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Effects of Cooperative Learning Strategy on Secondary School Students' Achievement and Knowledge Retention in Biology

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Abstract
The study investigated the effects of cooperative learning strategy on the achievement and knowledge retention of secondary II students in biology in Ebonyi State, Nigeria. Two research questions and one hypothesis guided the study and quasi experimental research design was used. The population of the study was 24,459 secondary II students and a sample of 161 students comprising 78 males and 84 female were used drawn from four (4) co-educational boarding secondary schools through simple random sampling technique. Two schools were assigned to the experimental group while the other two schools were assigned to the control group through tossing of coin. The treatment group was exposed to learning of Biology with the cooperative learning strategy while the control group was exposed to learning of biology with the conventional approach. A Biology Achievement Test (BAT) was used to collect data for students' achievement and was rearranged to collect data for knowledge retention. The research questions were answered using mean and standard deviation while the hypothesis was tested using ANCOVA at 0.05 level of significance. The results revealed that cooperative learning strategy is superior to conventional learning strategy in fostering high achievement and knowledge retention. It was recommended that biology teachers should adopt the cooperative learning strategy to improve students' achievement and knowledge retention.
Keywords: Cooperative learning, learning together, knowledge retention, academic achievement.
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1.0 Introduction

In Nigeria, the Secondary School Biology curriculum is designed to continue students' investigation into natural phenomena, expand learners understanding and awareness in biological sciences, and also inspire students' ability to relate scientific knowledge to everyday life in matters of personal, community, health, agriculture, among others (Federal Ministry of Education, 2009). The subject stands as the foundation upon which many other science courses like Medicine, Pharmacy, Nursing, Biochemistry, Genetic, Agriculture, etc. are based. These areas of human endeavour have great socioeconomic importance to Nigeria as a nation and to mankind in generally, as science of life, it allows one to appreciate himself and his intermediate environment.

As a science of life it has been emphasised that the teaching and learning of Biology should involve the use of innovative methods in teaching and learning methods and strategies; methods like discovery, problem-solving, open ended field trip and laboratory method among others (Patesan, Balagiu and Zechia, 2016) and learning strategies like space practice, retrieval practice, dual coding among others. These suggested methods of teaching, with accompanying learning strategies, have been utilized over the years and yet students have been recording poor achievement in biology

Ali, Toriman and Gasim (2014) noted that Biology has been known to continuously record low students' enrolment, interest and poor achievement levels in all examinations - both internal and external. In their words, this "has come a persisted public outcry as regards the falling standard of biology education" (Ali, Toriman and Gasim, 2014:3).

The outcry of poor performance in the West African Senior School Certificate Examination (WASSCE), especially the science subjects is notable in many Nigerian states, including Ebonyi State.

The West African Examination Council's Chief Examiners' Report for May June examinations from 2008 - 2018 lends credence to this poor performance/achievement of students in Biology as shown in the table below. Summary in support of this assertion.

Table 1: Chief Examiners Report for May/June Exams from 2008-2018

Year	$\bar{x}$	Standard Deviation	N	Paper	Chief Examiners' Remark
2008	18.00	10.10	-	II	The performance of candidates was poorer than that of 2007
2009	-	-	-	II	- There was no significant change in candidates' performance in Biology 2 - There was a decline in Biology 1
2010	18.00	9.95	-	II	-
2012	16.00	09.06	-	II	The performance of students is poorer than that of last year (2010)
2013	25.00	10.30	1,645,047	II	There was significant improvement in the general performance of the candidates
2014	29.00	12.37	1,415,341	II	There was a significant improvement in the performance this year
2015	25.00	11.87	1,182,038	II	The performance of candidates this year was poorer than that of last year (2014)
2016	31.00	10.91	1,087,921	II	The performance of candidates this year was better than that of last year
2017	31.00	11.92	-	II	The performance of candidates this year was better than that of last year
2018	30.00	9.00	1,087,884	II	The performance of candidates this year was slightly poorer than that of last year

Source: www.waeconline.org.ng/e-learning/Biologv -

This continuous poor performance of students in Biology must be tackled forthwith in order to ensure a repositioned science education in Nigeria. Ebonyi State is not excluded from this poor performance as indicated in the WASSCE from 2013-2018 by states (Southeast states alone) are shown below.

Table 2: Performance of Students in Biology in South East Nigeria from 2013-2015

Year	State/Rank by Performance in WAEC				
	Abia	Anambra	Ebonyi	Enugu	Imo
2013	2nd	1st	10th	3rd	4th
2014	2nd	1st	5th	3rd	4th
2015	2nd	1st	5th	5th	7th
2016	1st	3rd	5th	4th	2nd
2017	1st	3rd	5th	4th	2nd
2018	1st	2nd	5th	4th	3rd
South East Rank	1st	2nd	5th	4th	3rd

Source: www.dailypost.ng

This drift in poor achievement of students, if allowed to continue unabated, will have serious adverse implications to the development of scientific endeavour as well as scientific literacy of future generations of the Ebonyi State and Nigeria at large.

Several strategies of learning like space practice, retrieval practice, dual coding among others as well as several methods of teaching like lecture, discovery, problem-solving, open ended field trip and laboratory method among others have been tried out but having little effect in students' achievement (Patesan, Balagiu and Zechia, 2016; Ali, Toriman and Gasim. 2014). The researcher therefore sought for an innovative learning strategy that will improve students achievement and knowledge retention in biology in Ebonyi State.

In recent years, studies involving cooperative learning, one of kind of student centered approach have emerged as an important area of education research (Salvin, 2011). Cooperative learning is the use of small instructional groups so that students work together to maximize their own and each other's learning (Patesan, Balagiu and Zechia (2016). It is described as a strategy in which students work together in small mixed integrated groups and help each other for (i) a common academic aim, (ii) develop communication abilities, (iii) increase problem solving, (iv) increase critical thinking abilities and (v) take an active part in their own learning process (Elpisah, Devila, and Hartini, 2019). Hence, this strategy employs a variety of learning activities to improve students' understanding of a subject matter by using a structured approach, which involves a series of steps, requiring students to not only study, memorise or analyse present knowledge, but also create, analyse and apply concepts. This leads to positive outcomes such as (i) higher achievement, (ii) more positive attitudes toward the subject, (iii) higher self-esteem, (iv) greater acceptance of differences among peers, (v) greater persistence and retention, additionally, (vi) greater understanding of the material is obtained (Slavin in Elpisah, Devila, and Hartini, 2019).

Additionally, Moges, (2019) noted that cooperative learning takes place through an individual's interaction with his or her environment and peers. It is largely based on the idea that students learn best through social contexts. It refers to students working in teams or integrated groups on a given assignment or stipulated project. In this wise, students work together in small knit groups, draw on each other's strengths, and assist each other in completing a task. This form of learning ensures right integration of peers with one another, promoting team spirit and togetherness for collective good. Such learning strategy is novel in the science education context, it is necessary and imperative to study its effects in the retention abilities and achievement of students in Biology in secondary schools.

Three types of cooperative learning approach have been identified. These include: Informal Cooperative Groups, Formal Cooperative Groups and Cooperative Base Groups (Smith and Johnson, 1992). The Informal Cooperative Groups strategy is short-term, less structured and involves a turn to your neighbour approach while the Formal Cooperative Groups strategy ensures that learners stay together until the assigned task is done and either heterogeneous or homogeneous; on the other hand, the Cooperative Base Groups strategy is characterised by long-term cooperation with stable membership to ensure all members make academic progress and it is also heterogeneous in nature Smith and Johnson (1992). The Formal Cooperative Base Groups Strategy was used for this study. This is because it represents the core ideals of the cooperative learning strategy and is most suitable.

In teaching and learning, one important thing is the ability of learners to retain what has been learnt. Retention is a term used to describe the ability of learners to recall learning outcome after a period of time (Mboto, 2002). It is the ability to store that which has been previously learnt and recall what is stored in the memory after a considerable amount of time (Enohuean, 2015). The import of retention to the overall goal of Biology teaching and learning cannot be overemphasised. It forms the core of student success in field of Biology as it plays a key role to future success of students in academic achievement and future careers.

Ukadike (2001) was of the view that there is growing realisation that poor learning and retention of science concepts is related to the inability of students to link previous learning with present ones. In this view, Chauhan (1998) stated that retention is direct correlate of positive transfer of learning, thus, high retention will lead to higher achievement which is a factor of many variables like interval between learning and retrieval, subject involved, teaching method use, intervening experiences, specific objectives and environmental situation. The corporative learning approach could provide the link between new ideas and old one. This will in effect improve and encourage transfer and application of previous knowledge to make the new learning more meaningful to the learner especially as they interact with one another for mutual benefit. However, gender difference may still play a role in achievement and retention of secondary schools' students in Biology.

1.2 Statement of Problem

Biology is a subject that occupies an exceptional place in the senior secondary school science education curriculum because of its importance as the science of life. It leads the continuation of students' investigation into natural phenomena, expand learners understanding and awareness in biological sciences, and also inspire students' ability to relate scientific knowledge to everyday life in matters of personal, community, health, agriculture, among others. Biology stands as the foundation upon which many science-related professions are based. However, it has been noted that there is a progressive unimpressive achievement of secondary school students of Ebonyi State in the subject matter, especially in external examinations like the West African Senior School Certificate Examination (WASSCE) and the National Examination Council (NECO). The situation, if allowed to continue, is not healthy for the scientific of the nation. This poor achievement has been attributed to poor service delivery in the part of teachers, probably due to inappropriate teaching methods or learning strategies that have been used in the teaching of Biology over the years. The problem of this study therefore was to investigate how the use of cooperative learning strategy, as an innovative learning strategy, will affect students' academic achievement and retention in Biology in senior secondary school.

1.3 Objective of the Study

The main purpose of this study was to investigate the effects of cooperative learning on Secondary School Students' achievements and retention in Biology. Specifically, the study examined:

1. The effect of cooperative learning on secondary school students' achievement in Biology
2. The effect of cooperative learning on secondary school students' retention in Biology.

1.4 Research Questions

The following research questions guided the study:

1. What is the mean achievement scores of students taught Biology using cooperative learning strategy and those taught with the conventional method?
2. What is the mean retention scores of students taught Biology using cooperative learning strategy and those taught with the conventional method?

1.5 Hypotheses

The following null hypothesis was tested at an alpha level of 0.05.

H_{01}: There is no significant difference in the achievement mean scores of students taught Biology using cooperative learning strategy and those taught using conventional approach.

2.0 Methodology

2.1 Design

The study employed a quasi-experimental research design. Intact classes were used hence, no random assignment of subjects was made. The specific design that was used was the pre-test post-test non-equivalent control group design. There was a treatment group (where students' learning was done using cooperative learning strategy) and control group (where students' learning was done using the conventional individual learning). The design is represented thus:

$$\frac{Y^b \text{ x } Y^a}{Y^b \text{ x } Y^a}$$

Where: Yb = Measurement taken before treatment (Pre-test)
Ya = Measurement taken after treatment (Post-test)
X = Treatment
$\bar{x}$ = Conventional Method

The study was conducted in Abakaliki Education Zone of Ebonyi State.

2.2 Population

The population of the study comprised the entire 24,459 senior secondary schools' II (SSII) students in the 138 senior secondary schools Abakaliki Education Zone, Ebonyi State (Ministry of Education, Abakaliki, Inspectorate Department, 2019).

2.3 Sample

The sample used four (4) co-educational boarding secondary schools drawn through simple random techniques. Two of the schools were assigned to the treatment group while the other two were assigned to the control group through a simple toss of coin. Intact classes of the sampled senior secondary II (SS 2) were used for the study.

2.4 Instrument

The instrument for the study was a researcher-made Biology Achievement Test (BAT) of 50-item. 50-item multiple-choice test lettered A - D. The items were drawn from the NERDC Biology Curriculum (2014), from the theme: The Organism at Work. The two units considered (Digestive System and Transport System) were taken into consideration in item generation. The distribution of the items across the contents was guided by a test blueprint that covered theme, content area and process objectives/mental process.

2.5 Validation of the Instrument

The instrument (BAT) was subjected to both face and content validation by subject experts. Thereafter, the reliability of the biology achievement test was obtained using Kuder-Richarson's formula showing a reliability coefficient of 0.96.

2.6 Experimental Procedure

The researcher developed two instructional packages (with the integration of the learning strategies) for this study. The first instructional package was based on the Cooperative Learning Strategy (Cooperative Base Group type) as the treatment group while the second package is based on the chalk-talk/individual learning strategy as the control group. The different groups were taught for six (4) weeks of four (4) periods in each week, forty (40) minutes per class period with one double period in each week.

Four (4) research assistants (regular biology teachers) were used in the study. They were trained by the researcher using the packages. The training took place in different sessions and venues for the treatment and control groups. For the treatment group, the research assistants were guided on how to use the Cooperative Learning Strategy (Cooperative Base Group type), while the chalk-talk/individual learning approach for the control group. The training was necessary to help establish a common standard among the regular biology teachers who serve as the research assistants. The two approaches are similar in content, instructional objectives and mode of evaluation. However, their difference was in the learning strategies.

Pre-test was done in all schools at the beginning of the experiment. The treatment lasted for four weeks after which the subject teachers (research assistants) administered the post-test to the subjects in the two groups. Both the pre-test and the post-test were same in their contents. However, their arrangement was altered during the post-test. The retention test was administered to the study subjects after four (4) weeks of the post-test. The

same instrument that was used for the post-test was also used to collect date for retention test - the items were again rearranged for this purpose.

Data collected from pre-test and post-test were analysed and used to answer the research questions and hypotheses on achievement. Similarly, the data collected from post-test and retention test were analysed and used to answer the research questions and hypotheses on retention.

2.7 Control of Extraneous Variables

(a) Teacher Variable

To control the errors which may arise as a result of teacher difference, the researcher organised a pre-experimental conference for the regular biology teachers that were used as research assistants for the study on what they were to do. Separate conferences were conducted for teachers in the two groups (treatment and control). The conferences helped to establish common standards among the instructors.

(b) Subject Interaction

The researcher did not select treatment and control group from the same school. This was to ensure that students in the two groups do not mix up. This reduced the errors that might arise from the exchange of ideas as well as interactions among research subjects from the treatment and control groups. This equally eliminated the possibility of a John Henry effect (a spirit of competition which may arise in students when they realize that they are being used for experiment that requires comparison at the end.

(c) Intergroup Variable

The researcher used an intact class and employed a statistical approach - Analysis of Co-variance (ANCOVA) in analysing data. This is to control the errors that may arise from comparing effects of treatment on two unequal groups and also ensure that only the effects of the treatments formed the basis for inference.

(d) Instructional Situation Variable

To ensure that instructional situation was the same for all the schools, the researcher prepared instructional guides/manuals for the teachers in each group.

(e) Testing Effect

The same test was administered for the pre-test, post-test and retention. To ensure that the subjects do not memorise or cram answers, the items were reshuffled in the post-test and retention tests so that the numbers do not correspond.

(vi)Presence of students in treatment groups for cooperative learning strategy

To ensure that students are readily available to participate in different cooperative groups, the researcher made use of purposive sampling to select boarding schools (where students have learning hours of their own) for the study.

(vi) Additional Learning of Subjects

The researcher acknowledges that additional learning can have effect in the result of the study. The study was kept at a manageable time to ensure that the study is completed in limitation in this study.

2.8 Data Collection

At the beginning of the experiment, the subjects (students) in both the treatment and control groups were given the pre-test by the teachers (research assistants). The scripts were graded and the scores kept. The post-test was also administered to the same subjects by the teachers at the end of the experiment. After four (4) weeks of the experiment, the retention test was also administered on the same subjects. All the scripts were marked, graded and used for the data analysis. All the tests (pre-test, post-test and retention) are the same in scope and content but differ in arrangement. The pre-test scores served as covariate to post-test scores for the achievement test, while the post-test scores were used as covariate to retention scores for the retention test.

2.9 Method of Data Analysis

The Research questions were answered using mean and standard deviation, while the hypotheses were tested using the Analysis of Co-variance (ANCOVA) at an alpha level of 0.05 significance. The decision rule is to reject the null hypothesis if the calculated f-ratio (f-ratio) is higher than the critical value (f-critical) at alpha level of 0.05.

3.0 Results

3.1 Research Question 1: What is the mean achievement scores of students taught Biology using cooperative learning strategy and those taught with the conventional method?

For this research question, pre-test and post-test achievement scores of the students taught using cooperative learning strategy and those taught with the conventional (chalk-talk) strategy were analysed using mean and standard deviation. Summary of the result is shown in Table 1.

Table 3: Mean Achievement Scores of students taught Biology using cooperative learning strategy and those taught with the conventional method.

Group	N	Adjusted Mean	Standard deviation
Treatment group (cooperative learning)	84	43.79	3.05
Control group (conventional)	77	22.78	4.13

Summary of result in Table 3 shows that cooperative learning strategy is superior to the conventional approach in facilitating students' achievement in Biology. As indicated above, cooperative learning strategy yielded adjusted mean score of 43.79 with a standard deviation of 3.05 while the conventional strategy produced adjusted mean score of 22.78 with a standard deviation of 4.13 implying that cooperative learning strategy leads to higher achievement than conventional method.

3.2 Research Question 2: What is the mean retention scores of students taught Biology using cooperative learning strategy and those taught with the conventional method?

For this research question, post-test achievement scores and retention test scores of the students taught using cooperative learning strategy and those taught with the conventional (chalk-talk) strategy were analysed using mean and standard deviation. Summary of the result is shown in Table 4.

Table 4: Mean Retention Scores of students taught Biology using cooperative learning strategy and those taught with the conventional method.

Group	N	Adjusted Mean	Standard deviation
Treatment Group (Cooperative Learning)	84	43.90	3.12
Control Group (Conventional)	77	18.91	4.84

Summary of result in Table 4 shows that the treatment groups have an adjusted mean retention score of 43.90 and a standard deviation score of 3.12. On the other hand, the control group had adjusted mean retention score of 1891 and standard deviation of 4.84. It is seen that cooperative learning strategy has higher retention adjusted mean score than the conventional approach.

3.3 Hypothesis

H_{01}: There is no significant difference in the achievement mean scores of students taught Biology using cooperative learning strategy and those taught using conventional approach.

Hypothesis 1 was tested using Analysis of Co-Variance (ANCOVA). Summary of the analysis for the null hypothesis is shown in table 5 below.

Table 5: Analysis of Co-Variance for Students Overall Biology Achievement Scores by teaching methods.

Source of Variation	Sum of Squares	Df	Mean Squares	F	Fsig.
Covariate	4772.435	1	4772.435	502.174	.000
Main Effects	13552.442	2	6776.221	713.020	.000
Methods of Teaching	13499.033	1	13499.033	1420.421	.000
Explained	18334.962	4	4583.741	482.319	.000
Residual	1482.553	156	9.504		
Total	19817.516	160	123.856		

For hypotheses 1, the result in table 5 above shows that the alpha level (0.05) is greater than the sig. of f(.000). The null hypothesis is rejected and conclude that there is a significant difference in the achievement mean scores of students taught biology using co-operative learning approach and those taught with conventional approach.

3.4 Summary of Results

The result of data analysed in this chapter reveals the following:

1. There is significant difference in the achievement mean scores of students taught Biology using cooperative learning strategy and those taught using conventional approach. The cooperative learning group achieved significantly higher than the group taught with the conventional method.
2. There is significant difference in the retention mean scores of students taught Biology using cooperative learning strategy and those taught using conventional approach. The cooperative learning group retained significantly higher than the group taught with the conventional method.

4.0 Discussion

The results were discussed under the following headings:

1. Effect of cooperative learning strategy on students' achievement in Biology.
2. Effect of cooperative learning strategy on retention of male and female students in Biology.

3. Interaction effect of gender and method on students' achievement mean in Biology.

4.1 Effect of Cooperative Learning Strategy on Students' Achievement in Biology

The result of this study showed that the students taught Biology with Cooperative Learning Strategy achieved significantly higher than the students taught same Biology with conventional approach. That is, the difference in the adjusted mean between the treatment group and the control group is significantly higher in favour of the treatment group. The implication of this finding is that cooperative learning strategy has a highly positive effect in promoting student's achievement in Biology. The study supports the claims of Stanley (2017) who noted that because of the full participation of all group members in a cooperative learning class, there is always an observed mutual achievement. The study is also in line with the findings of Muraya and Kimamo (2011) who found that cooperative learning strategy resulted in significantly higher mean achievement scores compared to regular teaching method. The study is also in line with the findings of Nnorom (2015) who noted that Students taught using the cooperative learning instructional strategy yielded a better performance in Biology Achievement Test than those taught using conventional lecture method of instruction. Hence, application of cooperative learning is a veritable tool for boosting of students' achievement in Biology.

4.2 Effect of Cooperative Learning Strategy on Students' Retention in Biology

The findings of this study reveal that there is significant difference in the retention mean scores of students taught Biology using cooperative learning strategy and those taught using conventional approach. The cooperative learning group retained significantly higher than the group taught with the conventional method. In another way, the difference in the adjusted mean between the treatment group and the control group is significantly higher in favour of the treatment group. The implication of this finding is that cooperative learning strategy has a highly positive effect in promoting student's retention of Biology concepts. The finding of this study is in line with (Cohen, 1988; Slavin, 2011 in Elpisah, Devila, and Hartini, 2019) who noted that activities in cooperative learning approach leads to positive outcomes such as (i) higher achievement, (ii) more positive attitudes toward the subject, (iii) higher self-esteem, (iv) greater acceptance of differences among peers, (v) greater persistence and retention, additionally, (vi) greater understanding of the material is obtained. Chauhan (1998) also stated that retention is direct correlate of positive transfer of learning, thus, high retention will lead to higher achievement.

The study is also in line with the proposition of Stanley (2013) that participatory teachings methods like cooperative learning allows the learning to be more of learner centred. Thus, cooperative learning strategy allows learners to garner more feats for better retention. Hence, application of cooperative learning is a veritable tool for boosting of students' retention, which will promote positive higher achievement in Biology.

4.3 Summary

The study investigated the effects of cooperative learning on secondary school students' achievement and knowledge retention in Biology. Two (2) research questions were raised and one null hypothesis was formulated and tested at 0.05 level of significance. The research design for this study was quasi-experimental non-equivalent control group design. The population for the study consisted of all the SS II students of public schools in Ebonyi North Education Zone of Ebonyi State. The sample comprised of 161 students of four schools who were used in their intact class setting. The researcher made instrument - Biology Achievement Test (BAT) was used in collecting data for the study. The instrument was validated through the use of Test Blue Print. The reliability of the instrument was determined using the Kuder Richardson approach (K-R 20). The six (6) research questions raised were answered using mean and standard deviation, on the other hand, the six (6) hypotheses were tested using the Analysis of Co-Variance (ANCOVA) at 0.05 level of significance.

The result of the finding revealed that cooperative learning significantly enhances higher achievement and knowledge retention of students in Biology than the conventional approach.

Based on the findings of the study, it was recommended that students should adopt and develop the spirit of team (cooperative) learning approach to enhance their achievement and knowledge retention in biology. Biology teachers should see the need to encourage students participation in teaching and learning venture and in so doing make the lessons more student-centred through cooperative learning strategy.

4.4 Conclusion

The major result obtained from this study shows that cooperative learning strategy is superior to, and hence more effective that conventional approach in fostering higher achievement and knowledge retention of secondary school students in Biology. Cooperative learning is also a veritable tool in ensuring higher knowledge retention of Biology concepts in secondary school students. This is the case because the result showed that there exists great difference in the achievement and knowledge retention mean scores of students taught Biology with cooperative learning strategy and those taught with the conventional approach, in favour of the cooperative

learning approach.

References

Ali, A. R., Toriman, M. E., & Gasim, M. B. (2014). Academic achievement in biology with suggested solutions in selected secondary schools in Kano State, Nigeria. *International Journal of Education and Research, 2*(11), 215-224. Retrieved August 24, 2018 from www.ijern.com.

Chauhan, S. S. (1998). *Advanced educational psychology.* New Delhi: Vikas Polishing House

Elpisah, Devila, R., & Hartini (2019). Implementation of cooperative learning model jigsaw to improve student learning outcome. IOSR Journal of Research and Method in Education. 9(1), 60-66. Retrieved May 05, 2019 from www.iosriournals.org.

Federal Ministry of Education, FME (2009). *National biology curriculum for senior secondary schools.* Abuja: Nigerian Educational Research and Development Council.

Johnson, D. W., & Johnson, R. T. (2015). Theoretical approaches to cooperative learning. Retired August 24, 2018 from www.reseachgate.net

Johnson, D. W., & Johnson, R. T. (2009). An Educational Psychology Success Story: Social Interdependence Theory and Cooperative Learning. *Educational Researcher. 38,* 363-379. Retrieved November 20, 2018 from http://edr.sagepub.eom/content /38/5/365

Mboto, F. A. (2002). Relative effectiveness on Gagnian and Ausubelian learning sequences on physics students' acquisition of laboratory skills. *Unpublished Ph.D. Thesis, University of Uyo, Uyo.*

Moges, B. (2019). Practices and challenges of cooperative learning in selected college of Arsi University: As a Motivational Factor on Enhancing Students' Learning. *Universal Journal of Psychology*. 7(1), 1-17. Retrieved May 05, 20'9 from http://www.hrpub.org

Muraya, D. N., & Kimamo, G., (2011). Effects of cooperative learning approach on biology mean achievement scores of secondary school students' in Machakos District, Kenya. Educational Research and Reviews. 6(12), 726-745. Retrieved November 20, 2018 from www.academicioumals.org/ERR

Nnorom, N. R. (2015). Effect of cooperative learning instructional strategy on senior secondary school students' achievement in biology in Anambra State, Nigeria. International Journal for Cross-Disciplinary Subjects in Education (IJCDSE), *Special Issue.* 5(1). DOI: 10.14738/assrj.22.805

Patesan, M., Balagiu, A., and Zechia, D. (2016). The benefits of cooperative learning. *International Conference Knowledge-Based Organization, 22*(2).

Smith, J., & Johnson (1992). Types of Cooperative Learning. Retrieved August, 17, 2018, from www.andrews.edu

Stanley J. (2013). Understanding the learning pyramid. Phuket Education. Retrieved March 12, 2018 from www.thephuketnews.com/Understanding-the-Learning-Pvramid-40899.php?

Ukadike, N. O. (2001). Effects of concept mapping on students' interest and achievement in Algebra. *Unpublished M.Ed. Thesis, University of Nigeria, Nsukka.*