (2023). Advance Organizers. <https://study.com/learn/lesson/advance-organizers-types-strategy.html>
- Duruaku, I. C. (2019). Effects of simulation and jigsaw teaching methods on students' achievement and interest in senior secondary biology. *An Unpublished masters degree thesis*. Imo state University, Owerri.
- Echetama, S. U. (2019). Effects of concept mapping and scaffolding on the academic achievement of secondary school students in Biology. *An Unpublished masters degree thesis*. Imo State University Owerri.
- Ekwebelem, I. B. A. (2012). The effects of co-operative peer assisted learning on reading skills of remedial studies. *The Educational Psychologist*, 6(1), 204-209.
- Ibe, H. N. (2015). Effects of learning styles on the performances of senior secondary school biology students. *International Association of African Researchers and Reviewers*, 9(1), 36.
- Ibe, H. N. (2016). Facilitating creativity in science students' through teacher professional development. *African Research Review*, 10(2), 266-274.
- Ibe, H. N. (2017). Boosting biology students' achievement and Self-concept through constructivist-based Instructional model (CBIM). *Global Journal of Educational Research*, 16(2), 129-137.
- Mehar, R. (2018). Effect of graphic organizer model on achievement and retention in geography. *Online Journal of Multidisciplinary Subjects*, 12(1), 523-533.
- Kuru, A. C. (2019) Effects of two metacognitive strategies on the academic achievement of students in Biology. *An Unpublished Masters degree thesis*. Imo State University, Owerri.
- Nworgu, B. G. (2015). *Educational Research Basic issues & Methodology*. Enugu: University Trust Publishers.
- Okarter, E. N. (2018). Effect of reciprocal peer question and conference style learning on students' academic achievement and affective responses in chemistry. *An Unpublished Doctoral Thesis*. Imo State University, Owerri.
- Okebukola, M. (2013). Improvisation of instructional materials in teaching and learning.
- Omondi, K. K.; Keraro, F. N. & Anditi, Z. O. (2018). Effects of advance organizers on students' achievement in biology in secondary schools in Kilifi County, Kenya. *Frontiers in Education Technology*, 1(2), 191-205.
- Ugwuanyi, C. S. (2013). Assessment of senior secondary school students' conceptual understanding of force and motion. *Unpublished M.Ed thesis*. University of Nigeria Nsukka.
- Umo, U. C. (2013). Effect of games on the achievement and interest of junior secondary school students in Igbo grammar. *Unpublished Ph.D dissertation*. University of Nigeria, Nsukka.
- West African Examination Council (2019). Chief Examiners Report in Biology.
- Zaman, T. U.; Choudhary, F. R. & Qamar, A. M. (2015). Advance organizers help to enhance learning and retention. *International Journal of Humanities Social Sciences and Education (IJHSSE)*, 2(3), 45-53.