

# Impact of Collaborative Learning Strategy on the Academic Achievement of Senior Secondary School Chemistry Students in Obio-Akpor Local Government Area

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## **Abstract**

*The researcher investigated the impacts of collaborative learning strategy on the academic achievement of senior secondary students in Obio/Akpor Local Government Area of Rivers State. The study adopted quasi-experimental pretest-posttest control group design. A total sample size of hundred students participated in the study. Two research questions and two hypotheses guided the study. The instrument used for data collection was chemistry achievement test. The reliability coefficient was calculated using Person Product Moment Correlation with reliability coefficient of 0.87. For data analysis, the research questions were analyzed with mean and standard deviation. Analysis of covariance (ANCOVA) was used to test hypothesis 1, while t-test was used to test hypothesis 2, at 0.05 level of significance. Findings showed that students who studied chemistry using collaborative learning strategy achieve better than those of the lecture based method. Some recommendations were made based on the findings. For example, science teachers should spice up their methods of teaching by using the collaborative method in their lesson delivery since it enhances achievement and active participation*

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## **Introduction**

Chemistry is an experimental science. It is studied through experiment. (Nnoli, 2011) define chemistry as a science that systematically studies compositions, properties, and activities of organic and inorganic substances, and various elementary forms of matter.

According to Nigerian Education Research and Development Council (NERDC, 2007) chemistry is crucial for effective learning in the modern age of science and technology given its application in industries and many other professions, the minimum standard embodied in chemistry education is designed to build confidence in students and enhanced ability to adapt to the changing situations in scientific and technological oriented society.

Akpan (2008) stated that nations at the forefront of modern development are those that have invested enormous resources over considerable time in the establishment and nurturing of a stable well supported science and technology education. Therefore, there is the need for effective science and technology education of the learner. For this reason, Science Teachers Association of Nigeria (STAN) often hold workshops, seminars and conference for science

teachers, geared towards improving the methods of teaching science subject (chemistry inclusive) and making them interesting to the students.

In learning chemistry effectively, it is recommended that students should be motivated and allowed in knowledge getting process of observing, exploring, organizing and interpreting knowledge with minimum direction and guidance. The above recommendation became necessary because a review of students' achievement in senior secondary school certificate in chemistry showed a decline in the performance of students both in internal and external examinations (Chukwunke and Nwachukwu, 2005) (Ezeano, 2002 and Ajagun, 2006).

Osborne, Simson and Collins (2003), indicated that large numbers of learners (students) in some countries of the world (Nigeria inclusive) evade studying science because of their negative attitude towards it. One of the reasons for this, is omission of the role of the learner in the learning process and considering the learner as a store to accumulate information and knowledge and limiting the learning process to remembering information only, as the method of teaching prevailing often in teaching of science depends on the theoretical instructional explanation that neither engage the learners nor linked the new experiences to the previous ones.

In a study conducted by Eniayeju (2010) students attribute their poor performance in science subject (chemistry inclusive) as the ways science courses are taught. Balogun (2003) observed that lecture method is commonly adopted strategy for science teaching in Nigeria. The method focuses on memorization and rote learning and does not equip students with the ability to derive deeper understanding of concept, ideas and principles.

Therefore, chemistry education can only be effective if it is student centered. It is the researcher view that collaborative learning strategy could be an effective method to improve the intellectual ability of students. Collaborative learning is based on the view that knowledge is a social construct. Collaborative or active learning is a methodology that transforms that traditional lecture or teacher focused classroom into a students centered room. Collaborative learning can occur peer-to-peer or in large group. Peer learning or peer instruction is a type of collaborative learning that involves students working in pairs or small groups to discuss concepts or find solution to problems with instructor acting as a facilitator. It was designed based on the understanding that interactivity and collaboration in small groups provide strong solution that would have not been reached individually and encourages sharing of research for enhanced learning.

Further, the most advantage of collaborative learning is enhancement of learning through a decrease in anxiety arising from the exam and critical analysis of complex situations, collaborative learning also promotes group work, more retention, encourage students to be engaged in the learning process and transfer of knowledge. In this method, emotionally and intellectually, supporting the students will lead to profound learning and retention of concepts. In order words, results by Wigg, 2011 and Bloom (2009) showed that the use of collaborative learning improves the performance of students.

The teaching of chemistry should show how facts are established by experiment and observation, how generalizations are built upon, how knowledge and concepts developed. National Policy on Education (2004), stated that the instructional strategies proposed to improve science teaching are those that take into cognizance the students active participation in the teaching and learning process. The role of students personal in the construction of knowledge has been largely neglected in traditional method of teaching. There is therefore

the need to have a paradigm, which recognizes the role of personal participation in the development of scientific knowledge. It is to this end that this study is being conducted to examine the impact of collaborative learning strategy on chemistry students' achievement in Obio/Akpor Local Government Area of Rivers State. Also, the probable effects of gender were also investigated in the study.

### **Purpose of the Study**

The main purpose of the study is to determine the impact of collaborative learning strategy on the academic achievement of chemistry students in Obio/Akpor Local Government Area of Rivers State. Specifically, the study sought to:

- i. Find out if there is any difference in the mean score of students taught chemistry using collaborative learning interaction strategy and those taught using lecture based method.
- ii. Examine the mean difference in the achievement of male and female chemistry students taught chemistry using collaborative learning interaction strategy.

### **Research Questions**

The following research questions were formulated to guide this study.

- i. What are the difference in the mean score of students, taught chemistry with collaborative learning strategy and those taught with conventional lecture method?
- ii. What is the difference in the mean scores of male and female chemistry students taught chemistry collaborative learning strategy?

### **Research Hypotheses**

The following hypotheses guided this study.

**H<sub>01</sub>:** There is no significant difference in the mean scores of students taught chemistry using collaborative learning strategy and those taught using lecture method.

**H<sub>02</sub>:** There is no significant difference in the mean scores of male and female students taught chemistry using collaborative learning method.

### **Significance of the Study**

The researcher hoped that this study will be of immense importance to chemistry teachers as this will help them create a conducive learning environment that is challenging stimulating and relevant to boost student's interest and motivation, for instance, promoting cohesiveness among students using small group collaborative learning strategy.

### **Research Design**

The study adopted a quasi-experimental research design. The design is considered appropriate because intact classes and two levels of treatments are involved. According to Campbell and Stanley (1986), it is advisable to employ this non-equivalent design when administrative decision or practical considerations (e.g. school regulation) prevent random assignment subjects to treatment.

### **Area of the Study**

This study was carried out in Obio/Akpor Local Government of Rivers State.

### **Population of the Study**

The population of the study comprised the entire senior secondary two (SS 2) chemistry students in co-educational public secondary schools in Obio/Akpor Local Government Area of Rivers State. A total of 1225 students in 2016/2017 academic session formed the study.

### Sample and Sampling Techniques

Sample of 100 students participated in the study. A simple random sampling technique by balloting was used to select two co-educational government secondary schools in Obio/Akpor Local Government Area of Rivers State. Purposive sampling technique was used to select two intact classes of equal number (50 each) in a class. From the two schools selected, one was randomly assigned to experimental group and the other to control group using hat and draw method that is using lucky deep for the experimental group, the students were randomly assigned through the balloting technique into their various collaborative group. There were 50 students in the experimental group and 50 in the control group.

### Instrumentation

The research instruments used for data collection was Chemistry Achievement Test (CAT) developed in response to lesson taught using collaborative teaching strategy and conventional lecture method. The CAT consist of 20 multiple choice objective questions, each with four options with one correct option.

### Validation of the Instrument

The research instrument was face validated by the supervisor and two other experts in the field of study and content validated using a table of specification. A table of specification was constructed to ensure that the item cover the six levels of Bloom taxonomy of educational objectives.

### Reliability of the Instrument

The test-retest reliability approach was used to obtain data from 20 students. Simple random sampling technique was used to draw a sample of 20 students. This set of students did not participate in the main study. Students were pretested before treatment and after treatment; the same instrument was administered as post-test.

The results of the tests were processed with the Pearson product moment correlation and reliability of 0.87 was obtained, thereby guaranteeing the reliability of the instrument.

### Administration of the Instrument

The regular chemistry teacher was used for the teaching of the different groups and subsequently the administration of chemistry achievement test CATS

### Data Analysis

Mean and standard deviation were used to analyze the research questions. Analysis of covariance (ANCOVA) was used to test hypotheses for the hypotheses. The results are presented according to the research questions and the hypotheses.

### Research Question 1

What are the difference in the mean score of students taught with collaborative learning strategy and those taught with lecture method?

**Table 1: Difference in means score on test**

Group	Pre-Test $M_1$	Post-Test $M_2$	Difference within Groups
Experimental (N = 50)	4.46	16.62	12.16
Control Group (N = 50)	4.16	11.58	7.42
Difference between groups	0.30	-	4.04

Table 1 shows a pre-test mean score of  $M_1 = 4.46$  for the experimental group and a pre-test mean score of  $M_1 = 4.16$  for the control group. This slight difference in the mean score of the two groups could be attributed to extraneous variables. The table also reveals a mean difference of 12.16 between the pre-test and post-test scores of the experimental group; a mean difference of 4.42 between pre-test score for the experimental group ( $M_2 = 16.62$ ) was higher than that of the control group ( $M_2 = 11.58$ ) by 5.04. This shows that the experimental group performed better in organic chemistry that students exposed to lecture teaching method.

### Research Question 2

What are the differences in the mean scores of male and female chemistry students taught with collaborative learning method?

**Table 2: Mean scores of female and male students on their chemistry post-test**

Groups	Post-test
Male students( 29)	17.9
Female student( 21)	14.8
Mean difference	3.1

**Source:** Field Study, 2017.

Table 2 shows male and female students' mean achievement score in organic chemistry after being exposed to collaborative learning. Table 2 indicates a mean achievement score of 17.9 for male students and a mean achievement score of 14.8 for female students. A mean difference of 3.1 shows that on the average, male students performed slightly better than female students. However, the result of the hypothesis 2 later will show if this slight difference is statically significant.

### Hypothesis 1

**Ho<sub>1</sub>:** There is no significant difference in the mean scores of students, taught with collaborative learning strategy and those taught with lecture method.

**Table 3: ANCOVA for research question 1**

Source	Type III Sum of Squares	df	Mean Square	f	Sig.
Corrected model	755.325	4	188.831	96.615	.000
Intercept	1905.915	1	1905.915	975.156	.000
Pre-test	1.596	1	1.596	.817	.368
IM	557.201	1	557.201	285.090	.000
Sex	54.564	1	54.564	27.918	.000
IM* Sex	52.511	1	52.511	26.867	.000
Error	185.675	95	.954		
Total	20822.000	100			
Corrected Total	941.000	99			

The result from table 3 reveals that there was a statistically significant difference between the two groups ( $F(1, 95) = 285.0, p < 0.05$ ). With these result, the hypothesis was rejected. This implies that there was a statistically significant difference in the mean score of students

taught organic chemistry using collaborative learning and students taught organic chemistry using lecture method.

### Hypothesis 2

There is no significant difference in the mean scores of male and female chemistry students taught with collaborative learning method.

**Table 4: T-Test for research question 2**

Groups	Mean	SD	N	df	t <sub>cal</sub>	t <sub>crit</sub>	p-value	Decision
Male	17.90	1.68	29	48	0.43	2.00	0.6468	Accept
Female	14.80	0.92	21					

The results from table 4 show that there was no statistical significant difference in the mean scores of male and female students taught chemistry using cooperative learning strategy.  $T_{cal} (48) = 0.43$ ,  $P > .05$ . With these result, the hypothesis was rejected. Although, the mean scores of male and female students showed a slight difference as shown in table 2, however, the result of this hypothesis test reveals that such difference was not significant at .05 of significant.

### Discussion of Findings

The research question one sought to find out the difference in the mean scores of students taught using collaborative learning strategy and those taught using lecture method. The difference in the mean achievement scores between the experimental and control groups was shown to be significant as shown by ANCOVA result in table 3. This gains support from Piaget (1986), who discovered in his findings that collaborative interaction strategy promotes cognitive growth. The finding also gain support from Baines, Blatchford and Kutrick (2003), who emphasized the need for collaborative learning in secondary schools since students at this level more likely engage in peer interaction than any other level.

Falinscar and Brown (2005), in their findings said that the sense of cooperation that is fostered in collaborative work makes assessment less threatening than in a more lecture based experiences with group evaluation. The findings on table 4 indicate no significant difference in the academic achievement of male and female students. This study is in consonance with a study carried out by Ajewole (1990), in his study on guided discovery and expository instructional method effect on students' achievement found no significant difference in the achievement of male and female students exposed to guided discovery and expository learning methods.

Based on the findings, one can safely say that there is need for collaborate learning method for effective teaching and learning of chemistry for higher achievements in secondary schools.

### Conclusion

The significance of collaborative interaction in learning of chemistry has been post rayed by the findings of this study. Emphasis has been laid on the poor performance of students in chemistry. Chemistry being paramount in determining some course of studies, and considering its application in industries and many other professions, should be taught in such a way that students should achieve highly academically and acquire the necessary skill that will enable them to apply the acquired knowledge from education environment to society. Also, findings of this study reveal that collaborative interaction learning strategy makes more

positive influence on students' cognitive achievement than the conventional lecture based learning method. This implies that if every individual is provided with an equal opportunity and allow to participate actively in the classroom all the imposed barriers on chemistry will no longer affect the academic achievements of students in chemistry.

### Recommendations

- 1) Chemistry teachers should be encouraged to use collaborative technique as an alternative and a supplement to lecture-based learning method.
- 2) Textbook writers should shift emphasis from teachers' activities to students' activities that will promote the incorporation of collaborative method in chemistry textbooks.
- 3) Curriculum planners should ensure the implementation of collaborative teaching strategy which stimulate cognitive activities, promote higher academic achievement and knowledge retention.

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