

EFFECT OF PEER GROUP ACTIVITY-BASED LEARNING STRATEGY ON STUDENTS' ACADEMIC ACHIEVEMENT IN INTEGRATED SCIENCE IN LAGOS STATE, NIGERIA

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Abstract

This paper examined the effect of peer group activity-based learning on Junior Secondary 8 Schools students' academic achievement in integrated science. The study adopted quasi experimental research design. Two hypotheses were generated for the study. The study consists of 100 purposively sampled students in education district V, Lagos State. Students were taught in their intact classes. A test re-test reliability of 0.75 was obtained in respect of the instruments. The Pre-test and Post-test scores of the experimental and control group served as data for this study. Data analysis was done using ANCOVA. The analysis revealed that students taught using Peer group activity-based teaching strategy performed better academically in integrated science than those taught with traditional method. The findings also revealed significant effect in achievement scores of female students than the male students taught with peer group activity-based method. Furthermore, there was significant interaction effect of gender and peer group assisted based method on students' achievement in integrated science. It was recommended that curriculum planner should include peer group activity-based learning into the integrated science curriculum.; there is a need to organize in-service training for all integrated science teachers in the area of the use of activity-based method of teaching; and Government should provide functional laboratory for effective teaching and learning of integrated science and include more science kits to the schools at all levels, be local, state and federal level.

Keywords: Activity-Based Learning Integrated Science, Peer group, Academic achievement.

Introduction

The use of peer group activity-based method in a conducive learning environment is a golden teaching approach (Ajewole, 2016). It is the corner stone of intellectual development and it leads students to critical thinking. This method lay emphasis on the direct participation of students in the learning process. It helps the students to get the right concept while engaging themselves in different activities. Peer activity-based teaching is an approach adopted by the teachers whereby activities are used to bring about effective learning experience. It is a method that motivate the child to become actively involved both mental and physical learning by focusing on the right method. The more students are actively involved in the learning process, the longer they learn. A8ctivity-based method is students centered learning that is taught through many activities. Integrated science due to

its nature of being an activity-oriented course, has the potential of equipping learners with such processed and skills through activities.

The development of science, process skills such as observation, measurement, experimentation, manipulation and problem solving skills among others as well as scientific attitudes such as honesty, objectivity, open-mindedness and willingness to cooperate and accept criticism among others through integrated science can best be realized when the learners are taught practically using the activity-based approach as demanded by the course curriculum and at the same time as recommended by the National Commission for Colleges of Education (NCCE, 2008). Those teaching/learning techniques must have necessary provision for students active engagement with explanatory ideas and evidence so as to enable them make connection of scientific theories and concept to real purpose and practice in the world they live (Tyler 2016). The most recommended strategies for teaching science are problem-solving, inquiry-based teaching, laboratory-based activity and project based teaching/learning. But unfortunately teachers teach classes the same way they were taught, typically using lecture method (Mazur, 2008) and this situation is in continuation since. This stereotype results in learners depending upon rote learning without having deep understanding of scientific phenomenon, concepts and theories. Aladejana (2008), Delphonso (2015) & Delphonso (2018) explains that teaching still retains the old conservative approach of teachers acting as repository of knowledge and students the dormant recipients. Delphonso (2018) further states that the traditional teacher-centered teaching approach which favours passive reception of knowledge is still in vogue in most of our secondary schools all over the country and such an approach has been criticized for its neglect of students' learning from a variety of sources.

A positive attempt to improve students' learning of scientific concepts will therefore involve the use of strategies that are tailored towards constructivism that will help to modify students' misconceptions. The process of modifying misconceptions with scientifically acceptable concepts is called conceptual change. Constructivism is one of the pedagogical tools used to promote conceptual change among learners. The unique features of conceptual change instruction are (1) students exhibit their conceptions explicitly so that they become conscious of their own ideas and thinking including groups and (2) that students are constantly engaged in evaluating and revising their conceptions. Since learners engage in activities that aid the processing of information and mental activities that will assist them to acquire, organize, structure instill and retrieve incoming knowledge efficiently (Park, 1995), learning therefore, depends on the use of appropriate thinking strategies that will promote meaningful learning where teachers go about teaching for conceptual change by making use of teaching methods that emphasize constructivist philosophies.

Theoretical Framework

The theoretical framework of this study is based on constructivist theory. A basic assumption in teaching for conceptual change is the key constructivist idea that construction of new conceptions (learning) is possible only on the basis of already existing conceptions. Piaget's Genetic Epistemology is fundamentally constructivist. It emphasizes that assimilation, accommodation, disequilibrium and equilibrium are important components in the conceptual change process. Von Glaserfeld (1988) described constructivism as a theory of knowledge which is rooted in philosophy, psychology and cybernetics. Yager (1991) claims that constructivist theory of knowing and ability to cope

depends on equilibrium state while the equilibrium is like a balance beam. According to Slavin (1987), there are two major theoretical perspectives related to cooperative learning -- motivational and cognitive. The motivational theories of cooperative learning emphasize the students' incentives to do academic work, while the cognitive components emphasize the effects of working together.

Social Constructivism is a variety of cognitive constructivism that emphasizes the collaborative nature of learning. Social Constructivism was developed by post-revolutionary Soviet psychologist; Vygotsky. Vygotsky was a cognitivist, but rejected the assumption made by cognitivists such as Piaget and Perry that it was possible to separate learning from its social context. He argued that all cognitive functions originate in, and must therefore be explained as products of, social interactions and learning is not simply the assimilation and accommodation of new knowledge by learners; it is the process by which learners were integrated into a knowledge community.

Teaching strategies based upon cognitive dissonance and its resolution has been used as the basis for developing teaching strategies designed to teach for conceptual change. These teaching strategies are derived from a Piagetian constructivist view of learning; they involve creating situations where learners' existing conceptions about particular phenomena or topic are made explicit and then directly challenged in order to create a state of cognitive conflict. Cooperative Learning and Conceptual change Strategies related and rooted in both social and radical constructivism as they create and encourage social and pattern of interactions among students. Therefore it is against this premise that Cooperative Learning Approach is one of the appropriate and effective teaching strategies that guide the learners to attain goals that cannot be obtained working alone or competitively.

The use of active learning strategies, such as peer group, cooperative learning and Conceptual Change Strategy is growing at a remarkable speed. These learning strategies employ a variety of learning activities to improve students' understanding of a subject by using a structured approach which involves a series of steps, requiring students to create, analyze and apply concepts (Kagan, 1990). Based on the foregoing, the theoretical thrust of this study is derived from previous works of Dewey 1938; Piaget 1930, 1973, and Vygotsky 1978. The relevance of this investigation to such previous works is in the areas of cognition, logic reasoning, schema, problem-solving, group work, collaboration, memory inference and concept formation.

Integrated science is a practical subject which equips students with concepts and skills that are useful in solving the day-to-day problems of life. The study of integrated science aims at providing the learner with necessary knowledge with which to control or change the environment for the benefit of an individual, family or community. But lack of good science achievements in the part of students is linked to the poor performance to poor quality of science teachers, large and overcrowded classrooms and lack of suitable and adequate science equipment, students' misconceptions derived from religious, cultural and societal related sources (Salami, 2012). Both activity-based learning/teaching and Peer instructions are embedded in Constructivist theories of learning and both are being used in science classrooms with positive outcome.

Storh (2016) conducted a researcher to find relationship between students' achievement and hands on experience in a science classroom. A significant difference was found across the hands-on frequency variable with respect to science achievement of the students. The student who had been engaged in hand-on activities every day or once a week scored significantly higher on a standardized test of science achievement than students

engaged in hands-on activities once a month or never. Thus the integrating of peer instruction and activity-based instructing may be analogous to laboratory class supported by group discussion that form the core pedagogical practices as discerns by Planner (2013), where hands-on activities challenge learner personal theories and prior conceptions while group discussion allow them to reconstruct and reshape their knowledge, all this provides for deep understanding and conceptual linkage of various scientific representations unfortunately, research reports showed that the teaching of science in Nigeria secondary schools fall short of the standard expected of it. It has been observed that the present methods used in the teaching students in secondary school do not augur well for the acquisition of able process skills by students (Vandor, 2012, Ibe 2014, Madu 2015). These methods are demonstration of lecture, direct observation, fielding group work laboratory activities, reading, reciting, seminar and programmed instruction. Ali (2017) asserted that the most effective method of teaching should be laboratory centered activity oriented rather than textbook or lecture centered which characterized the Nigerian schools. It is against this background that the effects of Peer group activity-based learning on students' academic achievement in integrated science would be investigated.

Purpose of the study

The purpose of this study is to investigate the effect of peer group activity-based learning on students' academic achievement in integrated science in Ojo Local Government Area. Therefore, the specific objectives of this research are to:

1. determine the effect of Peer group activity-based learning strategy and Traditional methods on academic achievement of students in integrated science
2. examine the effect of gender and peer group activities-based learning method on the achievement of means scores of students taught integrated science.

Research Questions

The following research questions for the study are as follows:

1. What is the effect of Peer group activity-based learning strategy and Traditional methods on academic achievement of students in integrated Science?
2. What is the effect of gender on the achievement of means scores of students taught integrated science using peer group activities-based learning method and traditional method?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance

1. There is no significant effect of Peer group activity-based and traditional methods of teaching on academic achievement of the students in integrated science.
2. There is no significance effect of Peer group activity-based and traditional methods in the achievement of means scores of students based on gender
3. There is no significance interaction effect of gender, Peer group activity-based and traditional methods in the achievement of means scores of students based on gender.

Methods

The study adopted a quasi-experimental research design on carrying out investigation. The population of the study comprised of one hundred (100) students from randomly selected junior secondary schools in Ojo Local Educational District of Lagos State. The instrument used for this study was the Achievement Test (AT), which was used for pretest, post- test.

The scores on two administrations of the AT (i.e. test re-test method) were subjected to correlation analysis using Pearson Product Moment Correlation Analysis (PPMCA). The reliability coefficient was 0.75 which was considered high enough as being reliable for the study. The procedure for collection of data was in three main phases and it lasted for three weeks. The phases were: pre- test for the first one week, treatment within second week and post-test within the third week. The data collected were analysed using ANCOVA statistical tool at $p < 0.05$ level of significance.

Results

Research Question One

What is the effect of Peer group activity-based learning strategy and Traditional methods on academic achievement of students in integrated Science?

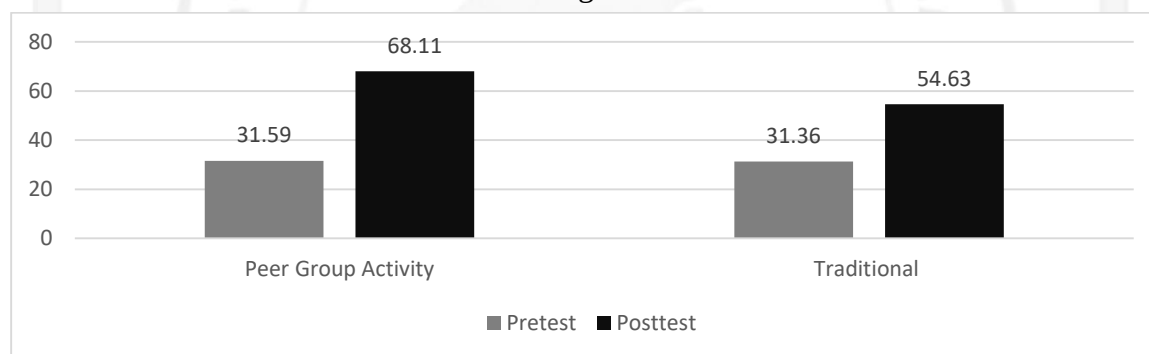


Figure 1. Students' achievement in integrated Science before and after being taught using Peer group activity-based learning strategy and Traditional methods

The result in Figure 1 showed that the students in peer group activity scored 31.59% before the treatment and 68.11% thereafter. Those in traditional classroom scored 31.36% and 54.63% respectively. It implies that peer group activity is more helpful in enhancing their achievement in integrated science.

Research Question Two

What is the effect of gender on the achievement of means scores of students taught integrated science using peer group activities-based learning method and traditional method?

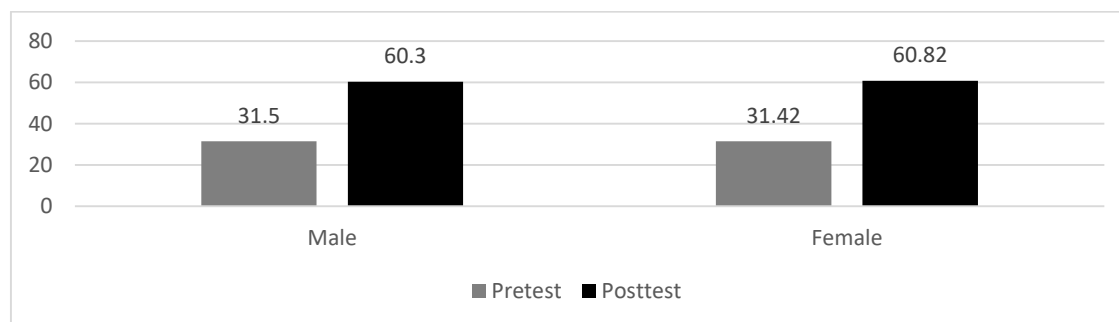


Figure 2. Students' achievement in integrated Science before and after being taught using Peer group activity-based learning strategy and Traditional methods based on gender

From Figure 2, it can be deduced that male students scored 31.5% and 60.3% before and after treatment, while the females scored 31.42% and 60.82% respectively. This means that both male and female students are the same in achievement in integrated science.

Hypothesis One

There is no significant effect of Peer group activity-based method and those taught by traditional method of teaching on academic achievement of students in integrated science.

Table I: Effect of Peer group activity-based and Traditional Method on Academic achievements

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4677.690 ^a	4	1169.423	88.526	.000	.788
Intercept	305.109	1	305.109	23.097	.000	.196
Pretest	20.845	1	20.845	1.578	.212	.016
Group	4473.397	1	4473.397	338.637	.000	.781
Error	1254.950	95	13.210			
Total	372684.000	100				
Corrected Total	5932.640	99				

a. R Squared = .788 (Adjusted R Squared = .780)

The result $F(1, 95)=338.64$; $p=0.00$ in Table 1 showed that there is significant effect of Peer group activity-based method and those taught by traditional method of teaching on academic achievement of students in integrated science. The null hypothesis which states that there is no significant effect of Peer group activity-based method and those taught by traditional method of teaching on academic achievement of students in integrated science was rejected. This implies that students exposed to peer group activity-based method performs better in integrated science than those taught with traditional method.

Hypothesis Two

There is no significance difference in the achievement of means scores of male and female students taught integrated science using peer group activities-based learning method and traditional method.

Table II: Effect of Peer group activity-based and Traditional Method on Academic achievements based on gender

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4677.690 ^a	4	1169.423	88.526	.000	.788
Intercept	305.109	1	305.109	23.097	.000	.196
Pretest	20.845	1	20.845	1.578	.212	.016

Gender	86.429	1	86.429	6.543	.012	.064
Error	1254.950	95	13.210			
Total	372684.000	100				
Corrected Total	5932.640	99				

a. R Squared = .788 (Adjusted R Squared = .780)

The outcome $F(1, 95)=6.54$; $p=0.01$ in Table 2 showed that there is no significant effect of peer group activity-based method on students' achievement in integrated science. Hence, the null hypothesis which states that there is no significant difference in the mean scores of male and female students taught integrated science using peer group activity-based and traditional methods was rejected. This result indicated that the female students had higher mean scores than the male students. That is to say the female students performed better than the male students taught integrated science using peer group activity-based method as shown in Figure 2.

Hypothesis Three

There is no significance interaction effect of gender, Peer group activity-based and traditional methods in students' means scores in integrated science.

Table III. Interaction effect of gender, peer group activity-based and traditional Method on Academic achievements

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4677.690 ^a	4	1169.423	88.526	.000	.788
Intercept	305.109	1	305.109	23.097	.000	.196
Pretest	20.845	1	20.845	1.578	.212	.016
Gender * Group	107.899	1	107.899	8.168	.005	.079
Error	1254.950	95	13.210			
Total	372684.000	100				
Corrected Total	5932.640	99				

a. R Squared = .788 (Adjusted R Squared = .780)

The outcome $F(1, 95)=8.17$; $p=0.01$ in Table 3 showed that there is significant interaction effect of gender and peer group activity based method on students' achievement in integrated science. So the third null hypothesis which states that there is no significance interaction effect of gender, Peer group activity-based and traditional methods in students' means scores in integrated science was also rejected. This significant interaction effect could be due to either gender or treatment.

Discussion

The study revealed that peer group activity-based method is an effective method of teaching. This shows that students that were exposed to peer group activity-based method performed better in grades than those taught with traditional method. This is in agreement with Harfield (2018) which asserted that students performed better in integrated science when taught with peer group activity-based method than traditional lecture method. This

implies that students exposed to peer group activity-based method perform well academically in integrated science due to the acquisition of more scientific skills than those exposed to traditional lecture method. Also, Jegede (2013) revealed that peer group activity-based method enhances effective science teaching as a result of acquisition of knowledge of process and product of science by the students through learning science by doing.

It was also discovered from this study that female students performed better in integrated science than male students using activity-based method because of constant interaction with scientific materials. This also implies that peer group activity-based method enhances the performance of female students more than the male students in integrated science. This in line with Stakery (2011) which revealed that peer group activity-based method stimulates the cognitive domain of female more than the (knowledge, understanding, application, synthesis and evaluation) of their male counterparts. The significant interaction effect of gender and the peer-group-activity based method was due to either of the two variables. Based on these findings, it is hereby concluded that using peer group activity-based method during integrated science lesson enhances academic achievement of the students in the subject. This implies that learning by doing enhances retention memory of the learner because it will be absolutely difficult to remember what they were taught without practical experience to demonstrate their ideas among themselves and in things they did by themselves.

Conclusion

Based on the finding made from the study, it was concluded that the use of peer group learning strategy is an effective method of teaching integrated science in secondary schools because it encourages students to learn from each other as they actively and innovatively participate and take responsibility for their own learning.

Recommendations

Based on the findings and discussions of this study, it was recommended that:

- (i) The curriculum planner should include peer group activity-based learning into the integrated science curriculum.
- (ii) There is a need to organize in-service training for all integrated science teachers in the area of the use of activity-based method of teaching.
- (iii) The Government should provide functional laboratory for effective teaching and learning of integrated science.
- (iv) The government should include more science kits to the schools at all levels, be local, state and federal level.
- (v) There is a need for government to provide an enabling environment such as physical infrastructural facilities for effective teaching and learning.
- (vi) In service teachers in integrated science should provide a platform for interaction with learners/students on the use of activity based method of teaching.

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