

COOPERATIVE LEARNING STRATEGY AND STUDENTS' ACADEMIC ACHIEVEMENT IN BIOLOGY

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Abstract

This study investigates cooperative learning strategy and students' academic achievement in biology. This study was guided by two research questions and two hypotheses using quasi-experimental design. The population of the study was made up of 1255 biology students in 15 public secondary schools in Isi-Uzo L G A. the sample size used was 120 students the instrument used for data collection was biology WAEC past questions drawn from Genetics, Nervous system and Digestive system content areas in biology. Mean and standard deviation were used to answer the research questions while ANCOVA was used to test the hypotheses. Findings revealed that significant difference exist between cooperative learning strategy and traditional learning method in favor of cooperative learning strategy. Based on the findings recommendations were made which includes: adequate attention should be given to the female students since male has been found to perform better than females using cooperative learning. Adequate training should be given to secondary school biology teachers on the use of cooperative learning strategy in teaching biology.

Introduction

The advancement of science, technology and major innovations in our world today has been a thing of great importance. The knowledge of Science has continually been integrated into our day to day lives, domestically, industrially, agriculturally, technologically among others. Hence, science is a systematic enterprise that creates, builds and organizes knowledge in the form of testable explanations and predictions (Wikipedia, 2017). Science comprises mainly of Biology, Chemistry, Physics and Mathematics. It occupies an important position in the world and contributes solely to the nation's gross domestic product and development. Biology as a branch of science and the prerequisite subject for many fields of learning contributes immensely to the technological growth of the nation. This includes medicine, forestry, agriculture, biotechnology and nursing. The study of Biology in senior secondary school can equip students with useful concepts, principles and

theories that will enable them face the challenges before and after graduation (Nwagbo & Chukelu, 2016).

Biology appears to be the most popular Science subject at Secondary level (Balogun, 2001). This is partly because most art students consider biology easier when compared to physics and chemistry. It could be due to the perceived humor created in biology classes. The objectives of teaching biology at secondary school level as stated by National Policy on Education include to make the learners know their environment, have meaningful and relevant knowledge in biology necessary for successful living in a scientific and technological world, advance technologically among others (NPE,2013).

In a view of the above, it becomes imperative that schools are not only to equip learners with basic knowledge of biology content but also the practical skills needed for enhancing self-development. In order to achieve this, the pedagogical approach which is centered on teachers' method of impacting facts and concepts of the subject is important. The implication is that biology teaching must be effective and meaningful to achieve this goal.

Teaching and learning are primarily about interaction: Interactions between students and teachers, between students themselves, and between the students and the course materials. The success of any teaching is measured by the degree to which the teacher is able to achieve the desired objectives. To achieve the goals of science education, the teacher must know the types of learning outcomes expected from the learners and the best methods to employ that will bring about such changes in students behaviors and academic achievement.

National teachers institute ,NTI(as cited in Fakorede, 2014) remarked that the traditional instructional methods is teacher centered while Adeyemi (2012) unreservedly posited that the traditional instructional method is characterized by emphasis on instructors behavior rather than students behavior, minimal responses of students to instructional materials; and delayed feedback on students' performance.

The search for effective and efficient delivery of instruction to students has been major concern of Science Educators. This is as a result of repeated massive failure in West African Senior School certificate Examination as observed by Ahmed (2008). Statistical evidence indicated that the number of students with grades A1 to C6 were 33.42% in 2012, 26.64% in 2013,45.35 in 2014,69.8 in 2015,71.1% in 2016, 58.52% in 2017,56.65% (WEAC Chief Examiners Report, 2017). Though the performance of biology students in 2015, 2016 and 2017 has been slightly appreciable but the desire to better same record has become focus of researchers.

There is a need to develop a learner centered strategy which to a greater degree will bring about effective teaching and learning (Solomon, Watson, & Battistich, 2011). Learner centered strategy encompasses methods of teaching that shift the focus of instruction from the teacher to the students (Wikipedia, 2017). Theorists like John Dewey, Jean Piaget, Carl Rogers, Maria Montessori, Leu Vygotsky whose collective work focused on how students learn have informed the move to students centered learning. Its advantages include; it encourages collation, it motivates the learners by giving them control over the learning process, engages students to hard work (Oludipe, 2012). Some of the learners' centered strategy include; discussion method, think pair share, problem solving, critical thinking and cooperative learning have been proven to be effective for all types of students, including academically gifted and mainstream (disabled) students because it promotes learning and fosters respect and friendship among diverse groups of students. Effectively used cooperative learning strategies enhance collaborative skills, positive interdependence, and individual accountability. Majority of the students indicate that truly cooperative learning groups have positive acceptance, friendships, self-confidence and even school attendance (Solomon, Watson and Battistich, 2011). It is even argued that cooperative learning experiences are crucial in preventing many of the social problems that plague children and adolescence (Willis, 2014). Oludipe (2012) investigated the influence of gender on junior secondary student's academic achievement in basic Science using cooperative learning strategy. He found out that there was no significant difference in academic achievement of male and female students exposed to cooperative learning strategy. This is contrary to finding of Viann (2012) on effect of cooperative learning on male and female students who found no significant gender related difference. Pandian (2014) observed a significant difference in academic achievement of biology students exposed to cooperative learning strategy over counterparts who learned the same biology concepts through traditional method.

This study aimed to bridge the gap of the differences in the findings on cooperative learning strategy and traditional learning strategy. A lot has been done to improve biology teaching in secondary schools in Nigeria. In spite of that, students continue to perform poorly in biology. This situation has created the need for more effective teaching method. It then becomes necessary to explore the efficacy of alternative method of redressing this situation.

Studies have been done on cooperative learning, but there is no empirical evidence so far, on cooperative learning strategy and students' academic achievement in biology in Isi-Uzo LGA to the best of the researchers' knowledge hence this study.

Two research questions and two hypotheses guided the study;

- What are the mean achievement scores of biology students when exposed to cooperative learning strategy and traditional lecture method?
- What are the mean achievement scores of male and female biology students when exposed to cooperative learning strategy and traditional lecture method?
- There is no significant difference between the mean achievement scores of students exposed to cooperative learning and those exposed to traditional method.
- There is no significant difference between mean achievement scores of male and female students exposed to cooperative learning strategy.

Method

The design of this study was quasi-experimental. The specific design was pre-test, post-test, non-equivalent control group design. This design was adopted because intact classes were used as it was not possible to have complete randomization of the subjects. The population of the study is 1255 SS11 biology students in 15 public secondary schools in Isi – Uzo L. G. A. of Enugu State. Purposive sampling was used to draw two schools making use of intact classes. Each of the school has experimental group and control group of intact classes of 30 respectively given a total of 120 students. In each of the school sampled there was experimental group and control group. The instrument used for data collection was Biology Achievement Test (BAT) adapted from WAEC past questions based on three content areas in biology; Genetics, Nervous system and Digestive system. The reliability of the instrument was established using kuder-Richardson 20 and the reliability index was found to be 0.75.

The regular biology class teachers were used for the study in both experimental group and control groups. Training was given to the biology teacher who took the experimental on the application of cooperative learning strategy while the biology teachers who took the control groups used the traditional lecture method, since intact class was used. The experimental class teachers was given notes of lesson plan prepared by the researcher while the researcher vetted the lesson plan prepared by the biology teachers in the control groups to ensure that the teacher did not deviate from the procedures of instruction commonly used by biology teachers. Biology Achievement Test (BAT) was used for both pre-test and post-test. The pre-test was administered before instruction in both schools. The treatments consist of teaching a selected biology concept: Genetics, Nervous system, Digestive system. The cooperative classes were properly guided by the class teacher with active

interaction of the students. The control groups were taught the same biology concept using traditional lecture method. Lesson plans for both the treatments and control groups were the same in terms of contents, instructional objectives, length of time for teaching and mode of evaluation.

At the end of the six (6) weeks of sixteen (16) periods, the teacher administered the post test (after reshuffling of the items) to the subjects in the two groups using biology achievement test (BAT). The scripts from both pre-test and post-test of the two groups were marked and scored using the marking guide.

The data collected from the pre-test and post-test of BAT were analyzed using mean and standard deviation for answering the research questions and analysis of covariance (ANCOVA) for testing the hypotheses at 0.05% level of confidence. ANCOVA was used to remove non-equivalence among research subjects since intact class was used for the study.

Results

Table 1-Mean achievement scores of students taught using cooperative learning strategy and traditional lecture method

Teaching Method	N	Pre-test		Post-test		Mean Achievement Gain
		Mean	SD	Mean	SD	
Cooperative	60	26.67	4.22	78.58	10.75	51.91
Traditional	60	27.36	3.36	65.08	11.95	38.08
Mean Difference		26.83	71.83			

Table 1 shows that at pre-test, the mean achievement scores of students taught with the cooperative learning method was 26.67 while those of the traditional learning method had a mean score of 27.36. After post- test, it was observed that students taught with cooperative learning method had a mean score of 78.58 with standard deviation of 10.75 while those taught using the traditional lecture method had a mean score of 65.08 with standard deviation of 11.95. The mean gain for cooperative learning was 51.91 and 38.08 for traditional lecture method. The mean achievement score of students taught with cooperative learning was higher in post-test than mean achievement scores of those taught with traditional lecture method. This implies that students taught with cooperative learning strategy achieved higher than students taught with traditional lecture method. As a result of this observed difference in mean achievement scores, hypothesis 1 was tested at 0.05 levels to determine if the observed difference was significant.

Table 2: mean achievement scores of male and female students exposed to cooperative learning strategy and traditional lecture method

Pretest Posttest Mean Achievement Gain							
Groups	Sex	N	mean	S.D	mean	S.D	
Cooperative	Male	30	27.50	5.76	79.83	8.04	52.33
	Female	30	25.71	4.66	77.33	7.52	51.62
Mean Difference			26.60		78.58		
Traditional	Male	30	15.24	2.90	33.06	3.72	17.82
	Female	30	12.12	3.48	32.02	3.65	19.9
Mean Difference			13.19		19.55		

The data above show that male taught with cooperative strategy had a mean score of 27.50 with mean gain of 52.33 against their female counterpart with mean score of 25.71 and mean gain of 51.62 in there pre-test. The higher mean score of male implies that male students achieved higher than female students taught with cooperative learning strategy. In other hand, male students taught biology with traditional method had mean score of 15.24 and mean gain of 17.82 while their female counterpart had mean score of 12.12 and mean gain of 19.9 in their post-test. The higher mean score of male students showed that male students achieved higher than female students exposed in the same method.

Table 3- Analysis of covariance (ANCOVA) for students mean achievement scores in biology achievement test

Source	Type III sum of squares	df	mean square	f	sig
Corrected model	3225.836	3	1075.279	9.024	.000
Intercept	31056.277	1	31056.277	260.619	.000
Method	3143.757	2	1571.879	13.191	.000
Pre	116.531	1	116.531	.978	.325
Error	10248.053	117	119.163		
Total	459387.500	120			
Corrected total	13473.889	119			

P< .05

From table 3, the result shows that there is a significant difference between the mean achievement scores of students taught biology using the cooperative learning strategy and the traditional lecture method. This is revealed in the p-value (sig) of .000 which is less than the $P < .05$ which is the bench mark for accepting and rejecting the hypothesis. Based on the fact that .000 is less than .05 the null hypothesis is rejected upholding the alternative hypothesis that says that there is a significant difference between the mean achievement of students

Table 4: Analysis of covariance for male and female students mean achievement score in biology achievement test.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig
Corrected Model	486.639	2	243.320	9.359	.000
Intercept	2976.734	1	2976.734	114.499	.000
Pre-test	.310	1	.310	.012	.913
Gender	486.549	1	486.549	18.715	.000
Error	2703.791	57	25.998		
Total	28235.00	60			
Corrected Total	3190.430	59			

From table 4, result shows that there is significant difference in the mean achievement scores of male and female students taught biology using the co-operative learning strategy. This is revealed in the p-value (sig) of .000 which is less than the $P < .05$ which is the bench mark for accepting and rejecting the hypothesis. Based on the fact that .000 is less than .05, the null hypothesis is rejected upholding the alternative hypothesis that says that there is a significant difference between the mean achievement of male and female students taught biology using cooperative learning strategy.

Discussion

The result indicated that the mean achievement of students taught biology using the co-operative learning strategy was significantly higher than those of the students taught using the traditional lecture method in favour of the cooperative learning group. This is in agreement with Pandian (2014) who stated that students in the cooperative learning instruction group showed remarkable posttest mean difference over their respective counterparts who learn the same biology concept through traditional method. This finding is also in line the argument of Willis, (2014) that cooperative learning experiences are

crucial in preventing many of the social problems that plaque children and adolescence.

The result of the present study also revealed that there is a significant difference in the mean achievement scores of male and female students in the BAT using co-operative learning strategy, with the male achieving higher than female. This finding is in disagreement with Oludipe (2012) whose finding revealed that there was no significant difference in the academic achievement of male and female students in the pretest and posttest respectively. The finding is in agreement with Fakerede and Okeke, (2014), who found out that significant difference, exist between male and female students exposed to cooperative learning strategy in chemistry achievement.

Conclusion

Co-operative learning strategy was found to be a significant factor in students' achievement. Also from the findings it was observed that male students achieve higher than the female when taught using co-operative learning strategy, this means that co-operative teaching method is gender sensitive.

Recommendations

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

1. Cooperative instructional strategy should be incorporated into curriculum at all levels of education sine students' achievement is enhanced using this strategy.
2. Biology teachers should be encouraged to adopt cooperative instructional strategy over the conventional method
3. In using the developed BAT, the influence of gender has to be noted since students' achievement in biology as measured by BAT is significant. Adequate attention should be given to the female students while using this strategy since males have been found to perform better than females using cooperative learning.
4. Adequate training should be given to secondary school biology teachers on the use of cooperative learning strategy in teaching biology

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