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EFFECTS OF SEQUENTIAL TEACHING METHOD ON SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT AND RETENTION IN BIOLOGY IN FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA.

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ABSTRACT

The study investigated the effects of Sequential Teaching Method on senior secondary school students' achievement and retention in Biology, in Federal Capital Territory Abuja, Nigeria. The research design used was quasi-experimental using pre-test, post-test and post-post-test control group approach; the study was carried-out in two randomly selected co-educational secondary schools in Federal Capital Territory, Abuja, Nigeria. The sample size was 115 biology students from two selected classes in the sampled schools. The instruments for data collection were Biology Achievement Test (BAT) and Biology Retention Test (BRT). Descriptive statistics were used to answer the research questions while t-Test inferential statistics was used to test the null hypotheses. The results of the analysis showed that there was significant difference in students' academic achievement in biology between those exposed to sequential teaching method and their counterparts taught with conventional method; there was significant difference in students retention in Biology between those exposed to sequential teaching method and their counterparts taught with conventional method; It was concluded that sequential teaching method has positive effect on students' academic achievement and retention in biology concept. It was recommended based on the findings of the study that workshop, seminars and conferences should be organized for biology teachers to make them familiar with the knowledge of sequential teaching method and they should be encouraged to use it in their classroom teaching and learning activities.

KEYWORDS: *Sequential Teaching Method, Senior Secondary School, Achievement and Retention.*

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INTRODUCTION

Science Education is defined as the study of the connection between science as a discipline and the application of educational principles to comprehend science teaching and learning in the classroom (Dabah, 2016). This means that science education acquaints students with certain basic knowledge, skills and attitudes needed for future work in science and science-related fields. Science as school subjects comprises of Physics, Chemistry, Mathematics, Agriculture and Biology are all descriptive science which is very much linked to human life unlike Chemistry and Physics which are quantitative in nature.

Biology is one of the core science subjects that senior secondary school students offer in Nigerian secondary schools, it was introduced to students at this level as a preparatory ground for human development, where career abilities are groomed, potentials and talents are discovered and energized (FGN, 2013). It is also a prerequisite for higher learning in a number of science related professional courses like medicine, zoology, botany, biochemistry and microbiology. Biology is very wide with many branches such as genetics, ecology, morphology, evolution and the more advanced cell biology among others. Hence biology is correlated to scientific development of individual and the nations. Despite the critical role of biology education in fostering scientific literacy and national development, students continue to exhibit poor performance and retention in the subject.Evidence from West African Examinations Council (WAEC) showed poor performance in biology as the number of students that passed Biology at credit level (A1-C6) is observed to be consistently less than 50% for instance in 2018 (26.08%), 2019 (39.65%), 2020 (36.39%), 2021 (71.20%), 2022 (69.3%)2023, (79.81%) and 2024 (72.12%). Many researchers such as Sakiyo and Waziri (2015); Twan and Useni (2022) have attributed this unsatisfactory achievement to many factors among which include lack of adequate laboratory facilities, unconducive learning environment, high student-teacher ratio, wide content of curriculum and most importantly, the predominant use of conventional methods of teaching in the classroom.

The conventional teaching method is concerned with the teacher being the center of the learning environment. It does not encourage deeper students' involvement as they are passive recipient of information already acquired by the teacher. Also, it does not facilitate the development of reasoning skills and processes in the students. These and among other reasons had not enhanced learning in students and thus had led to poor achievement and retention of biology concepts among students in secondary schools.

These shortcomings of conventional methods have driven education stakeholders to search of alternative approaches that may be employed to enhance achievement and retention of conceptsamong students in the classroom, this ushered in the era of innovative teaching methods such as cooperative learning, concept mapping, problem based learning and sequential teaching method.

Sequential teaching method is an instructional strategy that engages students to learn a particular topic in logical order of display or is a process of imparting knowledge to learners using different instructional strategies in logical order. It provides a concrete basis for promoting critical thinking skills and enhance students' achievement. A study on the adoption of sequential teaching strategy may enhance students' achievement and retention.

Academic achievement is the measure of what a student has accomplished after exposure to educational programme. Anekwe(2016) views achievement as a measure and comparison of skills across different academic fields. On the other hand, retention involves the ability to recall the content that has been taught within a specific period of time. It is the ability

exhibited by learner to demonstrate what he/she has learnt and has been able to demonstrate his/her cognitive skills in the subject learnt (Emmanuel, Ogbeba, & Ahmed, 2014).

Based on this background therefore, the present study investigated the effect of sequential teaching methods (STM) on senior secondary school students' achievement and retention in Biology.

Purpose of the Study

The purpose of this study was to investigate the effects of sequential teaching methods on senior secondary school students' achievement and retention in Biology. Specifically, the objectives of the study were to:

i. Compare the mean achievement scores of students taught Biology using sequential teaching method with those taught using conventional method;

ii. find out the mean retention scores of students taught Biology with sequential teaching method and those taught with conventional method;

Research Questions

The following research questions were raised to guide this study:

1. What are the mean achievement scores of students taught Biology using sequential teaching method and those taught using conventional method?
2. What are the mean retention scores of students taught Biology using sequential teaching method and those taught using conventional method?

Hypotheses

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

HO_1: There is no significant difference in the mean achievement scores of students taught Biology using sequential teaching method and those taught with conventional method.

HO_2: There is no significant difference in the mean retention scores of students taught Biology using sequential teaching methods and those taught with conventional method.

METHODOLOGY

The design adopted for this study was quasi-experimental research design of pre-test, post-test and post-post-test control group approach. The pre-test was used to establish the equivalence of the two groups, while the post-test was used to determine the effects of two independent variable that is sequential teaching methods (experimental) and conventional talk-chalk method (control) groups.

The population for this study was two thousand, four hundred and fifty eight (2,458) Senior secondary school, class two (SS II) biology students categorized according to their sexes as male students (1,344) and female students (1,114) in the eight (8) public senior secondary schools in Kuje, FCT (Federal Capital Territory Secondary Education Board, 2022). The reason for the choice of this class was that SS II students were not new to biology and as such would have acquired the basic pre-requisite knowledge in the subject. Also, at this level they are not likely to face any immediate external examinations.

A sample size of One hundred and Fifteen (115) biology students was used for the study. Multi stage sampling procedure was adopted in selecting the sample size. At first stage, purposive sampling was employed to select two co-educational secondary schools that

include coeducational senior secondary schools.At the second stage of sampling, one class of biology students from the two sampled schools was selected using balloting and the two classes would be assigned to experimental group and control group.

The research instruments used for data collection in this study was Biology Achievement Test (BAT) and Biology Retention Test (BRT). The Biology Achievement Test (BAT) was used to measure students' achievement in biology concepts. It consisted of thirty (30) multiple choice questions with four (4) options lettered A, B, C and D. Each item in Biology Achievement Test (BAT) carry 1 mark and the total was 30 marks. The test items were based on concepts in ecological management, association, tolerance, adaptation, pollution, nutrient cycling in nature, basic ecological concepts, population studies and conservation of natural resources adapted from past West African Examination Council (WAEC, 2015-2020). The researcher prepared a table of specification (Test blue print) to guide the test development, in accordance to the senior secondary curriculum.

The Biology Retention Test (BRT) was used to test retention and was drawn from BAT questions which were reshuffled before it was be administered as post post-test to experimental group after 30 days of post-test. The reason for this is in order to avoid retention error and to help the researcher in lesson plan.

The Biology Achievement Test (BAT) and Biology Retention Test (BRT) was subjected to face and content validity. The validation was done by two (2) experts one from the Department of Science and Environmental Education, University of Abuja, and one experience biology teacher from the selected school to check the content validity. The correction made by these experts was used to review the instruments (BAT and BRT).

After the validation, the BAT and BRT items was subjected to pilot test to find out the reliability of the instruments using one intact class consisting of fifty (50) SS2 Biology students outside the scope of the study. The reliability of both BAT and BRT was determined using test re-test method and Pearson Product Moment Correlation Coefficient (r) was adopted to determine the reliability coefficient of the two instruments which gave 0.85 and 0.78 respectively. This indicated that the items were reliable within the acceptable limits.

The BAT and BRT were administered as pre-test for both experimental and control group, after which the researcher and the research assistants went round the selected schools and though students personally for 10 weeks during their lesson periods using the prepared lesson plan. However, in the last one week, the researcher administered the BAT post- test. The script were marked and recoded with the use of the developed marking scheme. The Marks obtained from the pre- test and post- test from the instruments (BAT and BRT) were used as data for this study which were also used to determine the effectiveness of sequential teaching methods on students Achievement and retention in biology.

The data collected were analyzed using descriptive and inferential statistics. The Research questions was answered using frequency counts, means and standard deviations while, t-test statistics to test the hypotheses formulated at 0.05 alpha level of significance. The analysis was computed with the use of the Statistical Package for Social Science (SPSS), version 21.

Results

This shows the analysis of data and test of hypotheses as used in the study.

Research Question One: What are the mean achievement scores of students taught Biology using sequential teaching method and those taught using conventional method?

Table 1: Descriptive Statistics showing mean Achievement scores of students in experimental and control groups

Group	N	Mean Scores		SD	Mean Gain
		Pre- test $\overline{X}$	Post-test $\overline{X}$		
Experimental	65	32.93	47.93	14.33	15.00
Control	50	24.05	29.19	8.65	5.15
Mean Difference		8.88	18.74		9.85
Total	**115**				

Results in Table 1 shows the mean and standard deviation on the pre-test and post-test achievement scores of students exposed to the sequential teaching method (STM) and conventional method. From the table, the mean scores for pre-test and post-test of the experimental group was 32.93 and 47.93 with a standard deviation of 14.33. While in the control group the mean scores for pre-test and post-test was 24.05 and 29.19 with a standard deviation of 8.65.The mean gain of the students taught Biology using sequential teaching methods was 15.00. While students who were taught using conventional method had mean gain of 5.15. This means that the overall mean difference between the groups was 9.85 in favour of students taught using sequential teaching methods. Therefore, the mean achievement scores of students taught Biology using sequential teaching methods (STM) was higher than those taught using conventional method with a mean gain of 9.85 in favour of the experimental group which is an indication that the students in the experimental group performed better than the students in the control group.

Research Question Two: What are the mean retention scores of students taught Biology using sequential teaching method and those taught using conventional method?

Table 2: Descriptive Statistics showing Retention scores of Students Taught biology with sequential teaching method and those Taught using conventional method

Group	N	Mean Scores		Std	Mean Gain
		Pre-test $\overline{X}$	Post-test $\overline{X}$		
Experimental	65	32.39	55.08	16.07	22.15
Control	50	24.05	31.79	10.36	7.11
Mean Difference		8.88	24.11		15.04
Total	**115**				

Table 2 shows the means and standard deviation on the pre-test and post-test and retention scores of students exposed to the sequential teaching methods (STM) and conventional method. From the table, the mean scores for pre-test and post-test of the experimental group was 32.39 while and 55.08 with a standard deviation of 16.07. While in the control group the mean scores for pre-test and post-test was 24.05 and 31.79 with a standard deviation of 10.36. The mean gain in retention scores of the students taught Biology using sequential teaching method was 22.15 while students who were taught using conventional method was 7.11. The

overall mean difference between the groups was 15.04 in favour of students taught using sequential teaching method. Therefore, the mean retention score of students taught biology with sequential teaching method was higher than those taught using conventional method.

HO_1: There is no significant difference in the mean achievement scores of students taught Biology using sequential teaching methods and those taught with conventional method.

Table 3: Two tailed t-test Result in Respect of Mean Achievement Scores of students in the Experimental and Control Groups

Groups	N	$\overline{X}$	Std	df	t-value	p-value	Decision
Experimental	70	47.93	14.33				
				113	11.580	0.000	Rejected
Control	45	29.19	8.65				

Table 3, shows that there was significant difference between the mean achievement scores of students exposed to sequential teaching methods and those taught with conventional method as t-value = 11.580, df = 113? P<0.05. As a result, the hypothesis was rejected. Therefore, there is significant difference between the biology achievements of secondary school students taught using sequential teaching method and those taught conventional method.

H02: There is no significant difference in the mean retention scores of students taught Biology using sequential teaching methods and those taught with conventional method.

To test for this hypothesis, t-test statistics was used and the results presented in Table 10.

Table 4: Two tailed t-test Result in Respect of Mean Retention Scores of students in the Experimental and Control Groups

Groups	N	X	Std	df	t-value	p-value	Decision
Experimental	60	55.08	16.07				
				113	10.990	0.000	Rejected
Control	55	31.79	10.36				

Table 4 shows that there was significant difference between the mean retention of students exposed to sequential teaching methods and those taught with conventional method as t-value = 10.990, df=113, P<0.05. As a result, the hypothesis was rejected. In other words, respondents from both groups differed significantly in their mean retention scores in favor of the experimental group who were taught using sequential teaching methods.

Discussion of Findings

The results of the analysis for Research Question One and Null Hypothesis One reveled a statistically significant difference in mean achievement scores between the experimental and control groups. Specifically, the findings indicate that students who received instruction via sequential teaching methods demonstrated significantly higher achievement in Biology concepts compared to their counterparts in the control group, thereby suggesting the

effectiveness of sequential teaching methods in enhancing student achievement in senior secondary school biology.

The finding confirms those of Dajal, Apochi and Paul Fiase (2022) who in their study found that exposure of the learners to Sequential Teaching Method was found to positively affect the enhancement of students' achievement in Biology. The findings also lend support to those of Dajal and Mohammed (2019), Selviana and David (2017) who found significant difference in favour of the experimental group. The reason for the significant difference between the mean achievement scores of two groups was because STM motivates students to interact effectively with one another giving them opportunity to engage better in the learning activities and this result is similar with their studies because both used sequential method of teaching.

One of the findings of the study from research question two and null hypothesis two revealed that there was no significant difference between the mean retention score of students taught biology with sequential teaching method and those taught with conventional teaching method. On this bases, therefore, second hypothesis was not rejected. In other words, respondent from both groups differ significantly in their retention in biology in favor of experimental group. The findings supported Muhammed (2024), who reported significant difference in favour of the experimental group. Similarly, research conducted by Mondoh, Namasaka and Kerero (2013) showed that STM increases motivation and attracts attention. The reason for the significant difference between the mean retention scores of the two groups was because STM motivates and gives room for cooperate social interactions that brings about effective retentive learning.

Conclusion

Based on the findings of this study, it was concluded that the use of use of sequential teaching methods enhances the academic achievement and retention of students in biology in senior secondary and it shall be a good asset to biology teachers and students.

Recommendations

Based on the findings in this study the following recommendations were made:

1. Workshops and seminars should be organized for practicing biology teachers to enable them understand the importance of STM in the academic environment
2. Biology Teachers should adopt the use of sequential teaching method at all levels of learning. Increase the awareness of Nigerian educators, curriculum planners and teachers on current global trends in teaching strategies to enhance creativity in classroom.

REFERENCES

Anekwe, J.U (2016); Effects of constructivist based instructional model on students' interest andacademic achievement in basic technology in Anambra State. Unpublished Phd Thesis, University of Port Harcourt.

Dabah, J. A. (2016). Science Education in Nigeria Theory and Practice. Calabar: Theoda

Dajal, R. G. & Mohammed, A. U. (2019). Effects of Guided Discovery Method on Students' Attitude to, and Achievement in Biology in Senior Secondary Schools, Bauchi State. International Journal of Research and Scientific Innovation (IJRSI), 6 (7), 2321–2705.

Dajal, R.G. Apochi, M.A. & Paul-Fiase, R.U (2022). Effects of Sequential Teaching Method on Senior Secondary School Biology Students' Achievement in Niger State, Nigeria. *Ilorin Journal of Education* 42(2),75-82.

Emmanuel, K., Ogbeba, J., & Ahmed, A. (2014). Enhancing students' retention in mathematics through effective teaching strategies. *Journal of Education and Science Technology, 5(2), 1-9.*

Federal Republic of Nigeria, (2013). National Policy on Education, Abuja: NERDC Press.

Mbaegbu, S. C and Osuafor, M. (2023) "Ethnobiology Instructional Approach: Effect on Secondary School Students Retention of Biology Concepts in Onitsha Education Zone" Published in *International Journal of Trend in Scientific Research and Development. 7 (1), 237-245,*

Namasaka, F.W., Mondoh H. O. & Kerero, F. N. (2013).Effects of Concept and Vee Mapping Strategy on Students' Achievement in Biology in secondary schools in Uasin-Gishu District, Kenya. *International Journal of Current Research in life sciences, 7, 016-022.*

Nneka, R.N., (2015). Effect of Cooperative Learning Instructional Strategy on Senior Secondary School Students' Achievement in Biology in Anambra State, *Nigeria. International Journal for Cross-Disciplinary Subjects in Education (IJCDSE), Special Issue 5 (1).*

Sakiyo, J., & Waziri, K. (2015a). Concept Mapping Strategy: An Effective Tool for Improving Students' Academic Achievement in Biology. Journal of Education in Science Environment and Health, 1(1), 56-62.

Selviana N., & David, B. M. (2017).Developing students' research proposal design through group investigationmethod. IOSR *Journal of Research & Method in Education*7, (1),

Twan, S. M., Danjuma, G. S. and Useni, B. (2022). Effects of Think Pair Share Insructional Strategy on Interest and Performance in Biology Among Secondary Schools Students in Akko Education Zone, Gombe state, Nigeria. Journal of Science, Mathematics and Entrepreneurial Education, 1(5):220-228