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## **Influence of Gender on Achievement of Senior Secondary Two Students Exposed To Sequential Teaching Methods In Biology In Jos, Plateau State, Nigeria.**

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### **Abstract**

*The study investigated the influence of gender on achievement of senior secondary two (SS2) students exposed to sequential teaching methods in Biology in Jos, Plateau State, Nigeria. The study employed the non-equivalent pre-test, post-test quasi-experimental research design. The population of the study comprised 485 (264 male, 221 female) SS2 students while the sample was made up of 118 (47 male and 71 female) SS2 students offering Biology in four co-educational public secondary schools in Jos-South Local Government Area of Plateau State. Three research questions and three null hypotheses guided the study. A Biology Achievement Test (BAT) with reliability index of 0.92 was used as an instrument for data collection. Research questions were answered using mean and standard deviation while hypotheses were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance. Results revealed that sequential teaching methods improved the achievement of male and female senior secondary two students in Biology. Based on the findings of the study, it was recommended that Biology teachers should teach their students with sequential teaching methods to enhance the achievement of male and female students in the subject.*

**Keywords:** Achievement, Biology, Gender, Sequential Teaching Methods.

## Introduction

Science is one of the school subjects taught at all levels of education in Nigeria. The teaching of science exposes learners to activities which provide them with desirable knowledge and appropriate life-long skills that enable them to solve personal and societal problems. Agbama and Omoifo (2021) see science as a process of generating ideas and knowledge about natural phenomena in the natural environment. Science at the secondary school level consists of three main areas, namely, Physics, Chemistry and Biology. Biology is the study of plants and animals or the study of life (Michael, 2015). The knowledge of Biology is applied in solving personal and societal problems relating to health, population growth through planned-parenthood, environmental pollution and food shortage. The importance of Biology can also be seen in areas of disease control, animal breeding and environmental studies.

Despite the importance of Biology to human emancipation and national development, and the efforts of the Federal Government of Nigeria to boost the teaching and learning of Biology in secondary schools such as providing instructional materials through Step B project and training science teachers abroad in the technical aid programme, evidence from literature shows that students have not been achieving as expected in the subject in public examinations, such as the West African Secondary School Certificate Examinations(WASSCE) and National Examinations Council (NECO) examinations.

Researchers have advanced students' attitudinal dispositions, use of ineffective and stereotyped methods of teaching (Mbanefo, 2024; Ihejirika, 2025), abstract and difficult nature of some Biology concepts and gender, as some of the factors responsible for poor achievement of students in Biology in senior secondary schools in Nigeria (Salleh, Ahmad & Setyan, 2021). Biology concepts such as the human digestive and respiratory systems have been perceived among other topics like genetics, cell metabolism, and growth to be difficult by students (Chukwuemeka & Dorgu, 2019). Furthermore, the Chief examiners' reports of the West African Examinations Council from 2013 to 2017 and 2019 revealed that students' achievement in Biology was poor, particularly, in questions pertaining to the human digestive and respiratory systems. The percentage of students who failed Biology in the West African Senior Secondary Certificate Examinations ranged from 61.50 66.60%, from

2013 to 2017. Again, in the study area, in 2018 and 2019, the percentage failure of 85.90% and 87.80% failure, respectively was recorded in Biology.

The digestive system refers to the complex process by which the body breaks down food, absorbs food nutrients, and expels any remaining waste out of the body. The human respiratory system is a complex network of organs and structures used for gaseous exchange in humans. These two systems, therefore, carry out very vital functions in the body and as such help to maintain the general equilibrium and well-being of the human body. Furthermore, the digestive and respiratory systems form a critical mass of the secondary school Biology curriculum. The implication is that any student that does not achieve well in questions on them in the SSC Examinations may end up not obtaining a good grade in the subject.

The report from the Chief Examiner on students' achievement in the West African Senior Secondary Certificate Examinations for the year 2019 revealed that majority of the students failed to state the respiratory surfaces of the listed organisms. However, some students who could state the respiratory surfaces lost marks due to wrong spellings. Hence, spellings, drawings, amongst others, were perceived to be challenging for the students in the examinations which eventually translated to poor achievement in Biology.

Under-achievement in the subject, particularly in practical Biology, has also been attributed to candidates' unfamiliarity with the use of simple laboratory equipment, inadequate exposure to laboratory techniques, lack of observational skills, inability to draw and label diagrams correctly, inability to spell some Biology terms correctly, among others. Thus, students' inability to gain mastery of the basic skills needed for the understanding biological concepts may not be unconnected to the teaching methods adopted by Biology teachers; methods that do not engage students actively in the learning process.

Activity-based and participatory teaching methods have been recommended by the Federal Government (FRN, 2014) for the teaching of Biology in secondary schools. However, this does not appear to have been adequately done. Students are often unfamiliar with some of the biological processes as evidenced in the results of the WASSCE examinations. This could, in turn, lead to under-achievement of male and female students in the subject area.

Gender has been implicated in Biology achievement. However, findings regarding gender and students' achievement in Biology have been inconclusive. For instance, the study by Mbanefo (2024) revealed that male and female students taught with think- share-pair strategy did not differ significantly in Biology achievement. However, findings by Ihejirika (2025) showed the contrary, with female students achieving better than their male counterparts. The inconclusiveness of research findings, regarding gender and students' achievement in biology, therefore, calls for more empirical studies with effective, activity-based, innovative and learner-friendly methods of instruction.

Different teaching methods have been advanced for teaching Biology in secondary schools, such as scaffolding, laboratory, think-pair-share, expository and demonstration methods. Studies by Fauzi, Rosyida, Rohma & Khoiroh (2021) have shown that some teaching methods used by Biology teachers still make learning of the perceived difficult topics abstract since some of the biological processes are largely invisible for students. Hence, the only alternative for students, then, is to learn the said topics through rote memorization of facts from Biology textbooks, and this does not provide room for critical thinking, creativity or interaction by learners. This suggests that the teaching methods might not have been effectively yielding the right results in the subject. There is, therefore, a need to adopt methods of teaching that engage students in activity, critical thinking and reflection in Biology classrooms and laboratories. This may be the reason Wafula, Mondoh and Wasike (2017) recommended the formulation of new policy guidelines, laying emphasis on use of sequential teaching methods, as a means of improving learners' conceptual understanding of knowledge in Biology, especially with concepts concerned with physiological processes or mechanisms such as enzyme action and respiration.

Sequential teaching methods refer to methods of teaching that embrace the use of teaching methods in different sequences to facilitate students' mastery of the same concepts in Biology. Dajal, Apochi and Paul-Fiase (2022) described sequential teaching methods as the process of imparting knowledge to learners using different instructional methods in logical order such that it provides a concrete basis for promoting critical thinking skills. One of the goals of teachers is to sequence instruction effectively in a manner that will improve the academic achievement of the students (Zabanal, 2020). Hence, the



use of a variety of teaching methods could help ensure that all students, irrespective of gender, have equal opportunities to learn. What will be the most effective sequence of the use of such methods? What will be the effect of sequencing the instructional methods on students' achievement in Biology?

However, there is paucity of studies on sequential methods of teaching in science classrooms in Nigeria, particularly, in Plateau State. This current study, therefore, investigated the influence of gender on achievement of SS2 students exposed to sequential teaching methods as the use of the following teaching methods in Biology in Jos, Plateau State, Nigeria.

### **Purpose of the Study**

The study investigated the influence of gender on achievement of senior secondary two students exposed to sequential teaching methods in Biology in Jos-South Local Government Area of Plateau State, Nigeria. The specific objectives of the study were to:

1. determine the achievement scores of SS 2 Biology students in the three experimental groups and the control group.
2. determine the achievement scores of SS 2 Biology students in the three experimental groups based on gender.
3. ascertain which of the sequences is the most effective in teaching SS 2 Biology students in the experimental groups.

### **Research Questions**

1. What are the pre-test and post-test achievement mean scores of SS 2 Biology students in the three experimental groups and the control group?
2. What are the post-test achievement mean scores of SS 2 Biology students in the three experimental groups based on gender?
3. Which of the sequences is the most effective in teaching SS 2 Biology students in the experimental groups?

## Hypotheses

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

1. There is no significant difference between the post-test Biology achievement mean scores of SS 2 students in the three experimental groups and the control group.
2. There is no significant difference between the post-test Biology achievement mean scores of SS 2 male and female students in the three experimental groups
3. There is no significant difference between the post-test Biology achievement mean scores of SS 2 students in the three experimental groups.

## Method

The study employed the non-equivalent pre-test, post-test quasi-experimental research design. The population of the study comprised the 485 (264 male and 221 female) SS 2 students offering Biology in the 13 co-educational public secondary schools that met the criteria of the population. The sample for the study comprised 118 (47 male and 71 female) SS2 students offering Biology from four co-educational public secondary schools in Jos-South Local Government Area of Plateau State. Simple random sampling technique with the lottery method was used to select a sample of four schools for the study. In each of these schools, two intact classes of SS2 students who were offering Biology were randomly assigned to an experimental and a control group.

A Biology Achievement Test (BAT) was used for collecting data from the sample. The BAT consisted of 50 multiple choice test items adapted from 1998-2022 WAEC past questions on the concepts of human digestive and human respiratory systems. Each BAT item had four options, A to D. The BAT was validated by two experts in Science Education Unit and one in Research Measurement and Evaluation Unit, both from the Faculty of Education, University of Jos. The reliability index for BAT was determined as 0.92 using Kuder Richardson formula 21.

The experimental groups were taught Biology by the research assistants using the sequential teaching method (Expository method, Computer-Aided Instruction and Practical Biology) in three different sequences as follows: Group I (Expository method -Computer-Aided Instruction- Practical), Group II (Computer-Aided Instruction- Practical- Expository method) and Group III (Practical- Expository method- Computer-Aided Instruction). The Biology teachers explained the concepts of the human digestive and respiratory systems using the expository method of teaching. Computer-Aided Instruction involved projecting videos on the human digestive and respiratory systems with the computer while students watched and observed videos projected by the Biology teacher. The practical in the study focused on students carrying out hands-on activities on the mechanism of breathing in humans and enzyme activity of ptyalin on starch under the direction and supervision of the teachers (research assistants).

Eight Biology teachers, that is, two from each of the sampled schools, were employed as research assistants for the study. Six research assistants were trained for the experimental groups while the other two research assistants who were not trained taught the control group. Two hours training per day was given to the research assistants who taught the three experimental groups. The training lasted for five days after school hours in one of the schools at the Jos South Local Government Area of Plateau State. The control group was taught the same concepts in Biology as the experimental groups using the expository teaching method, with the contents and the objectives of the lessons the same as those of the experimental groups, however, with a different set of lesson plans. After six weeks teaching exercise, BAT was administered to the experimental groups and the control group as post-test. The scoring procedure of the BAT was based on students' responses to the multiple-choice items. Each BAT item has four options; A to D, where only one option was the correct answer while others were distracters and each option was assigned two marks. Since there were 50 questions, the maximum mark obtainable was 100 while the minimum mark obtainable was zero. The scores obtained from the test were categorized as high, average and low achievement scores representing 70%, 50-69% and 0-49%, respectively. Research questions were answered using mean and standard deviation while Analysis of Covariance (ANCOVA) was used to test all the hypotheses at 0.05 level of significance.

## Results

### Research Question One

What are the pre-test and post-test achievement mean scores of SS 2 Biology students in the three experimental groups and control group?

**Table 1**

**Pre-test and Post-test Achievement Mean Scores of SS2 Students in Biology in the Three Experimental Groups and Control Group**

Group	Pre-test			Post-test		Mean Gain
	N	Mean	SD	Mean	SD	
Experimental I	39	29.23	5.78	67.28	8.24	38.05
Experimental II	30	30.20	5.95	55.80	10.23	25.6
Experimental III	19	33.37	6.04	65.58	8.02	32.21
Control	30	28.60	5.54	45.47	6.01	16.87

Table 1 presents the results on pre-test and post-test achievement mean scores of SS2 students in Biology in the three experimental groups and control group. The result for experimental group 1 showed that the pre-test achievement mean score was 29.23 with a standard deviation of 5.78, while the post-test achievement mean score was 67.28 and a standard deviation of 8.24 with a mean gain of 38.05. This showed that there was an improvement in the achievement of students after treatment using Expository method-Computer-Aided Instruction-Practical (ECP). Also, experimental group II had a pre-test achievement mean score of 30.20 with a standard deviation of 5.95, while the post-test achievement mean score was 55.80 with a standard deviation of 10.23 with a mean gain of 25.6. This pointed to the fact that there was an improvement in the achievement of students after treatment using Computer-Aided Instruction-Practical- Expository method (CPE). Experimental group III had a pre-test achievement mean score of 33.37 with a standard deviation of 6.04, while the post-test achievement mean score was 65.58 with a standard deviation of 8.02 with a mean gain of 32.21. This result showed that there was an improvement in the achievement of students after treatment using Practical- Expository method -Computer-Aided Instruction (PEC).

For the control group, the achievement mean score was 28.60 and a standard deviation of 5.54 at the pre-test stage. At the post-test stage, the

achievement mean score was 45.47 and a standard deviation of 6.01 with a mean gain of 16.87. The findings showed that students in the ECP sequence group had a higher mean gain score of 38.05 and achieved higher than those in the CPE sequence group (32.21), followed by the PEC sequence group having a mean gain of 25.6. This implies that all the sequential teaching methods increased students' achievement in Biology.

## Research Question Two

What are the post-test achievement mean scores of SS 2 Biology students in the three experimental groups based on gender?

**Table 2**  
**Post-test Achievement Mean Scores of SS2 Students in Biology in the Three Experimental Groups based on Gender**

Group	Gender	Post-test			
		N	Mean	SD	Mean Difference
Experimental I	Male	14	66.29	11.445	1.64
	Female	25	67.84	5.970	
Experimental II	Male	13	50.15	5.857	9.97
	Female	17	60.12	10.874	
Experimental III	Male	8	67.00	9.071	2.45
	Female	11	64.55	7.435	

Table 2 shows the results on the post-test achievement mean scores of SS2 male and female students' in Biology in the three experimental groups. The result for experimental group I showed that the achievement mean score for male was 66.29 with a standard deviation of 11.45, while female achievement mean score was 67.84 with a standard deviation of 5.97 and a mean difference of 1.64. It means that female students achieved almost at the same level with the male students after treatment using Expository method - Computer-Aided Instruction-Practical (ECP). Also, experimental group II showed that the male achievement mean score was 50.15 with a standard deviation of 5.86, while female achievement mean score was 60.12 with a standard deviation of 10.87 with a mean difference of 9.97 indicating that there was an improvement in the achievement of male and female students after treatment using Computer-Aided Instruction-Practical- Expository method (CPE).

The result of experimental group III showed a male achievement mean score of 67.00 with a standard deviation of 9.07, while female achievement mean score was 64.55 with a standard deviation of 7.44 with a mean difference of 2.45, indicating that there was improvement in the achievement of students after treatments using Practical-Expository method -Computer-Aided Instruction (PEC). This showed that the female students in groups I and II (ECP and CPE) had a higher achievement mean scores (67.84 and 60.12) than their male counterparts. This implies that sequential teaching methods improved the achievement of male and female students in Biology in favour of the female students. However, male students in group III (PEC) achieved better than their female counterparts.

### Research Question Three

Which of the sequences is the most effective in teaching SS 2 Biology students in the three experimental groups?

**Table 3**

**Post-test Achievement Mean Scores of SS2 Students in Biology in the Three Experimental Groups**

Group	Pre-test			Post-test		Mean Gain
	N	Mean	SD	Mean	SD	
Experimental I	39	29.23	5.78	67.28	8.24	38.05
Experimental II	30	30.20	5.95	55.80	10.23	25.6
Experimental III	19	33.37	6.04	65.58	8.02	32.21

Table 3 presents the results on post-test achievement mean scores of SS2 students in Biology in the three experimental groups. The result for experimental group I showed that the pre-test achievement mean score was 29.23 while the post-test achievement mean score was 67.28 with a mean gain of 38.05. Also, experimental group II showed a pre-test achievement mean score of 30.20, while the post-test achievement mean score was 55.80 with a mean gain of 25.6. Experimental group III showed a pre-test achievement mean score of 33.37, while the post-test achievement mean score was 65.58 with a mean gain of 32.21. Thus, there was an improvement in the achievement of students after treatment using the three sequences although the mean gain of the sequence Expository method-Computer-Aided Instruction-Practical

(ECP) was the highest. The result also showed that the mean gain of the achievement score in the sequence Practical-Expository method -Computer-Aided Instruction (PEC) was higher than the Computer-Aided Instruction-Practical- Expository method (CPE).

### Hypotheses One

There is no significant difference between the pre-test and post-test Biology achievement mean scores of SS 2 students in the three experimental groups and control group.

**Table 4**  
**ANCOVA Results on Post-test Achievement Mean Scores of Three Experimental Groups and Control Group**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	12588.987 <sup>a</sup>	4	3147.247	78.955	.000	.736
Intercept	3699.147	1	3699.147	92.801	.000	.451
Covariate	3314.495	1	3314.495	83.151	.000	.424
Group	8145.413	3	2715.138	68.115	.000	.644
Error	4504.301	113	39.861			
Total	421504.000	118				
Corrected Total	17093.288	117				

a. R Squared = .736 (Adjusted R Squared = .727)

Table 4 shows that  $F(3,113) = 68.12$ ,  $p < 0.05$ . Since the p-value of 0.000 is less than 0.05 level of significance, the null hypothesis was rejected proving that there was a significant difference between the post-test Biology achievement scores of SS2 students in the three experimental groups and control group. The result further revealed an adjusted R-squared value of .727. This means that 72.7% of the variation in the dependent variable which is achievement is explained by variation in the treatment of sequential teaching methods, while the remaining are due to other factors not included in this study. This implies that sequential teaching methods improved students' achievement in Biology in the three experimental groups than those in the control group.

## Hypotheses Two

There is no significant difference between the post-test Biology achievement mean scores of SS 2 male and female students in the three experimental groups.

**Table 5: ANCOVA Results on Achievement Mean Scores of Male and Female SS2 Students in Biology in the Three Experimental Groups**

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2783.761 <sup>a</sup>	2	1391.880	18.532	.000	.304
Intercept	4258.553	1	4258.553	56.699	.000	.400
Covariate	2407.994	1	2407.994	32.060	.000	.274
Gender	206.549	1	206.549	2.750	.101	.031
Error	6384.239	85	75.109			
Total	358440.000	88				
Corrected Total	9168.000	87				

a. R Squared = .304 (Adjusted R Squared = .287)

Analysis of Covariance (ANCOVA) was conducted to determine if there was a significant effect of gender on achievement of SS2 students taught Biology using sequential teaching methods. Table 5 shows that the main effect of gender  $F(2,85) = 2.75$ ,  $p > 0.05$ . Since the p-value of 0.101 is greater than 0.05 level of significance, the null hypothesis was retained, indicating that there was no significant difference between the post-test achievement mean scores of male and female students in Biology taught using sequential teaching methods. The result further revealed an adjusted R-squared value of .287. This means that 28.7% of the variation in the dependent variable, namely, achievement in Biology is explained by gender while the remaining are due to other factors not included in this study. This implies that there is no significant difference between the post-test Biology achievement mean scores of SS2 male and female students in the three experimental groups.

## Hypothesis Three

There is no significant difference between the post-test Biology achievement mean scores of SS 2 students in the three experimental groups.



**Table 6**  
**Scheffe PostHoc of the Differences in SS2 Students' Achievement Mean Scores in Biology by Methods**

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig. <sup>b</sup>	Lower Bound	Upper Bound
ECP	CPE	12.382*	1.536	.000	9.338	15.426
	PEC	5.547*	1.816	.003	1.949	9.144
	E	21.229*	1.535	.000	18.189	24.270
CPE	ECP	-12.382*	1.536	.000	-15.426	-9.338
	PEC	-6.836*	1.879	.000	-10.559	-3.113
	E	8.847*	1.638	.000	5.601	12.093
PEC	ECP	-5.547*	1.816	.003	-9.144	-1.949
	CPE	6.836*	1.879	.000	3.113	10.559
	E	15.683*	1.914	.000	11.891	19.474
E	ECP	-21.229*	1.535	.000	-24.270	-18.189
	CPE	-8.847*	1.638	.000	-12.093	-5.601
	PEC	-15.683*	1.914	.000	-19.474	-11.891

Table 6 shows that a significant difference exists between the achievement scores of students taught Biology using the sequential teaching method (CPE, ECP and PEC) and Expository method (E) with the students taught Biology using sequential teaching methods having achieved better than those taught using Expository method. However, it further showed that there is a significant difference between the achievement scores of students taught using CPE, ECP and PEC. Hence, the two sequences were equally effective. The most effective sequence is ECP.

## Discussion

Findings from the study revealed that students taught Biology using sequential teaching methods achieved higher significant achievement scores than those taught Biology using lecture method. This finding is in agreement with Wafula, Mondoh and Wasike (2017) who reported that sequential teaching methods are effective methods of teaching because they help students acquire useful knowledge. This perhaps can be due to the fact that repetition of a concept using different means of expression, representation and engagement could challenge learners' ways of thinking appropriately for learning.

Findings from research question two revealed that sequential teaching methods were effective in improving students' achievement across gender. This indicates that there was improvement in the achievement of male and female students after treatment using Practical-Expository method-Computer-Aided Instruction (PEC). This outcome points to the fact that the female students in groups I and II (ECP and CPE) had higher achievement mean scores (67.84 and 60.12) than their male counterparts. This implies that sequential teaching methods increased male and female students' achievement in Biology with the female students achieving better than the male students, although male students in group III (PEC) achieved better than female students.

The results from research question three showed that the students taught Biology using the sequence Expository method-Computer-Aided Instruction-Practical (ECP) had the highest achievement scores than those taught Biology using the other two sequences (PEC and CPE). This finding is in line with that of Olanrewaju, Chollom and Ozoji (2024) which disclosed that the Expository-Computer Aided Instruction-Practical (ECP) sequence was the most effective sequence of the ECP, CPE and PEC sequences. This could be as a result of the fact that beginning a lesson by explaining the concepts, principles and processes therein could help the students understand the lesson.

The findings from study showed that sequential teaching methods were found to be effective in improving the achievement of secondary school Biology students. There was a significant difference between the post-test achievement scores of students in Biology in the three experimental groups and the control group. This is in line with the finding of Dajal, Apochi and Paul-Fiase (2022) who observed that students taught Biology using sequential teaching methods achieved significantly higher than those taught using conventional method. However, the finding of this study negates that of Azubuike and Mumuni (2018), who asserted that there was no significant difference in the mean scores of students in experimental and control groups.

Findings from the study also indicated that there was no significant difference between the achievement of male and female students in Biology in the experimental groups. This finding is congruent with Mbaegbu, Osuafor and Akachukwu (2020) who reported that no significant difference existed between the mean achievement scores of male and female students in the three sequences

of Laboratory Students' Experiment and Lecture sequence (DEL); Lecture-Demonstration- laboratory students' Experiment (LDE) and Laboratory Students' Experiment- Lecture- Demonstration (ELD). Hence, the teaching method is gender friendly. The finding is also in line with Dajal, Apochi and Paul-Fiase (2022) who pointed that male and female students taught Biology using sequential teaching methods performed better equally since there was no significant difference in their mean achievement scores. However, the study is at variance with Wafula, Mondoh and Wasike (2017) who found that gender had significant effect on retention with female learners scoring higher than their male counterparts. The present finding has shown that the era of gender disparity in science is gradually closing up as science subjects may no longer be perceived as subjects for the male in the near future.

The findings from hypothesis three indicated that there was significant difference between the achievement scores of students taught Biology using ECP, CPE and PEC sequences with the ECP sequence being the most effective. This finding is also in consonance with the finding of Gongden and Delmang (2016) who reported that there was a statistically significant difference in the post-test mean scores of the students in the three groups with the sequence used for group A, Lecture – Analogy – Discussion, being more effective than the sequence B: Analogy – Discussion – Lecture, which was better than C, Discussion – Lecture – Analogy.

Looking at the most effective sequence in this study (ECP), one can deduce that starting a lesson with expository method introduces the concept(s) to be taught such that it could increase students' desire to learn. Thereafter, the use of computer-aided instruction fostered critical and higher order thinking and the lesson terminated with the students demonstrating what they had heard the teacher speak verbally and what they have watched.

The enhanced achievement in BAT of the students in group I (ECP) thus must have stemmed from the fact that the students were able to eventually work-the-talk after visualizing the concepts on the computer. This is in consonance with the findings of Avwiri, and Okoli (2021) who reported that teachers' adoption of laboratory method (practical) at the end of the sequence is more like leading the students to verify what they already understood and for which they have the appropriate skills to do. Hence, trying the whole concept

all over during practical enhanced students' achievement of the concept taught. The introduction of computer-aided instruction and practical after the lecture method was quite appropriate. This is because the expository method must have laid the foundation and basics of conceptual knowledge and mastery of the concepts taught before the other teaching methods were used. Nevertheless, this finding contradicts that of Mbaegbu, Osuafor and Akachukwu (2020) who disclosed that a significant difference existed among the achievement mean scores of students in the experimental groups, in favour of Demonstration-Laboratory students' Experiment (DLE) and lecture sequence Demonstration-Students' Experiment-Laboratory sequence (DEL).

## Conclusion

The findings of the study indicated that sequential teaching methods improved the achievement of male and female students in Biology in favour of the female students, although male students in group III (PEC) achieved better than their female counterparts. In other words, gender influenced the achievement of students exposed to sequential teaching methods in Biology. The findings also showed that the Expository-Practical-Computer-Aided Instruction sequence was the most effective sequence of teaching.

## Recommendations

Based on the findings, the following recommendations were made:

1. Biology teachers should teach their students with sequential teaching methods to enhance male and female students' achievement in the subject.
2. Biology teachers should be exposed to workshops and seminars on how to effectively combine teaching methods in different sequences during a lesson especially in the sequence of expository method, computer-aided instruction and practical method.

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