International Journal of Multidisciplinary Education and Research
ISSN: 2455-4588; Impact Factor: RJIF 5.12
Received: 10-08-2020; Accepted: 25-08-2020; Published: 11-09-2020
www.educationjournal.in
Volume 5; Issue 5; 2020; Page No. 22-26

The effectiveness of cooperative learning strategy on the academic performance of chemistry students in OBIO/AKPOR local government area of rivers state

Gideon Wokocha
Department of Integrated Science, Faculty Education Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Nigeria

Abstract
This research explored, the efficacy of the Chemistry Students Academic Achievement Cooperative Learning Approach. The method used for the study was longitudinal survey. For the research, experimental-community interaction method involving pre-test and protest was used. The population is comprised of 120 randomly chosen SS2 students in four secondary schools in Obio/Akpor L.G.A. of Rivers State. The Chemistry Achievement Test (CAT) device used. Although the study questions 1, 2 were evaluated using mean ratings, the T-test was used to test the Null hypothesis. Cooperative research has been shown to have a beneficial impact on the academic success of senior high school chemistry graduates. The study been recommended for further study and usefulness.

Keywords: explored, Students, academic, government

Introduction: Background to the Study

Science and technology constitute the cornerstones of every country's cultural, political and social growth. The benefit of this is that they rely extensively on every element of human endeavour, when properly conceived and applied. Across Nigeria, the government has adopted numerous laws and policies to ensure that science education retains its momentum while propelling the country as one of the 21st century industrialized worlds. The FRN's National Education Policy (2004) underlined the need to place particular emphasis on science and technology development and progress in Nigeria. Based on this background, the National Education Policy has prescribed adherence of all higher education institutions to the student intake policy, which stipulates a science ratio: 60:40 Arts (Okebukola, 1999) [20]. This approach is driven by the need for growth of skills, and the value of improving the country's economic base, which can be achieved through science education.

Nevertheless, it is worrying because, due to some structural problems surrounding our educational system, these National Education Policy priorities and recommendations and the contributions of great educational specialists to enhance the teaching and learning of science are rapidly fading off. It requires a re-evaluation at all fronts of our educational principles.

The achievement of high school graduates in recent years in science subjects such as chemistry, physics and mathematics is cause for warning. It was revealed that Nigerian students do not do well in science topics such as further mathematics, chemistry, biology, and algebra (Ajagun (2006) [2] and Chukwuneke & Nwachukwu (2005) in both internal and external study. In the final exams such as W.A.E.C., NECO, and JAMB, educational players like the government have come up with numerous reasons for the students ' poor grades.

Over the years the students ' poor success in chemistry has been attributed in part to the dearth of qualified teachers. When we have quacks, teachers that are not qualified to enter the teaching profession. For this, as per the National Education Strategy. "No teaching will climb above its teacher level" (FRN, 2004:35). Therefore it is necessary to know that teacher quality influences the quality of the produced students. At the other hand, Ejiogu (1999) noted that lack of inspiration is a big concern. This is because it is not convenient to study the science of chemistry. It requires an analytical mind, a logical approach, a comprehension of technical terms, a broad knowledge of scientific laws and a lot of self-discipline. There is also a lot of reading involving other complicated texts including calculations, hypotheses and theories, which has also been corroborated by Wokocha (2014) [25], who enthused that "Empirical generalization refers to scientific terms used to identify, justify and forecast phenomena in nature as observations, rules and theories."

But teaching chemistry essentially needs a lot of costly laboratory equipment. For many schools and universities this is a challenge, especially when the budget has been cut. In addition, there is a need to have more than average mathematics skills, understanding different measuring systems and performing complex mathematics operations are all part of the students' tasks in chemistry.

Students ' poor performances have also been linked to the teaching methods. There has been widespread condemnation of the concept of using teacher-centric approach in science education. Since this results in low retention of the concepts and scientific facts, many scholars have criticized the utilization of the lecture method by science teachers (Abdullahi and James, 19991, and Usman 2002). According to these scholars, this instructional method is extremely didactic, teacher-centered in approach and does not lead to meaningful learning. Only the development of passivity and over dependence on teachers and textbooks can be encouraged. Chemistry is a field of science teaching built on the process-skill approach. Therefore it is unacceptable to use the lecture method exclusively to teach the subject.

Ogunniyi (1984), Cosgroove & Osborne (1985), observed that the kind of teaching and learning strategies that are capable of achieving school and community goals are the

ones that emphasize teaching based on science process-skills and child-centered inquiry-oriented instruction. Hence the search for improved approaches to teaching and learning science is an emerging process in which cooperative learning methodology can be applied to enhance the teaching-learning environment in schools.

Concept of Cooperative Learning

Cooperative learning is an educational approach that requires students collaborating in groups to accomplish a particular assignment. Johnson, Johnson & Smith (1991), conceive of cooperative learning as part of a group of teaching / learning techniques in which students interact with each other in order to acquire and practice the elements of a subject matter and meet common objectives. Co-operative learning approach is successful for all forms of students, including academically gifted traditional students, including science students, as it facilitates collaboration and encourages appreciation and cooperation among diverse student classes.

Cooperative learning is a very formal way of structuring activities in a learning environment that includes specific elements intended to increase the potential for rich and deep learning model include the following basic principles.

1. Group tasks are designed to be suitable for group work.
2. Positive interdependent is built among the group members.
3. Attention and class time are given to interpersonal/ cooperative skill building.
4. Participants learn together in small (2-5) group.
5. Students are individually accountable for learning and participation.
6. The instructor's role changes from being the "sage on the stage" to the "guide on the side".

To promote interaction among students in a large class, the teachers first either reduce the class size or break the class up into smaller groups. Groups can be formed on a temporary or a more permanent basis. They must be given clear directions for the resulting group activity. Mohanan, (2000).

Moreover, for cooperative group to reach the full potential of the group, they must possess these five essential elements: positive interdependence, individual and group accountability, promotive interaction, appropriate use of social skills and group processing, Johnson & Johnson (1989)

Johnson & Johnson (2009) [7], observed that "the more positive the relationship among students and between students and faculty, the lower the absenteeism and dropout rates and the group goals".

The mastery of co-operative learning core elements helps the instructor to;

1. Taking curricula and courses currently available and arrange them
2. Cooperation.
3. Taking classes in group learning to address specific educational demands,
4. Circumstances, curricula, fields of research and subject matter.
5. Diagnosis of the issues that certain students might have when studying together intervene to increase student learning community performance.

This study therefore seeks to investigate the effectiveness of cooperative learning strategies on the academic achievement of students in chemistry.

Statement of the problem

It was observed that the majority of students are not interested in studying chemistry. In comparison, in recent years the success of chemistry students in Senior Secondary School Certificate Examinations (SSCE) was low. For realistic paper the loss rates are still on the rise (Ezeano, from 2002).

Most prevalent lapses of students in recent examination reports include;

1. Inability to draw logical conclusion from observation.
2. Use of incorrect symbols for ions.
3. Lack of adherence to step-wise instruction.
4. Incorrect use of moles concept.

Based on the facts discussed above, the researcher wishes to investigate the effectiveness of cooperative learning methods on the academic achievement of chemistry students.

Purpose of the Study

The purpose of the study is to investigate the effectiveness of cooperative learning and direct instruction on the achievement of chemistry students.

Hence, the study intends to:

1. Find out if there is any difference in the academic achievement of students taught with cooperative learning and those taught with lecture method
2. Find out if there is any difference in the attitude of students before and after exposure to cooperative learning strategy.

Research Questions

The following research questions were posed to guide the study

1. Is there any difference in the mean score of students taught with cooperative learning strategy and those taught with lecture method?
2. Is there any significant difference in the attitude of chemistry students before and after exposure to cooperative learning strategy?

Research Hypotheses

The following hypotheses were formulated to guide the study:

1. There is no significant difference in the mean scores of students taught with cooperative learning strategy and those taught with lecture method.
2. There is no significant difference in the attitude of chemistry students before and after exposure to cooperative learning.

Scope of the Study

This study was undertaken to determine the effects of cooperative learning strategy on academic achievement of chemistry students. The Senior Secondary School (SS2) Students in Obio/Akpor Local Government Area of Rivers State were the target group.

Research Methodology

Research Design

This research has used a quasi-experimental non-randomized pre-test and post-test group design. Nwankwo, (2007) defined quasi-experimental study as "a study in which certain threats of validity cannot be properly controlled due to unavoidable situations associated with the study when human beings are used for experimental studies"

Population of the Study

The population for the study consists of all SS2 Chemistry students in Obio-Akpor Local Government Area of Rivers State.

Sample Size and Sampling Techniques.

Two co-educational public secondary schools were identified by simple random sampling techniques in Obio-Akpor State Local Government Area of Rivers, from the 12 senior secondary schools. 100 SS2 students were placed in intact schools. There were two intact equal number classes (50 each). The study group was one group and it was taught using the cooperative method of learning. A traditional teaching approach was adopted by the other community. The study group comprised 50 students, and the control group 50 students.

Instrumentation

A modified questionnaire and Chemistry Aptitude Test (CAT), developed to address lessons learned with different instructional strategies which are cooperative learning techniques and direct instruction, are the instrument used for this research. The objects, correctly edited and re-edited by the researcher, are carefully checked and restored and updated until the researcher considers the instrument to be of good quality. The researcher must also ensure that the instruments are characterized by concise and clearly worded statements without ambiguity.

Validation of the Instrument

In order to receive their own feedback, the instrument's face and material validity were accomplished through the distribution of two copies of the question to educational experts in curricula and technology. In addition, the Chemistry Aptitude Test was used to provide students with assessments to assess the success of students in chemistry. This will help the researchers enhance the instrument's material scope by adding certain elements that the researcher may have missed.

Reliability of the Instrument

Using the trial test method (stability measurement), the reliability of the instrument CAT was determined. The drawing of a group of 30 students using a basic random sampling technique was also done and this group of students was not included in the main research. A sample was issued with copies of the instrument. All 20 CAT products were ordered to be checked. A copy of CAT was given to the same sample to reply to the second time after a 2-week interval. Original and re-test tests of the subjects with Pearson Product Moment Correlation were correlated and reliability of 0.87 achieved.

Administration of the Instrument

The instrument was given directly to the students. The teachers of the student at the school were trained to manage the questionnaires. The teachers were also used for the instruction of the various classes and then the administration of the CAT. The questionnaire and the chemical suitability test (CAT) are subsequently given to the students face to face and obtained from them after they have been administered. This was done by helping teachers in the schools that conducted the research.

Data Analysis

Research questions 1 and 2 were analysed using mean and standard deviation. While the Null hypotheses were analysed with t-test and ANCOVA.

Presentation of Result

Research question 1: Is there any difference in the mean score of chemistry students taught with Cooperative Learning Strategy and those taught with Lecture Method?

Table 1: Mean scores of chemistry students taught using cooperative instruction

Approaches	N	Pretest Mean, X	SD	Post test Mean, X	SD	Mean Gain
CLM	50	4.46	1.52	16.62	2.09	12.16
LTM	50	4.16	1.51	11.58	1.35	7.42

CLM: *Cooperative Learning Method LTM*: *Lecture Teaching Method*

Table 1 shows students who are exposed to experiments and control groups for their tests and post-tests. The averages ranged accordingly between 4.46 and 16.62 and between 4.16 and 11.58. The mean difference was 12.16 in Group 1 and 7.42 in Group 2.

Hypothesis 1: There is no significant difference in achievement between students taught with cooperative learning strategy and those taught with lecture method.

Table 2: Analysis of Covariance (ANCOVA) showing students' achievement scores when taught with cooperative instructions and those taught with lecture method

Source	Type III sum of squares	Df	Mean Square	F	Sig
Corrected model	755.325	4	188.831	96.616	.000
Intercept	1905.915	1	1905.915	975.156	.000
Pretest	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	1.954	-	-
Total	20822.000	100	-	-	-
Corrected Total	941.000	99	-	-	-

Table 2 reveals that there is a significant difference in achievement (F1, 95= 285.0, $p<0.05$). This means that students exposed to cooperative instructions performed better than their counterparts that were not exposed to cooperative instructions. Hence, hypothesis 1 was rejected.

Research question 2: what is the difference in the mean score of male and female chemistry students taught with cooperative learning?

Table 2: Gain in scores of chemistry students in the experimental and control group

Table 4 reveals that there is a significant difference in achievement (F1, 95= 27.9, $p<0.05$). This means that male students performed better than the female students. Hence,

hypothesis 2 was rejected.

Research question 2: Is there any difference in the attitude of chemistry students before and after exposure to cooperative learning?

Table 3: mean and standard deviation of chemistry students' attitude before and after exposure to cooperative learning

Group	N	X	SD
ABT	25	4.84	1.99
AAT	25	14.28	1.62

ABT Attitude before Treatment AAT Attitude after Treatment

Table 3 shows that chemistry students attitude was 4.84 with a standard 1.99 deviation before treatment and a median 14.28 with a standard 1.62 deviation after treatment. It results in students having greater attitude than their peers who are taught with a teaching approach following care.

Hypothesis 2: There is no significant difference in the attitude of students before and after exposure to cooperative learning.

Table 4: Group Statistics and t-test of students score in attitude

Group	N	Mean	SD	Mean Diff	T. Value	Sig.
ABT	25	4.84	1.99	9.44	18.3	0.000
AAT	25	14.28	1.62	-	-	-

ABT Attitude before Treatment AAT Attitude after Treatment

Table 4 shows a statistically significant mean difference of 9.44, t (48) = 18.3, p·<0.05. From the above, we rejected the zero hypotheses that the attitude of students taught by co-operative learning approach and students taught through teaching method does not vary significantly.

Discussion of Findings

The findings in Table 1 showed the substantial difference in the academic performance of students of chemistry between students in the cooperative research group and their counterparts who are taught through the means of lecturing. The test has also shown that they have taught better than their counterpart using a cooperative method of learning. This research is consistent with the findings of Johnson & Johnson (1990) [14], who states that average co-operative students have obtained significantly better outcomes than students not exposed to co-operative learning approaches.

Again, the null hypothesis 2 results show significant change in the attitude of the student. The result also shows a better attitude towards chemistry for students who had been taught after treatment with cooperative methods of learning.

Conclusion

2. Students with cooperative learning strategies were far better able to perform in chemistry than those who were exposed to the teaching method irrespective of their styles of study.

2. Cooperative research approach has a positive effect on students' attitudes. In this research, it is proposed that cooperative methods of learning are more successful in raising the achievement of chemistry students than conventional methods of lecturing and that the use of the cooperative approach is the solution to the decline in success of chemistry students.

References

1. Abdulahi A. Science Teaching in Nigeria. Ilorin: Atoto Press, 1982.
2. Ajagun GA. Towards Good Performance in Science Education. In E.J, 2006.
3. Maduewesi (Ed). Nigerian Journal of Teacher Education and Teaching.
4. Ajewole AG. The Effectiveness of Guided Discovery and Expository Instructional Methods on Students. Transfer of Learning Journal of Science Teachers Association of Nigeria. 1990; 22(2):59-66.
5. DFES. Pedagogy and Practice: Teaching and Learning in Secondary, 2004.
6. Schools: Unit 19: Learning Styles. London: Department for Education and Skills.
7. Johnson D, Johnson R. Learning together and alone, cooperation, competition, and individualisation. Needlam Heights, M.A: Prentice Hall, 1975.
8. Johnson DW, Johnson R, Maniyama G. Interdependence Interaction among Heterogenous and Homogenous Individuals. A Theoretical formulation and Meta-Analysis of the Research. Review of Educational Research, 1983; 53:5-54.
9. Johnson LC, Waxman HC. Evaluating the Effects of the "Group of Four" Program. Paper Presented at the Annual Convention of the American Educational Research Book Company, 1985.
10. Johnson DW, Johnson RT. Cooperative and Competition: Theory and Research, International Book Company: Edima, MN, 1989.
11. Johnson DW, Johnson RT. Cooperative Learning and Performance in Sharan (eds). Cooperative Learning, Theory and Research. Pp. 23-337. New York: Praager Press, 1990.
12. Johnson D, Johnson RW, Smith K. Active Learning: Cooperation in the college classroom, Interaction Book Company, 7208 Cornelia Drive, Edina, MN 55435, ISBN O.939603-14-4, 1991.
13. Johnson D, Johnson R, Holubec E. Cooperation in the college classroom. Interaction Book Company; 7208 Cornelia Drive, MW55435, 1993. ISBN O-939603-14-4. http://www.cooperation.org/pages/cl-methods.html.
14. Johnson DW, Johnson F. Joining Together: Group Theory and Group Skills (10th.ed.). Boston: Allyn & Bacon, 2009.
15. National Policy on Education. 4th Edition, 2004, Page 35.
16. Ndioho OF. Effect of Constructivist Based Instructional Model on Senior Secondary Student' Achievement in Biology. In Unzewi (Ed) Science Teacher Association of Nigeria. 50thAniversary Conference Proceedings. (98-101). Sokoto. Heineman Educational Books, 2007.
17. Nwankwo BC. "Management Principles and Practice in Organisation". Paper Presented at a Workshop on Efficiency and Productivity Improvement in the Civil and Public Service Organised by the Cross River State Government from 26th, 27th, September, 2007, Pp 1-26.
18. Obomanu JB, Adaramola MO. Factors Related to Underachievement in Science Technology and Mathematic Education. (STME) in Secondary Schools in Rivers State Nigeria. Vol. 1, No 1(2011). World Journal of Education, 2011. ISSN 1925-0746 (print) ISSN 1925-0754 (online).
19. Okebukola PA. Tackling the Problem of Large Class-

size in Biology. An Investigation into the Effect of a Cooperative Learning Technique. Journal of Science Teachers Association of Nigeria. 1984; 22(2):73-77.
20. Okebukola PA. Attaining Meaningful Learning of Concept in Genetics and Ecology. An Examination of the Potency Concept Mapping Techniques. Journal of Research in Science Teaching. 1990; 27(5):493-504.
21. Okebukola PA. Beyond the Stereotype of New Strategies in Science Teaching. Journal of Science Teachers Association of Nigerian (STAN). Ibadan, 2002.
22. Olorukooba SB. A survey of the Different Methods of Teaching Science in Zaria and its Environs. An Unpublished M.Ed. Thesis ABU Zaria, 1983
23. Olorukooba SB. The Relative Effects of Cooperative Strategy and Traditional Method on the Performance of Senior Secondary School Chemistry Student, 2001.
24. Soyibo K. A Comparison of Selected Lagos Students' Attitude to and Performance on a Biology Test. Education in Lagos State. An Overview of Selected Papers from a Conference on Education Development in Lagos State held at Lagos State University. 2-4th April, 1991.
25. Wokocha GA. Fundamentals of Environmental Science, 2014, Pg 2.
26. CHICOM GRAPHICS, 6 Obrikom Road, Omoku, Rivers State, Nigeria.