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INVESTIGATING THE EFFEECT OF CO-OPERATIVE LEARNING AND DEMONSTRATION METHODS ON THE ACHIEVEMENT OF JUNIOR SECONDARY BASIC SCIENCE STUDENTS IN ABUJA MUNICIPAL COUNCIL AREA

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ABSTRACT
This study investigated the effect of Student Teams Achievement Division, STAD co-operative learning and demonstration methods of teaching on the academic achievement of Junior Secondary Basic Science School students in Abuja Municipal Council Area. A quasi experimental design with pre-test, post-test, experimental and control groups were used. The population of the study comprised all Junior Secondary Schools in Abuja Municipal Council Area. Three schools from which three intact classes of 191 students were randomly sampled from the 48 Junior Secondary Schools in Abuja Municipal Council Area. Basic Science Achievement Test (BASAT) which was the instrument used for data collection consists of 30 test items. Students in two experimental groups were taught using STAD cooperative learning and demonstration methods respectively while students in the control group were taught using the conventional method. Pre-test was administered to students in all groups before teaching commenced and after the teaching and experiment, a post-test was administered. Data obtained was used to analyze six research questions and hypotheses using mean, standard deviation and ANCOVA. The study revealed that students taught with STAD cooperative learning performed better in Basic science than those taught with the demonstration method. It also revealed that STAD cooperative learning method of teaching was more effective for both male and female students and for high and low ability students than the demonstration method of teaching. It was recommended among others that STAD cooperative learning be adopted in the teaching of Basic Science in Junior Secondary Schools.
Keywords: Cooperative Learning, Demonstration method, Academic Achievement, Basic Science, Experimental group, Control group
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Background of the Study
Science education plays a vital role in the lives of individuals and the development of a nation scientifically and technologically, it is widely and generally acknowledged that the gateway to the survival of a nation's development scientifically and technologically is through science education.

The Nigerian government, in a bid to enhance science and technological education, came up with 6-3-3-4 policy on education which stipulates that a child should spend six years at the primary school, three years at the Junior Secondary School level, three years at the Senior secondary school level, and four years in Higher Institutions. This system of education was reviewed in 2004 and came up with 9-3-4 system which stipulates that a child speeds 9 years compulsory right from primary school level to Junior Secondary School level, three at the Senior Secondary school level, and four years in the Tertiary Institutions. All special provisions for science and technology learning in schools, Nigerian Government also came up with a policy that 60 percent of the students seeking admission into the nation's Universities, Polytechnics, and Colleges of Education should be admitted for science oriented programs, while 40 percent of the students should be considered for Arts and social science programs (Sambo, Ibrahim & Oyelade, 2020). Educators understand that changes in student outcomes must be supported by parallel changes in curriculum and instruction. However, it is apparent that many of today's teachers are caught in the midst of a change for which they may not have been professionally prepared. Many teachers were educated in the

classrooms where the role of the student was to memorize information, conduct well regulated experiments and were then tested on their ability to repeat these tasks or remember specific facts (Ajaja, 2002, Dogru and Kalender, 2007, Sambo & Tagans, 2021) found that the most dominant method of teaching science in Nigerian schools is the lecture method.

Basic science, formerly known a Integrated Science, is the first form of science a child encounters at the secondary school level; hence Basic Science prepares students at the Junior Secondary School level for the study of core science subjects at the Senior Secondary School (Olarewaju, 1994 and Adejoh, Sambo & Kanu, 2020). This implies that for a student to be able to study single science subjects at the Senior Secondary school level successfully, such student had to be well grounded in basic Science at the Junior Secondary School. It is therefore necessary for the learner to know these processes through integrated approach of learning science.

In an attempt to improve the standard of science teaching and learning, a lot of research studies had been carried out. Studies in Basic Science education have reported that many students at the Junior secondary school level have developed negative attitudes towards the subject and many of the students at this level, because of their dismal performance in the subject, are not benefiting much from the basic science curriculum (Afuwape, 2003; Afuwape and Olatoye, 2004; Odetoyinbo, 2004, Sambo, 2015, 2018 (a & b), 2019, Sambo, Yohanna & Msheliza, 2020 and Sambo & Tagans 2021). The percentage of FCT Junior secondary student with distinction in the 2013 Basic science BECE was 8.32%, those with credit was 14.61% while those with pass was 29.33% and 47.7% failed. This kind of performance has prevented many of them from offering core science subjects or performing better in the core science subjects at the Senior Secondary school level (Afuwape and Olatoye, 2004, and Sambo, Mahmuda & Nurudeen, 2014 a). WAEC reports between 20016-2020 shows the trend in the performance of Nigerian students in Chemistry, Physics and Biology. This is a cause of concern to parents, students, school administrators and the general public.

While other factors for poor performance cannot be ignored, evidence from research shows that if teaching methods are improved, achievement can be higher (Daramola & Asuquo, 2006) and Sambo, Oyelade and Ibrahim (2020). Research studies have also emphasized that teachers should-shift from the present overwhelming emphasis on learning facts to the use of effective critical thinking as the primary tool for learning (Sambo, Mahmuda & Nurudeen, 2014 b) and studies should be encouraged to take an active role in creating understanding and problem solving (Baker et al., 2008), Herman & Knobloch, 2004) which cooperative learning and demonstration methods do especially in a world of rapidly changing technologies, the students must be able to construct viable knowledge and adapt.

Cooperative Learning (CL) is a teaching arrangement that refers to small, heterogeneous group of students working together to achieve a common goal. In this method, students work together to learn and are responsible for their teammates' learning as well as their own, which leads to positive interdependence, individual accountability, equal participation, simultaneous interaction and group processing (Sambo, 2018 a) and Hudu, Yohanna and Msheliza, 2020).

How students interact with one another is a neglected aspect of instruction. Much training time is devoted to helping teachers arrange appropriate interactions between students and materials, that is textbooks and curriculum programs and some time is spent on how teachers should interact with students, but how students should interact with one another is relatively ignore. This should not be. How teachers structure student-student interaction patterns has a lot to say about how well students learn, how they feel about school and the teacher, how they feel about each other, and how much self-esteem they have. The emphasis is laid more on learning science as a process than as a body of knowledge. Hence, teachers should actively involve students in the teaching and learning of Basic science. Cooperative learning was specifically chosen because it allows active involvement of students in the teaching and learning process.

Demonstration method of teaching involves showing by reason or proof, explaining or making clear by use of example or experiments. Put more simply, demonstration means t clearly show. In teaching through demonstration, students are set up to potentially conceptualize class material more effectively. Demonstrations often occur when students have hard time connecting theories to actual practice or when students are unable to understand application of theories. Teachers not only demonstrate specific learning concepts within the classroom, they can also participate in demonstration in classrooms to help improve their own teaching strategies.

One of the objectives of science education is to develop students' interest in science and technology, as today's society depends largely on development in science and technology. Teachers are expected to devise ways of making their students develop positive attitudes towards science and science-related disciplines. The effort of the

Nigerian government towards making sure that Nigerian children show interest in science and science-oriented programs for instance the 60:40 ratio admission policy in favour of the science-oriented programs cannot be said to have yielded much fruit. This is because many of the students at the junior secondary level (J.S.S) do not show interest in studying core science subjects at the senior secondary school level. This has affected them in choosing science-oriented programs at the Nation's tertiary institutions level. It appears that the problem stemmes from the method being used by the Basic science teachers at the J.S.S. level (Sambo, Isaac, Agahu and Odagboyi, 2010). The Nigerian budget for 2016 shows that Education had the highest allocation of N426.5 billion of a total of N4.987 trillion budgeted. This represents 8.55%of the total budget. It seems that as the demand for education rises and budget for education rises, there is no noticeable improvement in the academic performance of students.

Gender of learners is also one of the factors that appear to affect student's academic achievement. Over some decades there has been evidence of growing gender gap in educational achievement in many countries (Sambo, Oyelade and Ibrahim, 2020). Gender bias is a very crucial issue in many spheres of life. The study of science appears to be more male dominant since it is believed that male students have more time than females because females perform more house chores at home. Whereas reports from some studies indicate that some teaching methods are gender sensitive (Isaah, Sambo, Abimiku and Emmanuel, 2014), others indicate that teaching methods are not gender sensitive (Sambo & Tagans, 2021). Hence, the effect of gender requires further research as it relates to academic achievement especially in Basic science.

All students do not learn in the same way. It is common for a class of students to be at different ability levels in a subject. Teachers are increasingly facing serious instructional challenges as the diversity among students within each class room continues to widen. Adejoh and Sambo (2011) noted that within each classroom students of a wide academic range with different labels such as gifted, fast learners, average learners and the low learners all face their teacher daily with full hope that their need will be met. The traditional teaching method seems not to have adequately equipped instructions with contemporary view of students. Teaching methods have been found to influence the academic achievement of low and high ability students (Sambo, Odagboyi & Ibrahim, 2011).

Government Junior Secondary schools in Abuja especially within Abuja Municipal council Area is characterized with large class size, mixed sexes and most times, the presence of students whose ages are above the average expected age for the Junior school class. This is particularly so with the introduction of free and compulsory basic education for all. While empirical evidence supports the use of corporative learning and demonstration method within a variety of subject areas and age groups within and outside Nigeria, the extent to which these strategies are beneficial in Basic science in Abuja, is to the best of researchers' knowledge unknown.

Purpose of the Study

The main purpose of this research work was to find out the effect of STAD cooperative learning and demonstration method on the academic achievement of Junior Secondary students in Basic Science within the Abuja Municipal Council Area. Specifically, the study attempted to:

1. Determine the effect of STAD cooperative learning method, conventional method and demonstration methods of teaching on the achievement of Junior Secondary School students in Basic Science.
2. Determine whether there is any difference in the mean achievement test scores between students taught using STAD cooperative learning method and those taught using demonstration method.
3. Determine the effect gender has on achievement in Basic science when students are taught using STAD cooperative learning.
4. Determine whether there is any difference in achievement test scores between high ability students taught with STAD cooperative learning method and those taught with demonstration methods of teaching.
5. Compare the achievement in test scores between low ability groups of students taught with demonstration method and those taught with STAD cooperative method of teaching.
6. Determine the effect gender has on achievement in Basic science when students are taught using demonstration method.

Research Questions

This study was guided by the following research questions:

1. What is the difference in the mean achievement scores between students taught using STAD cooperative learning method, conventional method and demonstration method?
2. What is the difference in mean achievement scores between students taught using STAD cooperative learning method and those taught using demonstration method.
3. What is the difference in the mean achievement scores between male and female students taught with STAD cooperative learning method?
4. What is the difference in the mean achievement scores between male and female students taught with demonstration method?
5. What is the difference in the mean achievement scores between high ability students taught with STAD cooperative learning method and those taught with demonstration method?
6. What difference is there in the mean achievement scores between low ability students taught with STAD cooperative learning methods and those taught with demonstration method?

Hypothesis

To achieve the purpose of this study, the following null hypothesis were formulated and tested for the study at $P<0.05$

$Ho_{1:}$ There is no significant difference between the mean achievement scores of the students taught by STAD cooperative learning, conventional method and demonstration method.

$H0_{2:}$ There is no significant difference between the mean achievement scores of students taught by STAD cooperative learning method and the students taught by demonstration method.

$H_{03:}$ There is no significant difference between the mean scores of male and female students taught using STAD cooperative learning method.

$H_{04:}$ There is no significant difference between the mean scored of male and female students taught using the demonstration method.

H_{05}: There is no significant difference between the mean scores of high ability students taught using STAD cooperative learning method and those taught using Demonstrative method.

$H_{06:}$ There is no significant difference between the mean scores of low ability students taught using the STAD cooperative learning method and those taught using the demonstration method.

METHODOLOGY

The research design employed in this study was quasi experimental research design. Quasi-experimental design was used because of the use of intact classes for the study. Specifically, the non equivalent pre-test posttest control design was employed. This design consist of three instructional group (STAD cooperative group, demonstration group and the conventional classroom teaching group), sex (male and female) ability (high and low) and repeated testing (pre-test and post test) STAD cooperative method and the demonstration method served as the experimental groups while the conventional method was the control.

The population of this study comprised the entire junior secondary schools student in public schools in Abuja Municipal Area Council. However the targeted population for the study was all junior secondary school two (JSS 2) students in the area. This is because JSS 2 student are more stable than JS 1 and 3 students. There are forty eight junior secondary schools in Abuja Municipal Council with a population of 44,561 students made up of 20816 male and 23645 females as at 2016/2020 academic session.

The sample of this study was 183 junior secondary II students spread across three intact. The method of sampling used was simple random sampling. Three schools were randomly picked by lucky dip from the list of junior secondary schools in AMAC. In each school an intact JS 2 class was used for the study. Two of these intact classes were assigned by balloting as the experimental groups and were taught using the STAD cooperative method of teaching and the demonstration method while the other which was the control group was taught using the conventional method.

The research utilized one instrument for this study. The instrument is called basic science achievement test (BASAT). BASAT is made up of two sections A and B. Section A elicited demographic data while section B was made up of 30 multiple choice questions (A-D) based on the content of the topics taught during the research. To validate the instrument, table of specification based on three levels of blooms taxonomy of education objectives were used. The three levels are knowledge, comprehension and application.. These three levels were used because junior secondary II students might not be able to operate on the levels of synthesis, analysis and evaluation. The use of blooms taxonomy ensures that the functional (content) validity of the instrument is attained. The duration for the test was 40 minutes. BASAT was used for the pre-test and the post test. That is in the first instance, it was used to know the entry behavior of the students and also to divide the student into high ability, average ability and low ability students. In addition the instrument was used to assess the achievement gains of the students after the experiment. 30 test items in BASAT were adapted from past NECO and BECE question.

The test instrument, BASAT was given to two experts in the subject from the department of science, technology and mathematics education and an instrument construction expert from measurement and evaluation, in Federal University of Lafia to assess the items on the appropriateness of the research instrument in relation to the topics (face validation) and the rational or logical vanity. The validity carried out was for content and face validity. The mean validity index as calculated from their appraisal was 0.84.

For the reliability of the instrument, a pilot test was carried out in the schools that are not part of the sample schools. Thirty students in JS II participated in the test. Scores obtained from the test used to determine the internal consistency of BASAT. The internal consistency was found to be 0.71 by using the split-Half reliability and Spearman Brown formula.

For data analysis, The student that were used as experimental subjects were exposed to orientation activities on cooperative learning techniques. Both the participating teachers and the researchers addressed the students in their classrooms. The students were taught the social skills and rules guiding the principles of cooperative. They were encouraged and motivated to interact among themselves. The training of research assistants and the use of regular basic science teachers are attempted to avoid experimental bias.

The research questions were answered using descriptive statistics of mean and standard deviation. With the pre-test and post-test, analysis of covariance (ANCOVA) was employed to analyzed the data and test the hypotheses. The hypotheses were tested at 0.05 level of significance. SPSS package was employed in the data analysis.

RESULTS AND DISCUSSION

Research question 1:

What are the differences is the mean achievement scores between students taught basic science using STAD cooperative learning method, conventional method and demonstration method?

Table 1: Mean score and standard deviation in BASAT of students in STAD cooperative, demonstration and conventional groups.

Teaching method	Types of test	No of students	Mean	Standard deviation
STAD Cooperative	Pre-test	64	4.78	2.82
	Post-test		20.52	3.780
Demonstration	Pre-test	70	3.89	2.356
Method	Post-test		16.21	3.763
Conventional	Pre-test	57	4.75	2.960
Method	Post-test		15.46	4.310

Table 1 shows the mean scores and standard deviation of the students in the experimental and control group. It could be seen that the mean scores of students taught with STAD co-operative was 4.78 and 20.52 in pre-test and post-test respectively and standard deviation of 2.82 and 3.78 in the achievement test. The students who were taught using demonstration method had mean score of 3.89 and 16.21 in the pre-test and post-test with standard deviation of 2.36 and 3.76 respectively.

For students who were taught using conventional method, it was observed that they had mean scores of 4.75 and 15.46 respectively and standard deviation of 2.96 and 4.31 in the pre and post-test. From this result, students taught with STAD co-operative had a better achievement than those taught with demonstration method and conventional than those taught with conventional method.

Hypothesis 1:

There is no significant difference between the mean achievement scores of students taught using STAD co-operative learning method, those taught using demonstration and those taught using the conventional method.

Table 2: One-way ANCOVA results on students' achievement in BASAT

Source	Type III sum of squares	DF	Mean square	F	Sig	Remark
Corrected model	1688.951[a]	3	562.984	48.608	0.000	S
Intercept	10040.461	1	10040.461	866.89	0.000	S
Group	836.696	2	417.348	38.034	0.000	S
Pretest	754.065	1	754.065	65.106	0.000	S
Error	2165.845	187	11.582			
Total	61877.000	191				
Corrected Total	3845.796	190				

S=Significant at P < 0.05

Table 2 shows the summary of the one way ANCOVA result on student's achievement scores in BASAT. The result revealed that the noted differences among the mean achievement scores of the three groups are significant at 0.05 alpha levels. This is for the fact that $F_{(2,187)=}$ 38.03 and P=0.000 <a=0.05. The null hypothesis was therefore rejected indicating that there is significant difference in the mean achievement scores of students taught using STAD cooperative, demonstration and conventional methods.
For students who were taught using conventional method, it was observed that they had mean scores of 4.75 and 15.46 respectively and standard deviation of 2.96 and 4.31 in the pre and posttest. From this result, students taught with STAD cooperative had a better achievement than those taught with demonstration method and conventional method, while students taught using demonstration method had better achievement than those taught with conventional method.

Research Question 2:

What is difference in mean achievement of scores between students taught using STAD cooperative learning method and those taught using demonstration method?

Table 3: mean scores and standard deviation of students in BASAT for experimental groups.

Teaching Method	Types of Test	No. of student	Mean	Standard Deviation
STAD cooperative learning	Pretest	64	4.78	2.84
	Posttest	64	20.52	3.78
Demonstration method	Pretest	70	3.89	2.36
	Posttest	70	16.21	3.77

Table 3 shows the mean scores and standard deviation of students in BASAT and the demonstration method. Students taught using the STAD cooperative method had mean pretest score of 4.78 and a mean posttest of 20.52 with standard deviation of 2.84 and 3.78 in the pre and posttest respectively. The student taught using demonstration method had a mean pretest score of 3.89 and a mean posttest score of 16.21, with a standard deviation of 2.36 and 3.77 for the pretest and posttest respectively. From this result, students taught using STAD cooperative method had better achievement than those taught using demonstration method.

Hypothesis 2:

There is no significant difference between the mean achievement scores of students taught by STAD cooperative learning method and the students taught by demonstration method.

Table 4: **ANCOVA results on BASAT for STAD cooperative learning and demonstration method.**

Sources	Type III Sum of square	DF	Mean square	F	Sig	Remark
Corrected model	880.601[a]	2	440.301	35.655	0.000	S
Intercept	8973.398	1	8973.398	726.64	0.000	S
method	472.462	1	472.462	38.259	0.000	S
Pretest	262.043	1	262.043	21.220	0.000	S
Error	1617.727	131	12.349			
Total	47220.000	134				
Corrected total	2498.328	133				

S=significant at P< 0.05

Table 4 shows the ANCOVA result on BASAT STAD cooperative learning method and demonstration method. The result reveals that the noted difference between the STAD cooperative method and the demonstration method is significant at alpha level this is because $F_{(1,131)} = 38.259$ and $P = 0.000 < a = 0.05$. The null hypothesis is therefore rejected indicating that there is a significant difference in the mean achievement scores of students taught using STAD cooperative learning method and the student taught using the demonstration method.

Research questions 3:

What is difference in the mean achievement scores between male and female students taught using STAD cooperative learning method.

Table 5: The mean scores and standard deviation in BASAT of male and female students in STAD cooperative learning method.

Gender	Type of test	No. of students	Mean	Standard Deviation
Male	Pretest	36	4.69	2.71
Posttest	36	20.92	3.91	
Female	Pretest	28	4.89	3.04
	Posttest	28	20.00	3.61

Table 5 shows the mean score and standard deviation in BASAT if the male and female students taught using STAD cooperative learning method. The table reveals that the male students had a mean score of 4.69 and 20.92

and standard deviation of 2.71 and 3.91 in the pretest and posttest respectively while the female students had a mean score of 4.89 and 20.00 and standard deviation of 3.04 and 3.61 in the pretest and posttest respectively. From the result, it shows that male students achieved better than female students when taught using the STAD cooperative learning method.

Hypothesis 3:

There is no significant difference between the mean scores of male and female students taught using STAD cooperative learning method.

Table 6: ANCOVA results of male and female students in BASAT for STAD cooperative learning method.

Source	Type III sum of squares	DF	Mean square	F	Sig	Remark
Corrected model	69.699[a]	2	34.850	2.560	0.086	NS
Intercept method	5805.070	1	5805.070	426.49	0.00	S
Gender	15.198	1	15.198	1.117	0.295	NS
Pretest	56.465	1	56.465	4.148	0.46	NS
Error	830.285	61	13.611			
Total	27837.00	64				
Corrected total	899.984	63				

S= significant at P < 0.05.

Table 6 shows the ANCOVA results of male and female students in BASAT for STAD cooperative learning method. The results reveals that the noted difference between the male and female students is not significant at 0.05 alpha level, this is from the fact that $F_{(1,61)}$=15.198 and P=0.295>a=0.05. The null hypothesis was therefore accepted indicating that there is no significant difference in the mean achievement scores of male and female students taught using STAD cooperative learning method.

Research question 4:

What is the difference in the mean achievement scores between male and female students taught with demonstration method?

Table 7: The mean score and standard deviation in BASAT of male and female students in Demonstration method.

Gender	Type of test	No. of student	Mean	Standard Deviation
Male	Pretest	38	4.13	2.52
	Posttest	38	16.29	3.74
Female	Pretest	32	3.59	2.15
	Posttest	32	16.12	3.86

Table 7 shows the man scores and standard deviation in BASAT of male and female students taught using demonstration method. This table reveals that the male students had an achievement mean score of 4.13 and 16.29 in the pretest and posttest while the female had a mean 3.59 and 16.12. The male had a standard deviation of 2.52 and 3.74 in the pretest and posttest while that of the female is 2.15 and 3.86 respectively. From the result the male students taught using demonstration method achieved ore than the female students.

Hypothesis 4:

There is no significant difference between the mean scores of male and female students taught using demonstration method.

Table 8: ANCOVA result on male and female student BASAT for demonstration method.

Sources	Types III sum of squares	DF	Mean square	F	Sig	Remark
Corrected model	232.694[a]	2	116.347	10.124	0.000	S
Intercept model	3160.397	1	3160.397	275.014	0.000	S
Gender	4.644	1	4.644	0.404	0.527	S
Pre-test	232.524	1	232.534	20.534	0.000	NS
Error	769.949	67	11.492			
Total	19083.000	70				
Corrected total	1002.6	43				

S= significant at P<0.05

Table 8 shows the ANCOVA results of the male and female students BASAT for demonstration method. The results reveal that the noted difference between the male and female students is not significant at 0.05 alpha levels. This is from the fact that $F_{(1,67)}$ =0.404 and P=0.527 > a 0.05. The null hypothesis was therefore accepted indicating that there is no significant difference in the mean achievement scores of male and female students taught using demonstration method.

Research question 5:

What is the difference in the mean achievement scores of high ability students taught with STAD cooperative learning method and those taught with demonstration method?

Table 9: The mean scores and the standard deviation of high ability students in the STAD cooperative learning method and demonstration method.

Method	Types of test	No. of students	Mean	Standard Deviation
STAD cooperative	Pre-test	24	7.33	2.35
	Post-test	24	22.17	4.33
Demonstration	Pre-test	19	6.84	2.36
	Post-test	19	19.00	2.34

Table 9 shows the mean scores and the standard deviation of high ability students in the STAD cooperative learning method and the demonstration method. The table reveals that the mean achievement score of high ability students taught using STAD cooperative method is 7.33 and 22.17 in the pretest and the post test respectively with the standard deviation of 2.35 and 4.33 respectively in the pre-test and post test. For students taught with the demonstration method a mean score of 6.84 and 19.00 was observed in the pretest and posttest with a standard deviation of 2.36 and 2.34 in the pre-test and the post-test respectively. From the result, high ability students achieved better when taught using the STAD cooperative learning method.

Hypothesis 5:

There is no significant difference between the mean achievement scores of high ability students taught using STAD cooperative learning method and those taught using demonstrative method.

Table 10: ANCOVA result of high ability students in the STAD cooperative learning method and demonstration method.

Method	Type III sum of square	DF	Mean square	F	Sig	Remark
Corrected model	106.671[a]	2	53.335	3.710	0.033	S
Intercept	1690.887	1	1690.887	117.626	0.000	S
Method	103.923	1	103.923	7.229	0.010	S
Pre-test	0.330	1	0.330	0.023	0.880	NS
Error	575.004	40	14.375			
Total	19227.000	43				
Corrected total	681.674	42				

S= significant at P < 0.05

Table 10 shows the ANCOVA result of high ability students in STAD in cooperative learning and demonstration method. The table reveals that the noted difference between the high ability students taught with STAD cooperative learning method and demonstration method is significant at 0.05 alpha levels. This is from the fact that $F_{(1,40)} = 7.223$ and $P = 0.010 < a = 0.05$. The null hypothesis was therefore rejected indicating that there is significant difference in the mean achievement scores of high ability students taught suing STAD cooperative learning method and those taught using demonstration method.

Research question 6:

What difference is there in the mean achievement scores between low ability students taught with STAD cooperative learning method and those taught with demonstration method?

Table 11: The mean score and the standard deviation of low ability students in the STAD cooperative learning method and demonstrative method.

Method	Type of test	No. of students	Mean	Standard Deviation
STAD cooperative	Pre-test	28	2.17	1.740
	Post-test	28	19.39	3.047
Demonstration	pre-test	30	2.33	0.994
	Post-test	30	13.37	2.512

Table 11 shows the mean score and the standard deviation of low ability students in STAD cooperative learning method and the demonstration method. Fromm the table, it can be seen that the mean scores of low ability student taught with STAD cooperative method was 2.71 and 19.39 in the pre-test and post-test respectively and standard deviation of 1.740 and 3.047 in the achievement test. The students who were taught with demonstration method had mean score of 2.33 and 13.37 in the pre-test and post-test with standard deviation of 0.994 and 2.512 respectively. From the result, low ability students achieved better when taught using STAD cooperative learning method than the demonstration method.

Hypothesis 6:

There is no significant difference between the mean achievement scores of low ability taught using STAD cooperative learning method and those taught using the demonstration method.

Table 12: ANCOVA result of low ability student in STAD cooperative learning and demonstrating method .

Source	Type III sum	DF	Mean square	F	Sig	Remark
Corrected model	547.230[a]	2	273.615	36.495	0.000	S
Intercept	3110.874	1	3110.874	414.92	0.000	S
Method	487.854	1	487.854	65.070	0.000	S
Pre-test	21.289	1	21.289	2.840	0.098	NS
Error	412.356	55	7.487			
Total	16324.000	58				
Corrected total	959.586	57				

S= significant at P < 0.05

Table 12 shows the ANCOVA result of low ability student in STAD cooperative learning and demonstrating method. The result revealed that the noted difference of the mean achievement scores for low ability students between the STAD cooperative learning and demonstrative method is significant at 0.05 alpha levels. This is from the fact $F_{(1,55)} = 65.07$ and $P = 0.000 < a = 0.05$. The null hypothesis was therefore rejected indicating that there is significant difference in the mean achievement scores of low ability students taught using the STAD cooperative learning method and those taught using demonstration method.

Summary of Major Findings

Based on the data analyzed a summary of the major findings of these research are

1. There is significance difference between the mean achievement scores of students taught by STAD cooperative learning, conventional and demonstration methods.
2. There is significant difference between the mean achievement scores of students taught with STAD cooperative learning method and he students taught with demonstration method.
3. There is no significant difference between mean achievement scores of male and female students taught using STAD co-operative learning method.
4. There is no significant difference between the mean achievement scores of high ability students taught using the STAD cooperative learning method and those taught using demonstration method.

Discussion

The findings of this study revealed that STAD cooperative learning method has significant effect on students' achievement in Basic science. Table 1 shows that the experimental groups had high mean achievement post test scores of 20.52 and 16.21 for STAD co-operative method and demonstration method respectively while the control had a mean post test achievement score of 15.46. this implies that though students would achieve more when demonstration method is used in teaching Basic science better than lecture, STAD Cooperative Learning is a better teaching method with a mean of 20.52 than the DM with a mean of 16.21, these are in agreement with the findings of Chianson, Kurumeh & Obida (2011), Samuel and Sambo (2019) and Hudu, Yohanna & Msheliza (2020) they found that students achieved better when taught Basic science using the co-operative learning method it is also in agreement with the findings of Gambari & Olumorin (2012) who found that learning in computer supported co-

operative learning enhanced students performance in physics. The findings of this research further revealed that teaching methods have effect on gender. From table 3 the male in STAD cooperative learning method had a mean achievement score of 16.29 while the female students had a mean achievement score of 16.12. this is in agreement with the findings Daluba & Romanus (2012), Daluba (2013) and Sambo (2015) who found that learning in basic science supported co-operative learning enhanced students performance in physics also. The findings of this research further revealed that teaching methods have effect on gender. From table 3 the male in STAD cooperative learning method had a mean achievement score of 16.29 while the female students in demonstration method had a mean achievement score of 16.29 while the female students had a mean achievement score of 16.12. This is in agreement with the findings of Daluba & Romanus (2012), Daluba. (2013) and Samuel and Sambo (2019).

Results on ability levels indicated that both high and low – ability students in STAD CL obtained better post test means scores of 22.17 and 19.39 respectively as compared to the post test mean scores of 19.00 and 13.37 for high and low abilities in demonstration method. This results implies that STAD cooperative learning brought about better achievement in Basic science concept taught than demonstration method. This results confirms the findings of Gambari & Olumorin (2013) and Sambo (2017 & 2018) who found that there is no significant difference between the high and medium achievement level, and between students of medium and low achievement levels who toughs social studies. However, this finding contradicts the findings of Fagbola (2000), Aluko (2004), Gambari & Olumorin (2012) and Sambo (2017), who found that high level achievers in cooperative learning out performed medium and low achievers respectively.

Conclusion

Based on the findings of this study, it was concluded that Student taught with STAD cooperative learning method achieve better than those demonstration method achieved better than those taught using the conventional method. Therefore STAD is a better method of teaching Basic science demonstration and conventional method. Male students achieve better than female students when taught using STAD cooperative learning method. Male students achieve better than females students when taught using demonstration method. STAD cooperative learning method is a better method for teaching high ability students than the demonstration method. Low ability students achieve better when taught using the STAD cooperative learning method than the demonstration method.

Recommendation

Based on the findings of this study, the following recommendations were preferred:

1. Teachers should adopt the use of STAD CL, as it fosters student's achievement. STAD CL is effective for male and female students and for high and low ability
2. Authors of Basic science text books should write their text to be child centered and based on STAD CL method.
3. Curriculum planners should include the STAD CL method when planning Basic science curriculum.
4. At the pre-service level, the use and implementation of cooperative teaching strategies in the classrooms should be emphasized in the methodology course being offered by the student – teachers; and
5. At the in-service level, seminars and workshops should be organized by ministry officials, zonal educational authority, and local educational authority in order to educate practicing teachers on how to implement STAD cooperative teaching method in schools at all levels.

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