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# EFFECT OF STRATEGIC CONTENT LEARNING ON SECONDARY SCHOOL BIOLOGY STUDENTS' ACADEMIC ACHIEVEMENT IN ENUGU STATE

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***Abstract:*** *The study investigated effects of strategic content learning on secondary school Biology students' academic achievement in Enugu State. Two research questions and two null hypotheses guided the study. The study adopted a quasi-experimental research design. The population of this study consisted of 9,881 senior secondary school two (SS 11) Biology students in all the 190 co-educational public secondary schools in Enugu State, comprising 4110 males and 5771 females. A sample size of 75 Senior Secondary II (SSII) Biology students drawn from two (2) intact classes in two (2) public co-educational secondary schools served as the sample for this study. The instrument for data collection is Biology achievement test (BAT). The instrument was validated and its reliability established using kuder-richardson 20-k and reliability index of 0.86 was obtained. Data were collected using a Biology Achievement Test (BAT). Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses. The findings revealed that Strategic Content Learning enhanced students' achievement in Biology more effectively than the conventional lecture method; significant differences existed between students taught using conventional lecture method. Both male and female students benefited from strategic content learning SCL and there was no significant difference in the mean achievement of male and female students when taught biology using strategic content learning It was therefore recommended among others that Biology teachers should adopt Strategic Content Learning as a major instructional strategy for teaching Biology School administrators should organize regular workshops, seminars, conferences, and in-service training programmes to equip Biology teachers with the knowledge and practical skills required to effectively implement Strategic Content Learning in schools*

***Keywords:*** *Strategic Content Learning, Biology Students and Academic Achievement*

## Introduction

Biology is a fundamental science subject that provides students with the understanding of living things in an ecological system. Biology is the study of plants and animals and their interactions with their physical environment (Ozoemezinem, 2025). Michael (2022) posited that Biology is a science subject offered at senior secondary school in Nigeria, and it is the study of life. According to Amedu (2025), it is the study of how living things interact with their environment, which enables the study of the structures, functions, growth, origin, evolution, distributions, interrelationships, diseases, and adaptations of living things. Biology, as a subject of inquiry, has enabled philosophers and scientists to make significant contributions to our understanding of the natural world. From the foregoing, Biology can be said to be the study of organisms and the relationship with their environment. Freeman et al. (2019) stated that Biology has numerous branches which include genetics, biochemistry, molecular biology, cell biology, histology, physiology, anatomy, microbiology and ecology. The knowledge of these branches helps in the study of very important fields in the society such as medicine, nursing, agriculture, pharmacy among others. The foundations of these disciplines are given at the senior secondary school Biology as stipulated in the objectives of Biology curriculum.

The objectives of Biology curriculum at senior secondary school compiled by Nigerian Educational Research and Development Council, Federal Republic of Nigeria (FRN, 2013) are to prepare students to acquire: Adequate laboratory and field skills in Biology, Meaningful and relevant knowledge in Biology, Ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture and reasonable and functional scientific knowledge.

These objectives explicitly show the importance of the subject. Furthermore, in the National Policy on Education published by Federal Republic of Nigeria (FRN, 2013), Biology at the secondary school level provides preparatory ground to provide trained manpower in the applied sciences, technology and

commerce at sub professional grades as well as to provide entrepreneurial, technical, vocational job – specific skills for self – reliance, and for agricultural, industrial, commercial, and economic development. Agboghoroma and Oyovwi (2025) opined that Biology provides a platform for teaching students to develop the ability to apply science concepts and principles in solving everyday life problems. Based on these assertions on the importance of Biology, there is need for it to be properly taught in secondary schools to improve students' achievement and create an atmosphere that will enable them to respond positively in the subject (Amedu, 2025).

Academic achievement refers to outcomes that indicate the extent to which a person has accomplished specific goals that where the focus of activities in instructional environments, specifically, in school, college and university (Steinmayr et al., 2017). For Azubuike (2022), academic achievement is the knowledge attained or skills developed in school subjects usually designated by test scores or marks assigned by the teacher. Similarly, Saima and Sufiana (2017) stated that academic achievement is the progress students make in relation to set goals and objectives. Academic achievement therefore is the accomplishment in a particular subject area indicated by grades, marks or scores.

Academic achievement of Nigerian students in Biology has not been stable in standardized examinations such as West African Senior School Certificate Examination (WASSCE). The analysis of Biology students' performance in WASSCE shows that only 47.39%, 46.89%, 44.93%, 50.52%, 46.48%, 51.52%, 49. 26%, 62.14%, 68.52% and 50.69% passed Biology at credit level in 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023 and 2024 respectively (WAEC Statistics Division, 2024). This further indicates that for the period of ten years, the pass rate of Biology students in WASSCE has not reached 70%. This means there is still need for improvement in WASSCE among Biology students.

The poor achievement of students in Biology has been associated with the use of poor methods of teaching, lack of retention and sometimes influence of gender (Aniodoh & Egbo, 2023). The poor performance of students in Biology is the inability to correctly identify the characteristics of ecosystems and understand the relationship between living organisms and their environment, as evidenced by a lack of knowledge regarding factors affecting energy flow and the proper classification of organisms (WAEC chief examiner report ,2020). Due to poor performance in Biology, teachers in science education seem not frequently use teaching methods that will enhance students 'achievement in Biology.

Teaching method is a process or a way of operation or teaching adopted to bring about the attainment of curricular objectives (Maikano *et al.*, 2022). There are different methods used in teaching Biology in secondary schools. Dorgu (2025) classified teaching methods into teacher centered and learner centered methods. An example of teacher centered method is lecture method, while learner centered methods comprises discussion, field trip, role playing, project, strategic content learning among others. Strategic content learning according to Buttler (2016) as a strategy intervention model whose goals are; to support students' self-regulated engagement in tasks, so that students learn to manage their cognitive, motivational and vocational processes during learning; to support students to construct a range of knowledge and beliefs that support, rather than undermine further self-regulation;to increase students 'participation in the full range of cognitive activities central to self-regulation. This implies that teacher using SCL provides guidance to the students to enable them to learn for themselves thereby enhancing critical reasoning and problem-solving approach to the students in other to attain educational objectives. Strategic content learning instructors provide guidance to students to develop strategies as they work through meaningful tasks. During strategic content learning (SCL) instructions, students are ultimately responsible for making decisions and judgments regarding their tasks performance, regarding what goals to set, what strategies to use, how effectively they are progressing towards goals and how to adapt strategies accordingly. Here, instruction is geared not towards teaching students specific, predefined strategies, but instead towards supporting students to generate personalized strategies for themselves (Maikano *et. al.*, 2022)

Buttler (2016) states that for effective use of SLC students are responsible for making decisions and judgment regarding their task performance, what goals to set, what strategies to use, how effective they are processing towards goals and how to adapt strategies accordingly. The teacher's job is to (a) help

students make effective decisions or judgment by directing their attention to ideas to ideas the think is not necessary or overlooked; (b) Support the students to identify what they currently do well. (c) Ask the students to reflect on their processes; (d) Allowing students to use the task approach in their own words supporting them to abstract a generalized understanding based on their experience with the task; (e) Direct students attention to the link between action during learning, their success on the task and their perception of control and competence. In conclusion, Buttler explains that the teacher only provides guidance therefore enhancing student effective engagement of cognitive activities to self-regulation in strategic content learning approach both the teacher and students are equally charge with interpreting each other's comments as a way of establishing a shared communicative context with which interactive discussion will be meaningful to students (Joinery & Andrews, 2018). This strategy adopts a more student-centred approach to learning than the conventional teacher-centred approach, as it actively engages learners in the learning process and promotes meaningful understanding rather than dependence on rote memorisation, which is often associated with the predominant use of the lecture method.

Lecture method according to Akpoghol et. al., (2018) is one of the conventional methods of teaching which involves only oral presentation of ideas. The researchers further stated that the teacher does most of the activities in form of talking while the students are passive listeners or slightly involved. Iornem (2016) posited that lecture method is a process of teaching whereby the teacher tells the students his planned facts while the students listen and take notes. Major et. al., (2025) stated that lecture method helps the teacher to teach a large group of learners at the same time, cover a wide topic within a short time and students are provided with facts so as to save their time and effort. Lecture method enables the teacher to give uniform information to the learners as they are taught using the same technique and material at the same time. There are different forms of lecture method which include formal lecture, Socratic lecture, semi-formal lecture, lecture discussion, and interactive lecture (Major *et al*., 2025).

There are divergent views on the effects of the various teaching and learning methods on the academic achievement of learners in different subjects. A number of researches have been conducted on effects of strategic content learning and conventional lecture method on students' academic achievement in Biology and other subjects. However, limited studies considered effect of strategic content on gender to bridge the gap in male and female students 'achievement in Biology.

Gender refers to whether one is born male or female. Bello and Famakinwa (2024) defined gender as the social and cultural construct, characteristics, behaviours and role which society ascribes to males and females. Our physical characteristics such as penis and vagina determine male or female respectively (Federal Ministry of Education, 2016). Some studies show that gender influences academic achievement. Amedu (2025) in a study on performance of male and female students taught Biology with jigsaw instructional strategy stated that males performed higher than the females in biological associations. Aniodoh and Egbo (2023) reported significant differences between male and female students taught ecology with collaborative strategies in favour of females. However, Udosoro (2021) stated that gender has no significant effect on achievement and retention in science. The researcher further stated that generally, the academic achievement of students in Nigeria is low. Adegun and Adegun (2023) attributed students' poor retention and consequent low achievement in sciences to poor teaching methods which fail to inspire students' learning. Given the inconsistencies reported in the academic achievement of male and female students in Biology, it is necessary to further examine whether gender influences students' achievement under different instructional approaches. Therefore, this study sought to determine the effect of Strategic Content Learning on the academic achievement of secondary school Biology students and to examine whether there are significant gender differences in achievement in Enugu State, Nigeria.

**Statement of the Problem**

Biology is a core science subject that equips students with knowledge and skills for scientific and technological development. However, secondary school students in Enugu State have continued to record unsatisfactory academic achievement in the subject, raising concerns about the effectiveness of existing instructional approaches.

The persistent use of teacher-centred lecture methods often promotes passive learning and rote memorisation, limiting students' meaningful understanding of biological concepts. Strategic Content Learning (SCL), which emphasizes active engagement and organized content processing, may improve students' academic achievement. However, there is limited empirical evidence on its effectiveness among secondary school Biology students in Enugu State. Therefore, the problem of this study is to determine the effect of Strategic Content Learning on the academic achievement of secondary school Biology students in Enugu State.

**Purpose of the study**

Specifically, the study sought to determine:

1. The mean achievement scores of students taught biology using strategic content learning, peer-tutoring learning instructional strategy and lecture method.
2. The mean achievement scores of male and female students taught Biology using strategic content learning.

**Research Questions**

The following research questions guided the study:

1. What are the mean achievement scores of students taught Biology using strategic content learning and lecture method?
2. What are the mean achievement score of male and female students taught Biology using strategic content learning?

**Hypotheses**

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

**$HO_1$:** There is no significant difference in the mean achievement scores of students exposed to Biology using strategic content learning and lecture method.

**$HO_2$:** There is no significant difference between the mean achievement scores of male and female students taught Biology using strategic content learning.

**Methodology**

The study adopted a pre-test -post-test quasi-experimental research design. Two Intact classes were used for the study. This study was carried out in Enugu State. The population of this study consisted of 9,881 senior secondary school two (SS 11) Biology students in all the 190 co-educational public secondary schools in Enugu State, comprising 4110 males and 5771 females (Post Primary School Management Board, Enugu State, 2026).

A sample size of 75 Senior Secondary II (SSII) Biology students drawn from two (2) intact classes in two public co-educational secondary schools served as the sample for this study. A multi-stage sampling procedure was used to select the sample. First, a simple random sampling technique by balloting was used to select two education zones from the six education zones in Enugu State. Thereafter, one Local Government Area (LGA) was selected from each of the selected education zones using the simple random sampling technique by balloting. Subsequently, one public co-educational secondary school was selected from each sampled LGA through simple random sampling by balloting, giving a total of two schools. One school was assigned to the Strategic Content Learning (SCL) experimental group while another school was assign to Lecture Method (LM) control group. The instrument for data collection was Biology Achievement Test (BAT) which was adapted from WAEC past questions 2022-2025. The BAT contained 50 multiple choice test items, each containing options A-D, from which the students chooses the correct answer. The Biology Achievement test (BAT) was face and content validated by three (3) experts from Science Education, Michael Okpara University of Agriculture, Umudike (MOUAU) and its reliability establish using Kuder Richardson 20 (KR20) and reliability index of 0.86 was obtained. The Biology teachers from the selected schools served as the research assistants in this study. These assistants were trained on the mode of instruction and techniques involved in this research.

**Experimental Procedure**

The experimental group was taught Biology using the Strategic Content Learning (SCL) approach. At the beginning of each lesson, the teacher introduced the topic, stated the instructional objectives and

elicited students' prior knowledge related to the concept. The lesson content was then divided into meaningful units and presented systematically using relevant examples, illustrations and instructional materials.

Students were actively engaged through guided questioning, discussion, identification of key concepts, linking of new ideas with previously learned concepts and problem-solving activities. They were also given individual and group tasks to enable them to apply the concepts learned, while the teacher provided guidance, clarification and immediate feedback where necessary.

At the end of each lesson, the teacher guided the students to summarize the major concepts and relate them to practical or real-life situations. Short exercises and evaluation questions were administered to assess students' understanding and identify misconceptions. The same procedure was followed throughout the period of treatment, while the control group was taught the same Biology concepts using the conventional lecture method. A pretest was administered to both group before treatment and post-test was administered to the two groups one week after the teaching exercise. The test was reshuffled during each administration. Data collected was analyzed using Mean and Standard Deviation to answer the research questions. The hypotheses were tested at 0.05 level of significance using Analysis of Co-Variance (ANCOVA). This implies that any p-value that is less than 0.05 is significant and therefore, the hypothesis was rejected. Any p-value that is equal to or greater than 0.05 is not significant and therefore the hypotheses were rejected.

**Results and Analysis**

The results of the descriptive and inferential analyses were presented as follows:

**Table 1: mean achievement scores of students taught Biology using strategic content learning (SCL) and lecture method**

| | | Pretest | | Posttest | | |
|---|---|---|---|---|---|---|
| **Strategies** | **N** | $\bar{X}$ | **SD** | $\bar{X}$ | **SD** | **Mean gain scores** |
| **SCL** | 37 | 34.17 | 6.75 | 68.92 | 7.16 | 34.75 |
| **LM** | 38 | 29.84 | 3.29 | 50.71 | 4.84 | 20.87 |

*Where n= Number of respondents,* $\bar{X}$ *= mean, SD= Standard deviation, SCL=* Strategic content learning, LM= Lecture method

Table 1 shows that students taught Biology using Strategic Content Learning (SCL) had a higher posttest mean score (68.92) and mean gain score (34.75) than those taught using the Lecture Method (LM), who obtained a posttest mean of 50.71 and mean gain of 20.87. This indicates that SCL was more effective than the lecture method in improving students' academic achievement in Biology.

**Table 2: Analysis of Covariance (ANCOVA) for mean achievement scores of Biology students taught using strategic content learning (SCL), and lecture method**

| **Source** | **Type III Sum of Squares** | **df** | **Mean Square** | **F** | **Sig.** |
|---|---|---|---|---|---|
| Corrected | 6536.235[a] | 2 | 2178.745 | 50.561 | .000 |
| Intercept | 8245.211 | 1 | 8245.211 | 191.344 | .000 |
| Pretest | 27.816 | 1 | 27.816 | .646 | .423 |
| **Strategies** | 5374.993 | 2 | 2687.816 | 62.368 | .000 |
| Error | 4826.205 | 72 | 43.091 | | |
| Total | 417877.000 | 75 | | | |
| Corrected Total | 11362.440 | 74 | | | |

a.R Squared=.575 (Adjusted R Squared=.564)

Table 2 shows that instructional strategy had a significant effect on students' Biology achievement, with *F-value of* 62.368, and probability value (Sig.) .000 at 0.05 levels of significant. Since the p-value .000 is less that 0.05 alpha value, thus the null hypothesis that there is no significant difference in the achievement of students taught using SCL and the lecture method was rejected. Therefore, there was a

significant difference in mean achievement scores of Biology students taught using strategic content learning (SCL), and lecture method.

**Table 3: Mean and standard achievement scores of male and female students taught Biology using strategic content learning (SCL)**

| SCL | | Pretest | | Posttest | | |
|---|---|---|---|---|---|---|
| **Gender** | **n** | $\bar{X}$ | **SD** | $\bar{X}$ | **SD** | **Mean gain scores** |
| **Male** | 17 | 35.38 | 7.36 | 68.55 | 8.11 | 33.17 |
| **Female** | 20 | 33.14 | 6.18 | 69.23 | 6.44 | 36.09 |
| **Effect** | | | | | | **2.92** |

Table 3 indicates that both male and female students taught using SCL improved in Biology achievement. However, females recorded a slightly higher posttest mean (69.23) and mean gain (36.09) than males (68.55 and 33.17, respectively), with a mean gain difference of 2.92. This suggests a slight advantage for female students in achievement under SCL. This was subjected to test of hypothesis to see if the there is a significant difference in the achievement.

**Table 4: Analysis of covariance (ANCOVA) of mean achievement scores between male andfemale students taught Biology using strategic content learning**

| Source | Type III Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Corrected | 15.792 [a] | 2 | 25.896 | .490 | .616 |
| Intercept | 5526.361 | 1 | 5526.361 | 104.656 | .000 |
| Pretest | 47.276 | 1 | 47.276 | .895 | .350 |
| **Gender*** | 10.555 | 1 | 10.555 | .200 | .657 |
| Error | 1900.978 | 34 | 52.805 | | |
| Total | 187218.000 | 37 | | | |
| Corrected Total | 1952.769 | 36 | | | |

a .R Squared=.027 (Adjusted R Squared=.028)

Table 4 shows that there was no significant difference in the mean achievement scores of male and female students taught Biology using strategic content learning (SCL). The result showed *F*-value of 0.200 and Probability value of .657 at 0.05 level of significant. Since the probability value (.0657) is greater than alpha value of 0.05 level of significant the null hypothesis was **not rejected**, indicating that gender did not significantly influence students' achievement in Biology when taught using strategic content learning.

## Discussion of Findings

The result of the study was discussed according to the research questions and the corresponding hypotheses as follows.

The findings in Tables 1 and 2 indicate that students taught Biology using Strategic Content Learning (SCL) recorded higher posttest mean and mean gain scores than those taught using the Lecture Method. The ANCOVA result further showed that the difference was statistically significant. This suggests that SCL was more effective in improving students' academic achievement than the lecture method. The finding agrees with Aniodoh and Egbo, (2023), who reported a significant difference in Biology achievement in favour of students taught using SCL. It is also consistent with recent evidence that learner-centred and strategically structured approaches can produce better Biology outcomes than conventional instruction.

The findings in Tables 3 and 4 show that although female students taught with SCL recorded a slightly higher posttest mean and mean gain than male students. The ANCOVA result revealed no significant gender difference. Thus, SCL benefited both male and female students comparably. This finding agrees with Udosora (2021), who found no significant difference between male and female Biology students

exposed to a strategic instructional material approach. It also aligns with evidence that gender does not necessarily determine achievement when students are exposed to effective instructional strategies.

## Conclusion

The study concludes that Strategic Content Learning significantly improves secondary school students' academic achievement in Biology compared with the lecture method. However, gender did not significantly influence students' achievement under SCL, indicating that the strategy benefits both male and female students comparably.

## Recommendations

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

1. Biology teachers should adopt Strategic Content Learning (SCL) in teaching Biology because of its effectiveness in improving students' academic achievement.
2. School administrators and education authorities should organise workshops and in-service training to equip Biology teachers with the knowledge and skills required for effective implementation of SCL.
3. Biology teachers should provide equal learning opportunities for both male and female students, since the findings showed that gender did not significantly influence achievement under SCL.

## References

Adegun, I. K. & Adegun, B. O. (2023). Students and teachers' views of difficult areas in Mathematics syllabus: Basic requirement for science and engineering education. *Journal of Education and Practice*, *4*(12), 235 – 243

Agboghoroma, U. E. & Oyovwi, S. C. (2025). Evaluating effects of students' academic achievement on identified difficult concepts in senior secondary school Biology in Delta State. *Journal of Education and Practice, 6*(3) 53 – 57

Akpoghol, T., Ezeudu, F. O., Adzape, J. N. & Otor, E. E. (2023). Effects of lecture method supplemented with music and computer animation on senior secondary school students' academic achievement in electrochemistry. *Journal of Education and Practice*, *7*(4)75- 78

Amedu, O. I. (2025). The effect of gender on the achievement of students in Biology using the jigsaw method. *Journal of Education and Practice*, *6*(1), 176 – 179

Aniodoh, N. A. & Egbo, C. N. (2023). Gender and performance in Physics in Anambra State. *Journal of Research and Method in Education, 5*, 13 – 21

Azubuike, A. (2022). Factors affecting the choice of science subjects among female students in Jigawa metropolis, Nigeria. *Creative Education, 5*, 96 -104

Butler, D. H. (2016). From learning strategies to strategic learning: Promoting self-regulated learning by post-secondary students with learning disabilities. Canadian *Journal of Special Education.* 4, (3), 69-101.

Dorgu, T. E. (2025). Different teaching methods: A panacea for effective curriculum implementation in the classroom. *International Journal of Secondary Education, 3*(6), 77 – 87 Education, 17(3), e2242. https://doi.org/10.21601/ijese/10896

Federal Ministry of Education (FME) (2014). *National Policy on Education*. Nigeria Educational Research and Development Council (NERDC)*,Publishers.*

Federal Ministry of Education (2016). *A handbook on adolescent reproductive health and HIV / AIDS education for trained teachers on family life and HIV education*. Ibadan: Arfh productions

Freeman, S., Quillin, K., Allison, L. & Black, M. (2019). *Biological Science*. Cambridge University: Pearson press

Iornem, D. (2016). Methodology of teaching and learning: Lecture, discussion methods and individualized instruction. Retrieved from www.google-analytics.com

Maikano, P. N., Zuhumben, J. D., Gokum, K. D., Ajiji, I. A., Sabina, M. J. & Klactu, K. C. (2022). *Curriculum theory and development*. Jos: Chuks Dee Production.

Michael, M. C. (2022). *Essential Biology for senior secondary schools*. Lagos: Tonad press.

Ozoemezinem, V. E. (2015). Effects of instructional materials on achievement and retention of Biology concepts among secondary school students in Delta State, Nigeria. *Unpublished M.Ed. Thesis, Ahmadu Bello University, Zaria*

Saima, S. & Sufiana, K. (2017). Impact of ICT enriched modular approach on academic achievement of Biology students. *Journal of Research and Reflections in Education, 11*(1), 49 – 59

Steinmayr, R., Meibner, A., Weidinger, A. F. & Wirthwein, L. (2017). *Academic achievement*. London: Routledge press

Udosoro, U. J. (2021). The effects of gender and Mathematics ability on academic performance of students in Chemistry. *African Research Review, 5*(4), 201 – 213

West African Examination Council (2024). Chief Examiner's Report. Lagos: WAEC press