



Effect of Cooperative Learning Strategy on Biology Students' Academic Performance in Senior Secondary School in Rivers State

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JSRR/2019/v23i630138

Editor(s):

(1) Dr. Ana Paula da Silveira Simões Pedro, Professor, Department of Education, University of Aveiro, Portugal.

Reviewers:

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(3) Alan Garfield, University of Dubuque, USA.

Complete Peer review History: <http://www.sdiarticle3.com/review-history/48100>

Received 20 January 2019

Accepted 05 April 2019

Published 08 July 2019

Original Research Article

ABSTRACT

Aims: This study investigated the effect of cooperative learning strategy on students' academic performance in biology in Senior Secondary Schools in Rivers State.

Study Design: Quasi-experimental design.

Place and Duration of Study: Port Harcourt, Rivers State, located in the South-South geo-political zone of Nigeria, West Africa.

Methodology: The population consist of 2,150 Senior Secondary three biology students out of which 120 students of intact classes in selected schools formed the sample. Three research questions and three hypotheses guided the study. The instrument used in data collection was Biology Performance Test developed by the researchers. The test items were selected from standardized past questions of Senior School Certificate Examinations conducted by The West African Examinations Council and validated by two lecturers in Science Education and one lecturer

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in Measurement and Evaluation. The reliability coefficient was determined by test retest method using Pearson Product Moment Correlation Coefficient to be 0.78. Mean, standard deviation and t-test at .05 level of significance were used for data analysis.

Results: The results of the study revealed a significant difference in performance between students taught biology with cooperative learning strategy and those taught with conventional lecture method. Students in the experimental group where cooperative learning teaching strategy was adopted scored significantly higher in biology performance test than those in lecture method group. There was no significant difference in performance based on gender (male and female) and school type (public or private).

Conclusion: Cooperative learning strategy is more effective in teaching and enhances biology students' performance than the conventional lecture method.

Keywords: Cooperative learning; lecture method; biology; academic performance senior secondary school.

1. INTRODUCTION

Biology as a subject is the science of life and deals with the study of living things. The knowledge of biology prepares students to apply basic scientific concepts in dealing with numerous issues encountered on daily basis and comprehend the natural world. There are three main divisions of biology – ecology, morphology (organism structural aspects) and physiology (organism functional aspects). Several methods are available for teaching biology in senior secondary schools. The suitability of a given method depends on the concept in consideration and works together with other components of learning to enhance students understanding and performance in examinations. One of the methods that is widely used by teachers is cooperative learning.

Cooperative learning is a student-centered instructor-facilitated instructional strategy in which small group of students are responsible for their own learning and learning of all group members [1]. It is an instructional strategy where the teachers organize students into small groups which work together and help one another to learn academic content and reach a common goal. The teacher maintains and controls the learning environment, designs learning activities and social interactions, and structure work teams. In this strategy every student participates in the team and there is cooperation among team members as well as collective effort which facilitates understanding of subject matter. That is why Slavin [2] argues that a critical element of cooperative learning is group team work and team goals. Cooperative learning can be formal or informal, but often involves specific instructor intervention to maximize student interaction and learning. In formal cooperative learning, students

work together for one or more class periods to complete a joint task or assignment, while in the informal cooperative learning small, temporary, ad-hoc groups of two to four students work together for brief periods in a class, typically up to one class period, to answer questions or respond to prompts posed by the instructor.

The advantages of cooperative learning are numerous. First, cooperative learning uses both goal interdependence and resource interdependence to ensure interaction and communication among group members. Changing the role of the instructor from lecturing to facilitating the groups helps foster this social environment for students to learn through interaction. Cooperative learning develops more friendly relation of students with their classmates and provide for development of social and communication skills, increased tolerance and acceptance of diversity. It promotes active participation of students in the process of knowledge construction which in turns help to develop their interest in the subject [3]. Cooperation in learning is different from competition. Cooperation which is positive interdependence, results in resourceful interaction during which individuals facilitates each other's learning effort. On the other hand, competition which is negative interdependence, usually results in oppositional interaction, during which individuals obstruct each other's learning effort leading to decreased achievement and negative relationship. Cooperative learning is designed to offer incentives to group of students who work together as a group to achieve a group task as opposed to non-cooperative activity where individuals are not intrinsically motivated to help their classmate towards a common goal. Cooperative learning finds its usefulness in the teaching of various science subjects including

biology at both the secondary and tertiary levels of education.

There are different methods and models of cooperative learning. Cooperative learning methods can be classified into two main categories: structured team work and informal group method. The structured team learning involves rewards based on learning progress of their members and is characterized by individual's accountability which means that success depends on individuals learning not group product. Models of structured team learning are Student Teams–Achievement-Division (STAD), Teams–Games-Tournament((TGT) and Cooperative Integrated Reading and Composition (CIRC). The informal group method focuses more on social dynamic of, projects, and discussion than mastery of well specified content. Examples of models of informal group learning methods are Jigsaw, learning together, think-pair-share and group discussion [1].

Student Teams-Achievement Division

(STAD): This model is most appropriate for teaching well-defined objectives, such as mathematical computations and applications, language usage and mechanics, geography and map skills, and science facts and concepts [2]. Student Teams-Achievement Division model (STAD) proposed by Slavin in 1995 consists of four steps which include, whole-class presentation, group discussion, test and group recognition

- (1) **Whole-class presentation:** At this level, teachers present materials to the whole class with the aid of technology and questioning techniques as used in any other teaching methods.
- (2) **Group discussion:** Afterwards, heterogeneous teams of four are formed, based on students' performance level, ability, sex, ethnicity and social economic status, to study the materials and do the worksheets. Students work within their teams to make sure that all team members have mastered the lesson by questioning and giving elaborated explanations, as they know they are interdependent and accountable for themselves and the whole group.
- (3) **Test:** After the group discussion, all students take individual test on the material, at which time they cannot help one another. Usually, the quizzes are in

the form of multiple-choice questions. Students test scores are compared to their own past averages, and points are awarded based on the degree to which students can meet or exceed their own earlier performances. The difference between the test score and the base score is then checked against the Improvement Score Conversion Table can be used to determine the individual improvement score which is then entered into the Test Score.

- (4) **Group recognition:** These points are then summed to form team scores, the group with the highest average group improvement score receives a group reward. Alternatively, any group which has its group score reaching a pre-determined level can receive a group reward. The whole cycle of activities, from teachers' presentation to team practice to quiz, usually takes 3-5 class period. In Cooperative learning environment there is positive interdependence and students perceive that better performance by individuals produces better performance by the entire group. Macpherson [4] proposed several features that can help these groups work well:

- The instructor defines the learning objectives for the activity and assigns students to groups.
- The groups are typically heterogeneous, with particular attention to the skills that are needed for success in the task.
- Within the groups, students may be assigned specific roles, with the instructor communicating the criteria for success and the types of social skills that will be needed.
- Importantly, the instructor continues to play an active role during the groups' work, monitoring the work and evaluating group and individual performance.
- Instructors also encourage groups to reflect on their interactions to identify potential improvements for future group work.

Motivational and social cohesion theories provide theoretical basis for this study. The two theories focus on the interactions among groups of students and holding these interactions themselves for better learning and achievement. The motivational perspective presumes that motivation is the single most important part of

learning process asserting that motivation motivates self-interest. The scholars holding to this believe focus on reward or goal structure under which students operate, even going so far to suggest that in some circumstance's interactions may not be necessary for the benefits of cooperate goal structure to manifest. By contrast the social cohesion perspective known as social interdependence theory proposed by [5] in 1989 suggest that the effect of cooperative learning is largely dependent upon the cohesiveness of the group. In this perspective, students help each other to learn because they care about the group and its members and come to derive benefit of self-identity from group membership [6]. There are two types of social interdependence. Positive interdependence which occurs when the actions of individuals promote the achievement of joint goals and negative interdependence which occurs when the actions of individuals obstruct the achievement of each other's goals. Cooperative learning follows the idea that groups work together to learn or solve a problem. Conflict occurs in the process of cooperation between one individual and another [7]. This conflict creates cognitive dissonance which in turns encourages learning in different perspective and cognitive development which accelerates students' intellectual development by forcing them to reach a consensus with other students whose points of view differ on the educational task in consideration [8]. Furthermore, [9] posited that human mental functions and accomplishments have their origins in social relationships, and that knowledge is socially constructed through cooperative efforts to learn and solve problems.

Several studies have explored use of cooperative learning strategy and its effect on students' academic performance. For instance, [10] investigated the effect of cooperative learning strategy on biology students' academic achievement in Yola educational zone of Adamawa State, Nigeria. The sample of the study was 372 biology students and Biology Achievement Test (BAT) the instrument. Results of the study revealed a significant difference between performance of students in experimental group taught with cooperative learning strategy and control groups taught with conventional lecture method in favour of experimental group. Students in the experimental group performed better than those in lecture method group. Further evidence from the study showed that cooperative learning strategy

produced positive effect on students' academic achievement. Muraya and Kimamo [11] investigated the effects of cooperative learning strategy on biology achievement of secondary school students in Machakos District, Kenya using 183 students as sample and Solomon 4 design with biology achievement test as instrument. Results of the study revealed that cooperative learning strategy caused significantly higher mean achievement scores compared to regular teaching method. Students who were taught through cooperative learning strategy attained significantly higher achievement scores in biology achievement test compared to those who were taught through the regular teaching method. Further findings revealed that gender had no significant influence on achievement.

Chatila and Al Hussein [12] investigated the effect of cooperative learning strategy on students' acquisition and practice of scientific skills using 120 grade 7 Lebanese biology students. Results of the study showed that cooperative learning strategy had a significant effect on students' achievement in learning and practicing scientific skills. Further findings revealed that cooperative learning improve students thinking since it allows students to communicate actively with each other. Nnorom [13] examined the effect of cooperative learning instructional strategy on senior secondary school students' achievement in biology in Anambra State Nigeria. The study adopted quasi-experimental design using 111 seniors secondary (SS1) students in Nnewi Local Government Area of Anambra State as sample and Biology Achievement Test (BAT) as instrument. The results of the study revealed that students taught using cooperative learning instructional strategy performed better in biology achievement test than those taught using lecture method of instruction. There was no interaction between method and gender on students' biology achievement test.

Molla and Muche [14] evaluated the impact of cooperative learning strategies on students' academic achievement and laboratory proficiency in biology subject in selected rural schools in Ethiopia. The researcher utilized 369 biology students and 18 biology teachers for the study. Finding of the study revealed a considerable increment in biology achievement and laboratory competence in students exposed to cooperative learning strategy. Further evidence showed that there was significant relationship between students' academic

achievement and laboratory proficiency. Yaduvanshi and Singh [15] examined the effect of cooperative learning method on biology achievement of rural and urban students at Secondary School Level in India. 63 class IX students and Biology Achievement Test (BAT) were used as sample and instrument respectively. The results of the study revealed that cooperative learning strategy method enhanced students' achievement in biology in favour of rural students. Further finding revealed that cooperative learning strategy had positive effect on every student irrespective of their locality. Students enjoyed group discussion, team work and group debate. Odagboyi [16] examined the effect of gender on the achievement of students in biology using the jigsaw method and 87 students in SS1 in a secondary school. Results of the study showed that there was a significant difference between the mean scores of male and female students in biology in favor of the males. This showed that the males gained more from the jigsaw method compared with the females.

Cooperative learning strategy has also been explored in other subject areas. Bukunola and Idowu [17] for example studied the effectiveness of cooperative learning strategies on Nigeria Junior Secondary Students academic achievement in Basic Science. The sample was 120 students and instruments Achievement Test for Basic Science students (ATBSS) and Basic Science Anxiety Scale (BSAS). The results of the study showed that two cooperative learning strategies (learning together and jig-saw II groups) had higher immediate and delayed academic achievement mean score than the students in the conventional lecture group. Learning together and jig-saw II cooperative teaching strategies were found to be more effective in enhancing students' academic achievement and retention of information in basic science more than the use of conventional lecture. According to them when friendliness is established, students are motivated to learn and are more confident to ask questions from one another for better understanding of the task being learnt. Ajaja and Eravwoke [18] examined how the adoption of cooperative learning as instructional strategy for teaching integrated science influences students' achievement and attitude towards the subject. The results indicated significant higher achievement test scores of students in cooperative learning group than those in the conventional classroom. [3] examined cooperative learning strategy and

students' academic achievement in home economics in Oredo Local Government Area of Edo State. The sample was 169 home economics students and instrument Home Economics Achievement Test (HEAT) the instrument. Findings of the study revealed that there was a significant difference in the achievement of home economics between students exposed to cooperative learning strategy and lecture method.

Tran [19] investigated the effects of cooperative learning on the academic achievement and retention of 110 first –year primary education students of Giang University, Vietnam towards the psychology subject and found that students who were instructed using cooperative learning strategy achieved significantly higher scores on the achievement test and knowledge retention than students who were instructed using lecture-based teaching. The study supported the effectiveness of cooperative learning in Vietnamese higher education. Hussian et al. [20] in their study to determine the effect of cooperative learning on the academic achievement and self-concept of the students at elementary school level using 40 students in the 5th class discovered that cooperative learning method was better than lecture method in development of academic achievement and academic self-concept of students. Across the gender, self-concept of female was significantly better than the male while there was no difference on academic achievement across gender and class. There was no significant difference in achievement test scores between male and female students in cooperative learning group and interaction effect between sex, and ability, sex and method, ability and method among method, sex, and ability and achievement.

1.1 Statement of the Problem

Despite the numerous applications of biology in provision of basic need of man, poor performance of biology students in Senior School Certificate Examinations has persisted over the years. Instructional materials and other learning facilities which constitutes the school environment blended with appropriate teaching method facilitate teaching and learning process. The use of inappropriate method in teaching biology renders adequate facilities unproductive and promote concept difficult, which constitutes a problem. Several attempts geared toward the discovery of appropriate method for optimum

learning of biology have been made. Specifically, studies have considered the use of different models of cooperative learning such as jig saw to establish the effect of cooperative learning on students' academic performance without looking at the Student Team- Achievement Division (STAD) model, thereby leaving a gap in knowledge. This study is therefore carried out to fill this gap in knowledge by investigating the effect of Student Teams-Achievement Division (STAD) model of cooperative learning on students' academic performance in biology in Senior Secondary Schools in Rivers State.

1.2 Purpose of the Study

This study was carried out to investigate the effect of cooperative learning strategy on students' academic performance in biology in Senior Secondary Schools in Rivers State. Specifically, this study tends to provide answers to the following questions:

1.2.1 Research questions

The following research questions were proposed to guide the study.

1. What is the difference between the performance of students taught biology using cooperative learning strategy and those taught using conventional lecture method in Senior Secondary Schools in Rivers State?
2. What is the difference between the performance of male and female students taught biology using cooperative learning strategy in Senior Secondary Schools in Rivers State?
3. What is the difference between the performance of public and private school students taught biology using cooperative learning strategy in senior secondary schools in Rivers State?

1.3 Hypotheses

The following hypotheses were developed to answer the research questions.

HO₁. There is no significant difference between the mean performance of students taught biology using cooperative learning strategy and those taught using conventional lecture method in senior secondary schools in Rivers State.

HO₂. There is no significant difference between the performance of male and female students taught biology using cooperative learning strategy in senior secondary schools in Rivers State.

HO₃. There is no significant difference between the performance of public and private school students taught biology using cooperative learning strategy in senior secondary schools in Rivers State.

2. MATERIALS AND METHODS

This study adopted quasi- experimental design. The population consist of 1,897 Senior Secondary 3 biology students in 25 Senior Secondary Schools of Port Harcourt Local Government Area of Rivers State. 102 Senior Secondary 3 biology students comprising of 47 male and 55 female students of intact classes in the selected schools formed the sample. 53 students were in the experimental group and 49 students in the control group. The selected classes were randomly assigned experimental and control group in each school. The instrument was Biology Performance Test (BPT) developed by the researcher which contains 25 multiple choice questions based on the contents of the Senior Secondary School Biology Curriculum. The items were selected from the West African Examinations Council Senior Secondary School Certificates Examination (WASSCE) past question papers. The instrument was given to two lecturers in science Education Department and one lecture in Measurement and Evaluation for face and content validation while the reliability coefficient was determined by test –retest method and calculated to be of 0.78 using Spearman's Rank Order Correlation Coefficient. Mean, Standard Deviation and t-test of independent were statistical tools used for data analysis and hypotheses tested at .05 level of significance. Students in the experimental group were taught using cooperative learning strategy and those in control group were taught using conventional lecture method. The lesson lasted for 4 weeks of 2 units each. Before treatment, the instrument was administered to the experimental and control group as pre-test and after treatment as post-test.

3. RESULTS

3.1 Research Question 1

What is the difference between the performance of students taught biology using cooperative

learning strategy and those taught using conventional lecture method in Senior Secondary Schools in Rivers State?

From Table 1, the pretest mean score of the experimental and control groups were 38.20 and

39.50 while the posttest mean performance score of experimental and control groups were 77.5 and 42.30. Students in the cooperative learning classroom had higher mean performance score than those in the lecture method.

Table 1. Mean score of students in biology before and after lesson using cooperative learning strategy and lecture method

Teaching method	N	Pretest mean	Posttest mean	Mean difference (within)
Cooperative learning	53	38.20	58.50	20.30
Lecture	49	39.20	45.30	6.10
Mean difference (between)		1.00	13.20	14.20

Table 2. Mean score of male and female students taught biology using cooperative learning strategy

Gender	N	\bar{X}	SD
Male	31	53.25	1.98
Female	22	45.39	2.13

Table 3. Mean and standard deviation of the performance score of public and private school students taught biology with cooperative learning strategy

School type	N	\bar{X}	SD
Private	25	68.25	2.16
Public	28	55.63	1.21

Table 4. t-test analysis of post-test mean performance score of students taught biology using cooperative learning strategy and those taught using conventional lecture method

Teaching Strategy	N	\bar{X}	SD	df	t-cal.	t – crit.	p	Decision
Cooperative learning	53	77.50	5.82	100	2.342	1.960	0.05	Rejected
Lecture method	49	42.30	4.11					

Table 5. t-test analysis of pre-test mean performance score of students taught biology using cooperative learning strategy and those taught using conventional lecture method

Teaching strategy	N	\bar{X}	SD	df	t-cal.	t – crit.	Sig. level	Decision
Cooperative learning	57	30.20	2.82	118	1.025	1.960	0.05	Rejected
Lecture	63	39.50	1.11					

Table 6. t-test analysis of the post-test mean score of male and female students taught biology using cooperative learning strategy

Gender	N	\bar{X}	SD	df	t-cal.	t - crit	Sig. level	Decision
Male	31	45.39	2.13	118	1.542	1.960	0.05	Accepted
Female	22	53.25	1.98					

3.2 Research Question 2

What is the difference between the performance of male and female students taught biology using cooperative learning strategy in Senior Secondary Schools in Rivers State?

From the Results in Table 2, the mean score of male students taught biology using cooperative learning strategy was 53.25 with standard deviations of 1.98 while those of their female counterparts was 45.39 with standard deviations of 2.13. Male students taught biology using cooperative learning strategy had higher mean performance score and higher standard deviation than public secondary school students.

3.3 Research Question 3

What is the difference between the performance of public and private school students taught biology using cooperative learning strategy in senior secondary schools in Rivers State?

From the Results in Table 3, the posttest mean score of private senior secondary school students taught biology using cooperative learning teaching strategy was 68.25 while those of their counterparts in public secondary schools was 55.63. students in private secondary school taught biology using cooperative learning strategy had higher mean performance score than public secondary school students.

3.4 Hypothesis 1

There is no significant difference between the mean performance of students taught biology using cooperative learning strategy and those taught using conventional lecture method in senior secondary schools in Rivers State.

From Table 4, the t-calculate value of $t = 2.342$ which is greater than the critical or table of 1.960 ($p < 0.05$). Therefore, the null hypothesis which states that there is no significant difference in performance between students taught biology using cooperative learning strategy and those taught using conventional lecture method is rejected. This mean that there is a significant difference in performance between students taught biology using cooperative learning strategy and those taught using conventional lecture method.

From Table 5, the t-calculate value of $t = 1.025$ which is greater than the critical or table of 1.960

($p < 0.05$). This mean that there is no significant difference in mean performance score between students taught biology using cooperative learning strategy and those taught using conventional lecture method and confirms the group equivalence showing that the students in the control and experimental group possess equal strength before the treatment.

3.5 Hypothesis 2

There is no significant difference between the performance of male and female students taught biology using cooperative learning strategy in senior secondary schools in Rivers State.

From Table 6 above, the calculate value of $t = 1.542$ is less than the critical or table value of 1.960 ($p < 0.05$). Therefore, the null hypothesis which states that there is no significant difference in performance between male and female students taught biology using cooperative learning strategy in senior secondary schools in Rivers State is accepted. This means that there is no significant difference in performance score between male and female students taught biology using cooperative learning strategy in senior secondary schools in Rivers State.

3.6 Hypothesis 3

HO₃. There is no significant difference between the performance of public and private school students taught biology using cooperative learning strategy in senior secondary schools in Rivers State.

From Table 6, the calculate value of $t = 0.596$ is less than the critical or table value of 1.960 ($p < 0.05$). Therefore, the null hypothesis which states that there is no significant difference in mean performance between public and private school students taught biology using cooperative learning strategy is accepted. This indicates that there is no significant difference in performance between public and private school students taught biology using cooperative learning strategy in senior secondary schools in Rivers State.

4. DISCUSSION OF RESULTS

The results of test of hypothesis 1 (Table 4) revealed that there was a significant difference in performance between students taught biology using cooperative learning strategy and those taught using conventional lecture method.

Table 7. t-test analysis of mean score of public and private school students taught biology using cooperative teaching learning strategy in senior secondary schools in Rivers State

School Type	N	\bar{X}	SD	Df	t-cal.	t - crit	Sig. level	Decision
Private	20	68.25	3.16	188	0.596	1.960	0.05	Accepted
Public	33	55.63	1.21					

Students taught using cooperative learning strategy performed significantly better than those taught using lecture method. The results of this study corroborate the findings of studies by [13,14,10,15,11,12] where students instructed with cooperative learning strategy achieved significantly higher in score than those instructed using lecture method in independent studies on effect of cooperative learning strategy on students' academic performance in biology. This results further supports the findings of studies on the effect of cooperative learning strategy on students' academic performance in basic science by [19,17,18,20] where the effectiveness of cooperative learning teaching strategy in teaching basic science were found. The agreement of the finding of this study with other studies confirms the effectiveness of cooperative learning instructional strategy in teaching biology. The higher performance of students in the experimental group where lessons were delivered by cooperative learning teaching strategy, could possibly be due to the fact that students took active part in the learning as they work in groups and exchange ideas during lessons. This process fosters positive and independent thinking, enhance their abilities to integrate and synthesize academic materials and enhance understanding as reflected in higher performance scores. Furthermore, students in the cooperative learning strategy, work together in small groups to maximize each other's learning potentials as they help one another and share ideas for their mutual benefits which enhances understanding of concepts.

These features are uncommon in the conventional lecture group where there is complete absence of cooperation and exchange of ideas as the students work independently without any assistance from each other as they spend more time listening to what the instructor says. This explains why [19] advocated for cooperative learning on the grounds that cooperative learning stimulates cognitive activities, promotes higher level of achievement and knowledge retention. Students in the lecture method classroom depend on the information

from the teacher and as such remain passive during the learning process giving room and only answer questions on teachers' demand. There is complete absence of social interaction among students and teachers. This could possibly create avenue for unhealthy competition instead of cooperation which does not foster proper understanding of facts and information. This affirms [21] assertion that competition is negative interdependence, usually results in oppositional interaction, during which individuals obstruct each other's' learning effort leading to decreased achievement and negative relationship.

The results of test of hypothesis 2 (Table 6) revealed that there was no significant difference in performance between male and female students taught biology using cooperative learning strategy. The findings of this study is in agreement with the results of [13] and [20] where no significant difference in students' performance based on gender was established in their independent studies on the effect of cooperative learning strategy on students' academic performance. The findings of this study, however disagree with the results of [16] who found significant difference in performance between male and female students taught biology using cooperative learning strategy with male students having higher scores than the female students. The evidence in this study affirm gender equality in performance and gives credence to cooperative learning teaching strategy in bridging the disparity gap in performance with regards to gender. This possibly could be the consequence of interaction and exchange of ideas between boys and girls which foster common understanding of concepts by both sexes. This is opposed to lecture method classroom where individuals work independently without any exchange of ideas. The results of test of hypothesis in Table 7 showed that there was no significant difference in performance between private and public schools students taught biology using cooperative learning strategy. This implies that the cooperation and team work in this strategy of learning cuts across bot he private and public sector.

5. CONCLUSION

Evidence from the results of this study showed that cooperative learning strategy is effective in teaching biology. The use of this strategy enhanced students' understanding of concepts and caused a significant improvement in their performance in biology in senior secondary schools. There was significant difference in performance between students taught biology with cooperative learning strategy and those taught with conventional lecture method. Students taught using cooperative learning strategy obtained higher test scores than those taught with conventional lecture method. There was no significant difference in performance based on gender (male and female) and school type (public or private).

6. RECOMMENDATIONS

The following recommendations were made based on the findings of the present study. Teachers should:

1. Adopt cooperative learning teaching strategy in teaching biology to enhance students understanding.
2. Endeavor to motivate students towards the learning of biology.
3. Encourage students to work together and discourage independent learning strategy.
4. Government should organize workshop for training of teachers on the use of cooperative learning strategy

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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