



Effect of Cooperative And Enquiry- Based Teaching Strategies on Biology Achievement of Secondary School Students in Minna, Nigeria

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ABSTRACT

The study investigated effect of cooperative and enquiry-based teaching strategies on biology achievement of secondary school students in Minna, Nigeria. The population comprised of Senior Secondary two (SS2) Students in three Coeducational Secondary Schools out of eight in Minna Metropolis area of Niger State. One hundred and fifty Students (150) were selected through random sampling technique. The instrument used for data collection was adapted from West African examination council (WAEC) past objectives question papers from 2014 to 2018. Test retest method with interval of two weeks was used to obtain data for reliability coefficient $r = 0.87$ was obtained, three null hypothesis were formulated and tested at 0.5 alpha level of significance, the three hypothesis formulated one was rejected and two were upheld. The findings of the study revealed that Cooperative teaching and learning strategy has positive influence on students achievement and active involvement in teaching and learning biology. But enquiry based teaching strategy was more effective. Enquiry-based teaching strategy was recommended for use by teachers, curriculum planners and the Government since it was more effective for teaching and learning and is gender friendly.

Keywords: Cooperative teaching strategy, Enquiry teaching strategy, Biology, Achievement

INTRODUCTION

Biology teachers have much to learn about how to reach all students. Sometimes, biology terms look like foreign language and the students find it difficult to understand. Besides there are many topics in biology and because teachers try to explain everything in detail, as dictated by the curriculum, students cannot connect the topics to each other and comprehend the knowledge. Since biology has many topics, the weekly lesson time is not enough to teach all of the topics in a proper way. To cover all the topics in the curriculum, therefore, teachers try to teach biology quickly without engaging in practical activities or involving students in the lessons. As the students are introduced to many concepts, terms, or information in too short a time, they may not learn biology properly. Tekkaya et al. (2012) and Powell (2014) Stated that making learning effective in biology is related to study skills or behaviors and the teaching methods applied by teachers. Various study strategies or tactics to make biology learning effective were suggested, such as co-operative learning, solving questions, regular reviews and taking notes. It was believed that if the students solve various biology questions related to the biology topics being taught, they can learn biology more effectively because while solving questions, they can review the topics again and learn new ones as well. Additionally, sometimes solving questions require students to make connections between topics or with other disciplines as well. This facilitates their learning. As stated earlier, because the students consider biology a verbal science that biology contains many verbal and abstract concepts, in order for the students to retain the information, practicing the work together, using the processes of science through enquiry method of learning, summarizing, repeating and reviewing the knowledge regularly with their class mates could help the students recall biological knowledge much more easily.

This paper therefore attempts to compare the effectiveness of a cooperative teaching strategy and an enquiry-based teaching strategy in teaching genetics concepts in biology.

Purpose of the Study

The major purpose of this study is to determine the effects of Cooperative teaching strategy, Enquiry based method and the conventional method of teaching on the achievements among secondary school biology Students in Minna metropolis of Niger State. Other objectives of the study are;

1. To determine the relative effects of Co-operative teaching Strategy and the enquiry- based Strategy on the Secondary School Student's Achievement in Genetics Concepts
2. To determine the influence of gender on the achievements of Students taught with the Cooperative teaching strategy in genetics concepts
3. To determine the influence of gender on the achievements of Students taught with the Enquiry based teaching Strategy in Genetics Concepts.

Research Questions

The study attempts to find answer to the following questions

1. What are the mean achievement score of students taught genetics through traditional teaching strategy
2. What are the mean achievement scores of male and female students taught genetics through - cooperative teaching strategy?
3. What are the mean achievement scores of male and female students taught genetics through Enquiry-based teaching strategy?

Statement of the Hypothesis

To guide the study the following null hypothesis were formulated.

Ho₁, There is no significant difference between the mean achievement scores of students taught genetics through Cooperative teaching strategy; Enquiry- based teaching Strategy and their counterpart in control group.

Ho₂, There is no significant difference between the mean achievement scores of male and female students taught through Cooperative learning strategy

Ho₃, There is no significant difference between the mean achievement scores of male and female Students taught through enquiry- based teaching strategy.

METHODOLOGY

The design adopted for this study is a pre test and post test experimental design' three levels of independents violable (two treatments and a control group) were investigated on students achievements in genetic concepts. All the experimental groups and control group were given treatments. Experimental group 1 was subjected to treatment using Cooperative teaching strategy; group two was subjected to treatments using enquiry- based method. Control group was taught using Conventional method. This study was conceptually framed using active learning as an approach to students centered learning. Active learning is described as the implementation of variety of specific students centered instructional strategies to teach science. The strategies may include enquiry method of learning, co-operative learning, use of instructional materials etc which can be beneficial to students and help improve their achievement as opposed to a traditional teacher- oriented learning environments that promotes passive learning.

The population for this study made up of ten Coeducational Senior Secondary School Students with a total number of one thousand nine hundred and eight biology Students in Minna metropolis of Niger State. Three stages of sampling was carried out. The first was random sampling to obtain five secondary schools in Niger State. The Second random sampling was used to select three equivalent schools which were randomly assigned to the two experimental and one control group. Then finally stratified sampling technique was used to select sample size for the study.

The researcher visited the sampled schools to obtain approval by the school authority for the research work. The duration for the research was six weeks, the objectives and the modalities were clearly stated and operational guide was provided before the experiment commenced. The researcher visited the schools the first week to familiarize herself with the staff and students.

The second week the researcher administered the genetic achievement test (GAT) to the students in the selected schools and this served as the pretest with the aim of ascertaining the equivalence of the students before the experiments begin. Thereafter treatments were administered in the three schools from the second week to the sixth week followed by posttest (GMT) to measure the achievement of the sample students in the selected schools. The Researcher ensured that the test was administered simultaneously in all the three schools and the scripts were collected and marked immediately. The

result was analyzed based on the stated hypothesis using mean, standard deviation, t-test and ANOVA. The significance of each of the statistical analysis was ascertained at 0.05 alpha level.

RESULTS

Table 1; Subjects Distribution by group and gender

GROUP	GENDER		TOTAL
	MALE	FEMALE	
Experimental Group 1	23	27	50
Experimental Group 2	26	24	50
CONTROL	30	20	50

Table 1 shows Subjects distribution by group and gender. The table shows three groups; experimental group 1 with a total of 50 students 23 male and 27 females, experimental group two with 50 students 26 males and 24 females and the control group with 50 students, 30 males and 20 females totaling 150 students

Table 2; T- test comparison of the pretest mean score of the experimental group 1, experimental group 2 and the control group

GROUPS	N	X	SD
EXPERIMENTAL GROUP ONE	50	15.70	8.05
EXPERIMENTAL GROUP TWO	50	15.30	8.90
CONTROL GROUP	50	15.10	9.06

The result on table 2 present the pretest means score of experimental group 1, Experimental group 2 and control group. The mean score was 15.70, 15.30 and 15.10 respectively. This shows that there is no significant difference between the pretest means score of the three groups. Therefore they were equivalent in their entry knowledge into the research.

Table 3 Null hypothesis one

H₀; there is no significant difference between the mean achievement scores of students exposed to Cooperative , Enquiry teaching strategies and their counterpart in the control group.

in order to test this hypothesis, ANOVA was used. The summary of the analysis is as shown on the table 3.. **Table 3 ANOVA result for comparison of the posttest mean score of the Experimental Group1, experimental Group 2 and control Group**

Source of variation	SS	DF	MS	F
Between groups	23950333	2	11975.167	131.23
Within groups	13417.000117	91.272		
Total	37368.321	1.50		

Significant at 0.05 level

Table 3 presents the ANOVA results, the result shows that analysis of variation for the data on experimental group 1, experimental group 2 and control yield an f-ratio of 131.203 and a significance value of 000, the result is significant at p 0.05. This indicates that there is significant difference in academic achievement of students taught using conventional teaching strategy (F) df F149 p F 0.05

Table 4. Scheffe Multiple comparisons result of Experimental Group 1, experimental group 2 and control

(1)!, 2(J) 1,2 & 3	Mean differences (I-J)	Standard Error	Sig	Lower boundary	95% Confidence interval Upper boundary
1 2	-13.800	1.920	0.00	-17.98	-9.12
3	17.1000	1.920	0.00	12.28	21.70
2 1	13.900	1,920	0.00	9.15	18.67
30	30.900	1.920	0.00	27.17	35.60
3 1	-16.000	1.920	0.00	21.78	-12.17
2	29.800	1.920	0.00	-3.602	-26.19

Significant at 0.05 level

1,2,3 represent experimental group 1, Experimental group 2 and control, multiple analysis on table 3 indicated that the observed significant difference was between experimental group 1, experimental group 2 and control with the highest mean score of 30.900 and highest upper boundary of 35.60 at 95% confidence level. Based on this, hypothesis one was rejected.

Null hypothesis two

H₀₂ There is no significant difference between mean achievement scores of male and female students exposed to cooperative teaching strategy

To test this hypothesis t- test was used to analyze the mean scores. The summary of these analyses is shown in table 5

Table 5. T -test comparison of the male and female mean score of the students taught through Cooperative teaching strategy. Experimental group 1

Variable	N	Df	X	SD	t-Value	P	Remarks
Male	27	48	55.73	9.78	3.78	0.001	Significant
Female	23		45,95	5.77			

Significant P<0.005

The table 5 presents the t-test of male and female students exposed to cooperative teaching strategy (experimental group one) , the mean score of the male students was 55.74 and 54.96 for the female. The calculated t-value of 3.78 was not significant at the 0.05 level. This indicates that there is no significant difference between the male and female students taught with cooperative teaching strategy.

Null hypothesis three

H₀₃ : There is no significant difference between the mean achievement scores of male and female students taught with enquiry- based teaching strategy. To test this hypothesis. T test was used to analyze the mean scores as summarized below in table 5

Table 6; t-test comparison of the male and female mean score of the students taught with enquiry-based teaching strategy (Experimental Group 2)

Variable	N	Df	SD	t-value	P	Remarks
Male	27	48	9.77	3.77	0.10	Significant
Female	23		5.80			

Ns=not significant $p > 0.05$

The Table 6 presents the t-test of male and female students taught through enquiry-based teaching strategy (experimental group two), the mean scores of the male and female was 55.8 and 55.68 for the female calculated t-value of 5.56 was not significant at the 0.05 level. This indicates that there is no significant difference between the male and female students taught with enquiry-based teaching strategy ($t=1.05, df=38, p=0.10$). Hence, H_{03} was not rejected.

DISCUSSION

The result table 3 hypothesis one (H_{01}) reveals that there is a significant difference in students taught genetics concepts by means of cooperative teaching strategy (Experimental group 1), those taught through enquiry -based teaching strategies (experimental group2) and students taught using conventional method (control group) in the posttest. The result table 3.2 Hypothesis (H_{01}) revealed that students taught genetics through enquiry-based teaching strategy (experimental group2) did better than those taught through cooperative teaching strategy and those taught with conventional method (control group) in the posttest. It is therefore observed that using enquiry – based teaching strategy allows students interaction which promotes their achievements in the lesson. The result is in agreement with Bassey (2018) which stated that enquiry based teaching strategy was more effective than cooperative teaching method in physics classroom

Table 5 shows the result of hypothesis two (H_{02}) which is the posttest comparison of male and female mean score of the students taught with cooperative teaching strategy (experimental group one) the results shows that both male and female students performed alike.. This is also in agreement with (Salehizadeh and Nouredin (2013) who in their research findings stated that there is no significant difference between male and female students performance in science classroom and disagrees with the findings of John (2018) which stated that female students performed better than male students in science subjects

Table 6 shows the result of hypothesis three (H_{03}) which is the posttest comparison of the mean score of male and female students taught with enquiry-based teaching strategy (experimental group two) reveals that both groups benefited equally from the teaching of the concepts of genetics through enquiry teaching strategy and that there is no difference in the performance of male and female student which were taught genetics concept with enquiry based strategy. This indicates that gender has no effect on students' performance when taught using cooperative teaching method.

This result is in agreement with the findings of Salehizadeh and Nouredin (2013) which discovered that gender has no influence on students' performance when enquiry teaching strategy is used.

CONCLUSION AND RECOMMENDATION

Based on this study it is concluded that one of the major causes of student's poor performance in biology at secondary school level is wrong choice of instructional strategy. Appropriate choice of instructional strategy will lead to improved performance in biology among secondary school students. It is therefore recommended that:

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students overcome difficulties in understanding, describing and interpreting genetics concepts

3 The use of enquiry-based teaching strategies should be encouraged by teachers, curriculum developers And the Governments since it appears to be gender friendly in terms of academic achievements.

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