



Effect of Collaborative Learning Strategy on Achievement in Basic Science among Low Ability Secondary School Students in Kano, Nigeria

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Abstract

This study investigated the effects of collaborative learning strategy on Performance in Basic Science between male and female Junior Secondary School (JSS II) students of low ability in Fagge Local Education Authority of Kano State. Experimental and Control group design with pretest and posttest were used in this study. Pretest was conducted on the two groups. After treatment, posttest was administered. The experimental group was given treatment for six weeks, using collaborative learning strategy, while the control group was exposed to six weeks teaching of the same topics using lecture method. The population consists of 4,061 students. Simple random sampling technique using balloting method involving pick from a hat, was used to select the sample of 60 students each for both experimental and control groups. The instrument used for data collection is Basic Science Achievement Test (BSAT) with reliability coefficient of 0.78. Two null hypotheses were stated in line with the research questions raised. Data collected was analyzed using t-test statistics at $P < 0.05$ level of significance. The findings revealed that: there is a significant difference in the mean scores of experimental and control groups in favour of the experimental group. Also, there is a significant difference in the scores of female and male low ability students of the experimental group in favour of the females. It was recommended that, collaborative teaching should be used by teachers to teach basic science at junior secondary school level and curriculum planners should consider its suitability for the teaching of basic science concepts among students.

Keywords: Collaborative Learning, Low Ability, Curriculum Planners, Collaborative Teaching, Academic Performance.



Introduction

The world is becoming a global village with every nation struggling to control the global market through technological innovations with high capacity to attract global acceptance. Lawal (2007) stated that, science and technology provide the foundation for wealth creation and advancement of quality life. Also, Ajewole (2005) stated that, Science and Technology have for long been recognized as the instruments par excellence for nation building and wealth creation which made every country today to crave for an advancement in that respect. However, the enormous importance of science in the technological, economic and political development of nations globally explains why technological attainment is often used to determine the level of development of every nation. Mathematics, Science and Technology are essential tools for socio-economic and cultural development of any nation Muhammad, Yusha'u & Lawal (2018). Because of this, every nation is strategizing how to develop, science and technology that could attract international recognition. In order to achieve these goals, Universal Basic Education (UBE) was launched on 29th September, 1999 by the Federal Government of Nigeria (FGN) to provide a fulcrum for achieving free, compulsory and nine year education for all school age children irrespective of their socio-economic circumstance (NOUN, 2013). The principal reasons why Nigerian Government emphasizes Basic Science teaching in Nigerian Secondary schools, as stated by FME (2014), is to develop interest in science and technology, to make students to apply their basic knowledge and skills in science and technology to meet the societal needs, and also, to make students take advantage of the numerous career opportunities offered by the study of science and technology.

Basic Science is a subject whose curriculum was designed with the major goal to inculcate process skills and science attitudes in learners at the junior secondary school level. However, Dawal, Ayuba and Bash (2018), found that basic science and technology students are not given the opportunity to involve in meaningful activity-based that will motivate them. This led to poor achievement in the classroom and junior secondary school certificate examination (JSSCE) in basic science and technology among students.

These calls for the use of appropriate teaching method that would help achieve these objectives. Although Ojimba (2013) has shown that, lecture method has been found to be more commonly used and it is inadequate to equip the students in learning. Therefore, lecture method solely used by teachers to teach students is inappropriate, because low ability students are usually left behind during the lesson. Basic science curriculum therefore, was designed to enable students become literate in science and to lay sound foundation for their subsequent study of Geography, Physics, Biology and Chemistry at senior secondary school level as stated in the National Policy on Education (FME, 2014). Also, Ibe (2008) found that in Nigeria, Basic Science teaching is faced with multi-talented problems among which are- poorly trained teachers, inadequacy in pedagogy and content knowledge, ill-equipped laboratories and poor assessment techniques. He further added that most teachers of basic science have their specialization in Biology, Chemistry, Physics, Geography and Agricultural science respectively and tend to teach only content areas related to areas of their specialization. This problem of teaching and learning of science is not only in Nigeria, because Duguryil and Poli (2017) reported abundant poor performance in science in developing countries, which is not just due to the students, but due to the absence of



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supportive environment such as teacher students verbal interaction for serious science learning. In addition, Usman (2007) stated that, teacher has to introduce methods that will develop students' scientific understanding, thinking and problem solving abilities that would help in solving conceptual problems and would result in high achievement in science, than the conventional lecture method which tend to emphasize knowledge and ignores higher order thinking.

Gender issue is topical in Science Education, more so with increasing emphasis on ways of boosting manpower for technological development as well as increasing the population of females in science and technology (Ogunkola & Bilesanmi, 2000). In Nigeria, and perhaps the whole of Africa, gender bias is still very prevalent (Arigbabu & Mji, 2004). This is a view to which Onyeizugbo (2003) has also mentioned in which he pointed out that "sex roles are somewhat rigid in Africa particularly in Nigeria where gender differences are emphasized". It is commonplace to see gender stereotype manifested in the day-to-day life of an average Nigerian, because, certain vocations and professions have traditionally been regarded as men's: (medicine, engineering, architecture) and others as women's: (nursing, catering, typing, arts). Typically, parents call boys to wash cars, cut grass, fix bulbs, or climb ladders to fix or remove things, and on the other hand, chores such as washing dishes, cooking, cleaning and so on, are reserved for the girls. In a nutshell, complex and difficult tasks are allocated to boys, whereas girls are expected to handle the relatively easy and less demanding tasks. As a result of this way of thinking, the larger society tended to see girls as the "weaker sex". Consequently, an average Nigerian child goes to school with these fixed stereotypes. However, Erinoshio (2005) and Kennedy (2000) mentioned that, Gender issues both on the part of the teachers and students, have been documented to affect achievement generally. Also, in a study conducted by Adedayo (2004) and Atadoga (2005), they reported no significant difference in the performance of boys and girls. Although this lack of significant difference was due to active interaction between teacher and students' gender difference, despite the fact that girls are generally shy and do not want to communicate in public (Rekha & Fisher, 2004). This is what urges me to conduct this study to find out if there are significance differences between male and female low ability Basic Science students when taught using collaborative learning strategy.

It is based on these that Dawal, Ayuba and Bash (2018) found that, there is need for Nigerian Science Teachers to develop more effective teaching strategies that can enhance high students' achievement and improve the quality and quantity of discourse during science lessons. The search for improved strategies for teaching and learning of science is therefore a continuous process. That is basically, what prompted the need for this study, in order to find out if collaborative learning strategy will enhance the academic performance between male and female low ability basic science students or not.

One of the most successful methods of helping students learn actively is collaborative learning strategy. It has been clearly stated by Dyel (2011) that, when collaborative learning strategy is used, students tend to exhibit higher academic performance, critical thinking skills and deeper understanding of learned materials among others. Despite the importance of collaborative teaching and learning strategy, most basic science teachers adopt the use of traditional method of teaching like lecture method, which brings about the total negligent of low ability learners. Despite the importance of collaborative teaching and learning strategies, low ability basic science



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students are not carried away, in which Bani (2012) stated that there is an increase in the number of low ability basic science students. Emily, Robert, and Michael (2003) found that if students are grouped homogeneously, there is the fear that low-ability students will be deprived of opportunities to learn i.e. they may be left behind and also unmotivated to learn because of peer, personal and teachers' expectations of poor performance, as low ability students learn very slowly. It will also identify peculiar problems that low ability students face in teaching and learning and prefer potent solution, which is hopefully aimed to help low ability students to overcome their peculiar problems in learning, among others. Although, Ishaq (2015) stated that, the way basic science is taught without adequate provision taken to ensure low ability students' weakness in learning is catered for through the use of effective mechanisms and right instructional method.

Esther (2012) defined low ability students as those students whose scores fall below 40% in a given standardized test of cognitive ability in which students in this category may not be expected to achievement or recall stored information within a reasonable amount of time, such students can be considered as low ability students. In addition, Duguryil (2017) found that, junior secondary school certificate examination in basic science and technology in public secondary schools in Jos, Plateau state of Nigeria from 2013-2017 showed consistence poor performance with majority of students scoring less than 50%. In another direction also, Dyel (2013) and Young, (2008), separately found that when students participate in collaborative learning activities their performance and retention of learned material are improved. It is in view of these above statements that, this study is aimed at investigating the effects of collaborative learning strategy on academic performance among low ability Basic Science students, and also to identify peculiar problems that low ability basic science students face in teaching and learning and to proffer potent solutions, which are aimed at helping them to overcome their peculiar problems in learning.

Objective of the Study

The main objectives of these study are to;

1. Find out the difference in performance of low ability basic science students taught Basic science using collaborative learning strategy and those taught using lecture method.
2. if the performance of male and female junior secondary school II Students of low ability in basic science taught using collaborative learning strategy differ or not?

Research Questions

The aim of this study is to answer the following research questions;

1. Is there any difference in the performance of low ability basic science students taught Basic science using collaborative learning strategy and those taught using lecture method?
2. Does academic performance of male and female junior secondary school II Students of low ability in basic science taught using collaborative learning strategy differ or not?

Null Hypotheses

1. There is no significant difference in the performance of low ability basic science students



- taught Basic Science using collaborative learning strategy and those taught using lecture method.
2. There is no significant difference in the academic performance of male and female Junior secondary school II students of low ability in basic science exposed to collaborative learning strategy.

Methodology

This study used quasi - experimental - control group design, which involves pretest and posttest. A pretest was administered to determine the equivalence in ability level of these two groups (experimental and control groups). Treatment was administered to the experimental group by exposing the study subjects to collaborative learning strategy, while the control group was taught using convectional lecture method. At the end of the six-week treatment period, the posttest was administered to both experimental and control groups. For the selection of topics for this study, relevant basic science topics were chosen for teaching. New UBE Basic Science for Nigerian Junior Secondary Schools Pupils 'Book II by (STAN) with teacher's guide of the same book was used, in order to guide the researcher on how to select the topics and frame the questions. Basic Science Achievement Test (BSAT) was used in both the pretest and posttest. The scores from the performances of both experimental and control groups was collected and analyzed in order to determine the differences in the students' performance using the SPSS statistical, package. The population for this study comprises all the second year students in Junior Secondary School JSS II Students in Fagge local Education Authority, Kano State of Nigeria. In this study, Fagge local education authority was used because; it is among the seven local education authorities found in Kano metropolis and is among the local education areas which have higher number of schools and students. In this local education authority, there are fourteen junior secondary schools with population of 4,061 students. Simple random sampling technique using balloting method involving pick from a hat was used in selecting the schools used for this study. To select students for the study, the researcher used (BSAT) as pretest to determine the subjects ability level as well as to determine their academic level at the beginning of the study. The researcher randomly selected 120 subjects for the study in line with central limit theorem, which proposed a minimum of 30 subjects as viable for Experimental research (Dambana, 2011 & Sambo, 2008). Out of this, 60 subjects formed the experimental and 60 subjects the control groups.

Results

Research Question One

Is there any difference in the Performance of low ability basic science students taught basic science using collaborative learning strategy and those taught using lecture method?

The posttest scores obtained for research question one, were analyzed using descriptive statistics such as mean and standard deviation. The result is shown in Table 1.

Table 1: Summary of Mean and Standard Deviation Score for Performance of Low Ability Basic Science Students of Experimental and Control Groups

Variable	N	X	SD	Mean Different
Experimental	60	81.75	13.56	25.67
Control	60	56.08	7.65	

As shown in Table 1, the mean scores of experimental group that is students who were exposed to collaborative learning strategy is 81.75 while those who were exposed to lecture method is 56.08. The mean difference between experimental and control groups therefore is 25.67. This shows that collaborative learning strategy improved the performance among Basic Science students of low ability.

Research Question Two

Does academic performance of male and female junior secondary school two students of low ability in basic science taught using collaborative learning strategy differ or not?

To answer research question two, the posttest scores of students from the academic performance test of the experimental and control groups were collected and analyzed using mean and standard deviation. The summary is shown in

Table 2: Summary of Mean and Standard Deviation of Male and Female Experimental Groups

Variable	N	X	SD	Mean Different
Experimental	30	81.33	10.66	3.84
Control	30	85.17	13.49	

From Table 2, the result shows that the academic performance of both male and female subjects of experimental groups among junior secondary school two students of low ability in basic science differs. Male subjects have a mean score of 81.33 while the female subjects have the mean score of 85.17. This shows that females performed better with mean difference of 3.84 compared to their male counterpart. Therefore, there is a difference between the performances of the two groups. This result has answered the research question two.

Hypothesis I:

There is no significant difference in performance between the low ability basic science students taught using collaborative learning strategy and those taught using lecture method.

To test this hypothesis, the posttest scores of students from the academic performance test of the experimental and control groups were collated and analyzed using t-test statistical technique to find out if there are any significant differences in the performance at $P \leq 0.05$. The result is presented in Table 3.

Table 3: t-test Analysis of Mean Performance Score of Basic Science low ability Students for Experimental and Control groups

Variable	N	X	SD	SE	t-cal	Df	p-value	Remark
Experimental	60	81.75	13.56	1.750	7.64	118	0.001	*Significant
Control	60	56.08	7.65	0.988				

* Significant at $P \leq 0.05$

The result in Table 3 shows that the P-value obtained is 0.00 at $P < 0.05$ with df- 118. This implies a significant difference in the performance of experimental group exposed to collaborative learning strategy and that of the control group exposed to the lecture method. The result reveals that collaborative learning strategy enhanced academic performance of low ability students. Also, the mean score value of 81.75 for the experimental group and 56.08 for the control group further confirmed this, thus the null hypothesis which stated there is no significant difference is rejected.

Hypothesis Two

There is no significant difference in the academic performance of male and female junior secondary school two students of low ability in basic science exposed to collaborative learning strategy.

To test this hypothesis, the posttest performance scores of the two groups that is male and the female students in the experimental group were subjected to t-test analysis. The result is presented in;

Table 4: t-test Analysis of Post-test Scores of Male and Female Low Ability Basic

Science Students Taught Using Collaborative Learning Strategy								
Variable	N	X	SD	SE	t-cal	Df	p-value	Remark
Experimental	30	81.33	10.66	1.95	1.22	58	0.004	*Significant
Control	30	85.17	13.49	2.46				

* Significant at $P \leq 0.05$

From the result in Table 4, it was observed that the t-value was 1.22, and the P value of 0.004 at degree of freedom 58. Since the P-value of 0.004 is less than $P < 0.05$, therefore, there is significant difference and thus, the null hypothesis is rejected. The significant difference found is therefore in favour of female basic science students.

Discussion of Findings

The results in, of this study shows that there is significant difference for low ability students taught using collaborative teaching strategy and those taught using lecture method. The result shows that the experimental "group, which was exposed to collaborative learning strategy, performed better than their counterpart in the control group who were taught using lecture method. This finding is in agreement with the findings of Nwanso (2004), Batin (2000). Yager, Mackunnu and Yager (2005), Onu



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(2007) and Wakili (2007) where, in their separate studies, they described that using activity oriented teaching strategies increased students abilities to come up with divergent views on issues hence their creative ideas improved. Also Adama (2013) found that low ability secondary school science students who were exposed to collaborative learning performed significantly better when compared with their counterparts who were exposed using lecture method.

Also Curtis and Lawson (2001) in their study, they showed that male and female students who were exposed to collaborative learning, had an increase in their involvement and critical thinking as well as understanding of the subject matter. Furthermore, this finding is in agreement with the findings of Bichi (2008) who stated that girls performed better than the boys in problem solving type of activity. Again, in recent research study on competitive and collaborative learning in senior secondary schools, Kolawole (2007) showed that academic achievement of the students is highly improved. But in disagreement with the finding of Adama (2013) who shows that there is no significance difference in the mean academic achievement of male and female students exposed to collaborative learning strategy and those taught using lecture method.

Conclusion

The findings of this study show that the low ability basic science students who were exposed using collaborative learning strategy (experimental group) which performed better than their counterpart in the control group who were taught using lecture method. The finding also shows that collaborative learning strategy enhances the performance of low ability female students in Basic Science, than the males. That is, it is in favour of female students. Generally, collaborative learning strategy has the potential of enhancing Low Ability Basic Science students' performances. Therefore, using collaborative learning strategy for the improvement of Science Education at the Junior Secondary school level is a welcome idea, and has the potentiality of enhancing students' academic performance in basic science.

Recommendations

Based on the conclusion from this study, the following recommendations were formulated:

1. Teachers should be encouraged to expose low ability basic science students to a collaborative learning strategy when conducting their lessons.
2. Educational stakeholders such as curriculum planners, Science Teachers Association of Nigeria, Federal Ministry of Education, and Parents Teachers Association, should examine the effectiveness of collaborative learning strategy on gender that is male and female basic science students, and consider its suitability for the teaching of Basic Science concepts in schools. Since it has the potentiality of bringing about meaningful learning and improved academic performance of low ability male and female basic science students, educational administrators as well as the principals and teachers of secondary schools should use it as the point of reference in formulating other educational policies in Basic Science.



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