

Teaching Strategy And Students' Academic Performance In Biology In Senior Secondary School Students Of Wukari, Taraba State, Nigeria

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Abstract: *The fall in the standard of education at all levels in Nigeria in the past decade is traceable to a vast array of underlying factors, the most important of which is linked to the wrong pedagogical approaches adopted by teachers in the dissemination of information in the classroom. The quasi-experimental research method was adopted to evaluate the impact which methods of teaching have on the academic performance of secondary school students taking Biology classes. The participants were divided into two groups; one experimental group and one control group. The experimental group was instructed using scaffolding strategy while the control group was instructed using the conventional chalk and talk method. The post-test mean score for the control group was 14.71 with a standard deviation of 2.09 while the post-test mean score for the experimental group was 23.83 with a standard deviation of 1.72. Also, the post-test mean scores for the male and female participants exposed to scaffolding strategy of teaching was 24.04 and 23.62 respectively. Analysis of variance revealed that at F-statistic of 1133.104 and F-criterion of 3.88853, there is significant difference between the post-test mean scores of the experimental and control groups. Results further revealed that there was no significant difference between the academic performances of male and female participants who were exposed to scaffolding strategy of teaching. Hence, variations in teaching methods can help improve the participation of students in the teaching-learning process which generates the required improvement in knowledge retention and academic performance.*

Keywords: *scaffolding strategy, teaching method, academic performance, pedagogy, Biology*

I. INTRODUCTION

The teaching process is a multifactorial system encompassing course design, course management and strategies of face-to-face teaching, provision of other learning opportunities, assessment and feedback to students (Nightingale and O'Neil, 2012). In essence, it is an attempt to assist students with viable learning opportunities so as to enhance their all-round development (Cangelosi, 2013). Since the end game of education is to equip individuals with the necessary skills needed to survive within their societies, quality education is greatly affected by the serenity of the

learning environment as well as the pedagogical skills of the teacher (Jalbani, 2014).

Teaching strategies refer to the distinct methodology of how teaching ought to be done and it involves a series of definite steps used by the teacher to achieve predetermined objectives (Biadgelign, 2010). The choice of a given pedagogical method for a given lesson affects the responses of students and determines the extent of their interest, motivation and involvement in the lesson (Mtsem, 2011). Curry stated that the primary objective for the study and application of learning and teaching styles is to improve the immediate and long-term outcomes of general teaching-learning episodes (Pashler *et al.*, 2009).

Students have different ways of absorbing information and demonstrating knowledge and their exposure to different strategies of teaching affects the way they grasp knowledge. The steep and spiral fall in the quality of education in Nigeria has been attributed to poor teaching quality and techniques (Ogunniyi, 2009; Emaikwu, 2012). This is so because there is an obvious reliance on teachers as dispensers of the body of knowledge while their students are relegated to mere note-taking and rote learning (Echevarria *et al.*, 2012). According to Ramsden, the choice of a given teaching strategy should depend on a variety of elements which include: the age and developmental levels of the students, what the students already know and need to know to succeed with the lesson, the subject matter content, objective of the lesson, available people, time, space and material resources, knowledge and skill of the teacher about teaching strategies, learning theories and the physical setting, students' background knowledge, environment and learning goals (Reece and Walker, 2009).

Scaffolding as a teaching strategy emphasizes a teaching-learning process which involves the engagement of students in collaborative tasks that would be too difficult for them to complete individually (Azih and Nwosu, 2011). The strategy is built upon the concept of 'zone of proximal development' which defines the distance between two levels of a learner's performance- the lower level reflects the various tasks which the child is capable of undertaking independently while the higher level states the tasks for which the child would require assistance (Gusrayani, 2014). Instructional scaffolding involves a more knowledgeable other providing scaffold to facilitate the learner's development (Hemmati and Mortazavi, 2016). To an extent, scaffolding can also be performed as the teacher offer explanations, invite students' participation, verify and clarify students' understandings and model desired behaviours (Ankrum *et al.*, 2017). Belland noted that the core elements of scaffolding encompass dynamic assessment, providing just the right amount of support, and Intersubjectivity (Belland, 2017).

II. STATEMENT OF PROBLEM

The fall in the standard of performance at post secondary level in Nigeria has been strongly attributed to the wrong use of teaching methods by teachers in schools. Student learning and understanding of school subjects have been frustrated by the clumsy strategies and instructional materials used (Emaikwu, 2012). Instructional strategies employed for usage by the teacher influences the cognitive, affective and psychomotor domains of the learner's knowledge base. Hence, the inadequacy of conventional lecture method to improve students' interests, achievements and retention is of grave concern to many educators in Nigeria.

This study aims to evaluate the impact of teaching strategies on the academic performance of Secondary School Students in Wukari Local Government Area, Taraba State.

III. RESEARCH HYPOTHESIS

The following hypothesis guided the study and was tested at 0.05 level of significance.

- ✓ H_0 : there is no significant difference between the academic performance of students taught Biology using scaffolding strategy and those taught using lecture strategy.
- ✓ H_0 : there is no significant difference between the academic performance of male and female students taught Biology using the scaffolding strategy of teaching.

IV. METHOD

RESEARCH DESIGN: the research employed the quasi-experimental design, a non-randomized pre-test and post-test control group design. Two groups were selected, one experimental group and one control group. The experimental group were taught using the scaffolding strategy while the control group was taught using the conventional chalk-and-talk method.

POPULATION OF STUDY: The population of the study consisted of all the senior secondary school class 2 students in Wukari Local Government Area, Taraba State. The SSS 2 students were selected because they are in the middle class of senior secondary school classes, where they were expected to have covered a good percentage of their syllabus and needed to be adequately prepared for their final examinations.

SAMPLE AND SAMPLING TECHNIQUES: The sample for the study consisted of two hundred (200) SSS 2 Biology students from five senior secondary schools in Ondo State. The multistage random sampling technique was adopted in the selection of the needed sample for the study. At the first stage, stratified random technique was used to select five (5) different districts within Wukari LGA. The second stage involved selection of one school from each of the selected districts through stratified random sampling. The third stage involved the use of simple random and purposive sampling technique to select 20 students from each of the five schools.

RESEARCH INSTRUMENT: the research instrument used to collect data for this study was Biology Achievement Test (BAT), which was developed by the researchers and validated by experts from the field of Biology Education. The test consisted of 30 multiple choice questions constructed based on the topics taught during the study, from which the respondents were to choose the correct options. The reliability of the BAT was established through trial-testing of the instrument on 50 SSS2 Biology students drawn from five schools not included in the study. Pearson Product Moment Correlation Analysis (PPMCA) was employed in determining the reliability coefficient of the BAT and the reliability was 0.86.

EXPERIMENTAL PROCEDURE: the experimental group consisted of three schools while 2 schools were selected as the control group. The purpose and objective of the study were discussed with the Biology teachers in each of the schools and arrangements were made for the administration of the pre-test with the assistance of the subject teacher prior to the commencement of treatment.

The main treatment for the study involved classroom teaching which lasted 5 weeks using scaffolding for the experimental group and the conventional chalk-and-talk strategy for the control group. At the end of the treatment, post-test was administered.

STATISTICAL ANALYSIS: descriptive statistics was used to determine the mean, standard deviation, sample variance, and sum of the post-test scores for the conventional and scaffolding teaching methods. Significant differences between the teaching strategies and between genders were tested using Single Factor Analysis of Variance (ANOVA). Statistical analysis was carried out using Microsoft Excel 2016.

V. RESULTS

A total of 100 SSS2 students in Wukari Local Government Area were randomly selected for the research study. Of these 100 participants, 50% were males while the remaining 50% were females. The ages of the participants ranged from 15 to 18. Table 1 shows the descriptive statistics for the post-test scores after exposure to the different teaching strategies. The post-test mean score of the experimental group was 23.83 with a standard deviation of 1.72 while that for the conventional teaching strategy was 14.71 with a standard deviation of 2.09. Table 2 shows the descriptive statistics for post-test scores of both genders after exposure to the scaffolding strategy. The males recorded a post-test mean score of 24.04 with a standard deviation of 2.10 which is slightly higher than the females who recorded a post-test mean score of 23.62 and a standard deviation of 1.23

Treatment	Number	Mean	S.E	S.D	S.V
Experimental	100	23.83	0.17236	1.723603	2.970808
Control	100	14.71	0.209035785	2.090357854	4.36959596

S.E- Standard Error

S.D- Standard Deviation

S.V- Sample Variance

Table 1: Descriptive statistics for post-test scores of experimental (scaffolding strategy) and control (chalk and talk strategy) groups

Gender	Number	Mean	S.E	S.D	S.V
Male	50	24.04	0.296868005	2.099173793	4.406530612
Female	50	23.62	0.173535	1.227076	1.505714

S.E- Standard Error

S.D- Standard Deviation

S.V- Sample Variance

Table 2: Descriptive statistics for post-test scores of male and female students exposed to scaffolding strategy

To test the first hypothesis, single factor analysis of variance was applied. Table 3 shows the one way analysis of variance (ANOVA) to test for significant difference between post-test scores of the experimental and control groups. Since the F-statistic (1133.104) is greater than the F-criterion (3.888853), we reject H_0 . Hence, there is a significant difference in the effects of teaching methods on the academic performance of the students.

Source of variation	SS	Df	MS	F	Fcrit
Between Groups	4158.72	1	4158.72	1133.104	3.888853
Within Groups	726.7	198	3.67020202		
Total	4885.42	199			

Table 3: Analysis of Variance of post-test scores of experimental (scaffolding) and control (chalk and talk strategy) groups

To test the second hypothesis, single factor analysis of variance was applied. Table 4 shows the one way analysis of variance (ANOVA) to test for significant difference between post-test scores of males and females exposed to scaffolding teaching strategy. Since the F-statistic (1.491819) is less than the F-criterion (3.938111), we do not reject H_0 . Hence, there is no significant difference in the academic performance of male and female students exposed to scaffolding strategy of teaching.

Source of variation	SS	Df	MS	F	Fcrit
Between Groups	4.41	1	4.41	1.491819	3.938111
Within Groups	289.7	98	2.956122		
Total	294.11	99			

Table 4: Analysis of Variance of post-test scores of males and females exposed to the scaffolding strategy of teaching

VI. DISCUSSION

Teaching is an act of providing, directing, checking and following-up activities to facilitate normal or informal learning. It is a process which involves the interaction of a teacher with a group of learners or students aimed at bringing about learning and bringing about an improvement in the student's intellectual capabilities. The mode or route via which this knowledge is passed down from the teacher to the students is termed teaching strategy. Teaching strategy or instructional strategy is an intentional and interactive process by which the teacher imparts knowledge, skills and attitudes to the students.

Analysis of variance revealed a significant difference between the post-test mean scores of the experimental group (scaffolding strategy) and the control group (chalk and talk strategy). The effect of this is that scaffolding strategy has a better effect on the academic performance of students taking Biology classes and supports Maduabum's premise that teachers' method can greatly affect students achievement and skills acquisition (Maduabum, 1995). The observed significant difference in the post-test mean scores for the two teaching strategies in this study could be attributed to students' improved participatory learning, leading to an understanding of the concepts of Biology. Also, the scaffolding strategy of teaching ensures the active participation of students in the teaching-learning process. The result is in alliance with that obtained by Bassiri (2012) and Syarifah and Gunawan (2015). Analysis of variance also revealed that there is no significant difference between the academic performance of male and female participants exposed to the scaffolding strategy of teaching. This assertion is corroborated by Azih and Nwosu (2011).

VII. CONCLUSION

Scaffolding strategy of teaching enhances and improves the learning and understanding of Biology-related topics among students, irrespective of their gender. Hence, it leads to an improvement in their academic performance and success

when compared to the conventional chalk and talk strategy of teaching. Also, variations in instructional strategies on the part of the teacher can positively affect the increased participation of students in the teaching-learning process which can lead to a resultant improvement in their academic performance.

VIII. RECOMMENDATION

The introduction of scaffolding strategy in the teaching of Biology-related topics in secondary schools should be encouraged as this will enhance student participation in the teaching-learning process.

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