Impact of Learning-Together-Model of Cooperative Learning on Performance and Retention of Upper Basic Science Students in Kabba Metropolis

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Abstract

This study examined the impact of Learning-Together-Model of cooperative learning on performance and retention of upper basic science students in Kabba Metropolis, Kogi State. The study was guided by two objectives, two research questions and two research hypotheses. The study adopted quasi-experimental involving pre-test, post-test and post posttest control group design. The students in the experimental group were exposed to Learning-Together-Model of cooperative learning while students in the control group were exposed to conventional teaching method. A total of 1450 JSS II students constituted the target population out of which 134 students were randomly selected as sample for the study. The instrument used for data collection was Basic Science Performance Test (BSPT). The instrument was duly validated and the reliability coefficient was found to be 0.84. The research questions were answered using descriptive statistics while the hypotheses were tested at $p \leq 0.05$ level of significance using independent t-test. The findings of the study showed that students in the experimental group who were exposed to Learning-Together-Model of cooperative learning performed significantly better than those in the control group who were exposed to conventional teaching method. Based on the findings of the study, it was recommended among others that Basic Science teachers in Junior secondary schools should adopt Learning-Together-Model of cooperative learning in teaching Basic Science.

Keywords: Learning-Together-Model; Cooperative Learning, Basic Science, Performance, Retention

Introduction

The teaching and learning of Basic Science at junior secondary school level have been challenging to both teachers and students. The major challenges that basic science teachers face include lack of resources for science lesson preparation, lack of creative and innovative teaching strategies, and lack of confidence to teach the subject outside of the teachers' expertise. Because of the teaching strategies employed by the teachers of basic science, students are not allowed to be creative, explore and think critically. Daodu (2021) opines that memorizing facts, procedures and teacher-centered approach in teaching Basic Science have made science to appear abstract and a difficult subject for most students. The aims of teaching Basic Science, according to National Policy of Education are to: "instill the culture for all to acquire scientific literacy to develop and make decisions of life through curiosity and use concept, investigative principles to carry out research to solve every day's life (FRN, 2013). In achieving scientific culture, students should be trained to develop scientific and technological literacy that portray science as a process of finding solutions to problems. However, Basic Education Certificate Examination Chief examiner (BECE, 2021) reported that students lack the

scientific skills of answering questions involving comprehension, application, analysis, synthesis and evaluation. This is evidential in the low performance of Basic Science students in Basic Education Certificate Examination (BECE, 2021). Balarabe (2016) opined that students' low performance is due to wide coverage of the syllabus, poor attitude towards basic science, the abstract nature of science concepts, inappropriate teaching method adopted by basic science teachers. Researchers like Bolarin (2011), Abiodun (2021) and Daodu (2021) were concerned with poor understanding and low performance of students in Basic Science. The researchers suggested new and innovative strategies to teaching and learning of Basic Science and also advocated for the use of inquiry-based science teaching, in that students learn better when they are placed at the center of teaching, construct their knowledge collaboratively with peers and the teacher serves as a facilitator. Abiodun, Daodu and Ebiejete (2022) added that inquiry-based science teaching allows students' active participation in the classroom and students are allowed to construct their own knowledge which enhances meaningful learning to bring about better performance and retention. A lot of attention has been given to the use of instructional strategies to enhance students' academic performance, interest, attitude, motivation, self-efficacy, and perception in basic science and other science subjects. But the area of using learning-together-model of cooperative learning to enhance students' performance and retention in basic science is lacking. Hence, learning-together-model of cooperative learning.

Learning-together-model of cooperative learning was developed in 1987 at the University of Minnesota by David W. Johnson and Roger T. Johnson. It involves students working together in a group of four to five heterogeneous groups sharing of the opinion on a given material (Ahmed & Lawal, 2020). Ahmed and Lawal (2020) added that Learning-together-model of cooperative learning promotes team-building activities and allows students to work in groups and discuss how well they are getting along. It promotes quality values such as honesty, cooperation, mutual respect, responsibility, tolerance, and willingness to sacrifice a consensus by encouraging students to interact and communicate with teammates in harmony. According to Dajal, Ogar and Sunday (2019) learning-together-model of cooperative learning allow students active participation in the learning process and enables the students to be in charge of their own learning and leads to an improvement in students' performance and retention.

Learning-Together-Model of cooperative learning according to Johnson and Johnson (2011) organizes instruction based on the principles of positive interdependence, promotive face-to-face interaction, individual accountability, social and collaborative skills, and group processing. Specifically, positive interdependence implies that students' success is linked to the success of their team members and can be structured through mutual goals, joint rewards, shared resources, complementary roles, and a shared team identity. Individual accountability implies that the academic performance of each member is evaluated and outcomes are communicated to the team and the individual so that team members do not get a free ride on the efforts of their teammates. Slavin (2015) opines that team members still assist, share, encourage, and support one another's efforts to succeed through promotive interaction within the groups. more so, they also use and develop their interpersonal and small-group skills such as leadership, decision making, trust building, and conflict resolution. Finally, team members engage in group processing to assess how well the team is performing and how its effectiveness can be improved. Esiobu (2011) and Slavin (2015) noted that learning-together-model of cooperative learning had lots of benefits with respect to academic performance in many subjects, language procurement, sharing of power and authority among peers, social unity and acceptance of diversities, gender equity and decline in absenteeism.

A number of studies like Gokkurt, Dundar, Soylu and Akgun (2012) examined the effects of learning-together-model of cooperative learning on students' performance in Mathematics. The authors found that learning-together-model promoted better performance compared to exposed to conventional method. It was concluded that learning together model brought about a significant interaction between students of the same group. Elis (2018) investigated the impact of learning-together method-based lesson study affects students' self-awareness. Based on the research result, it is found that students' self-awareness is high during the teaching and learning process throughout learning together method-based lesson study so students enjoyed the teaching and learning process and they are easy to understand the material given. Hobri, Dafik and Anowar, (2018) examined the effects of Learning-Together-Model of group learning on students' mathematics achievement and attitudes toward mathematics. Findings from the study indicated that Learning-Together-Model had significant effects on students' mathematics achievement and attitudes toward

mathematics. Students in the experimental group showed significant improvement in their mathematics achievement and attitudes toward mathematics. In a study conducted by Dajal, Ogar and Sunday (2019) investigated the effect of learning together strategy on secondary school students' achievement. The study revealed that; students exposed to learning together model of cooperative learning achieved higher than those exposed to conventional method. Ahmed and Lawal (2020) examined the effects of learning together strategy on students' academic achievement in photosynthesis and students' gender. The findings of the study revealed that learning together form of cooperative learning strategy enhanced better performance of students in Biology than the students taught using conventional method of teaching. The study concluded that learning together form of cooperative learning strategy enhanced students' performance and retention.

Retention is the ability to hold and consequently remember things experienced or learned by an individual at a later time. Bichi (2012) defines retention as the processes of relegation of the past experience in the sub-conscious mind of the individual in the form of mental experience. According to Okeke (2015), retention can be defined as an ability to recall or reorganize what has been learned or experienced. It means the ability to retain facts and figures in memory. When a learner is able to remember and manifest whatever he/she has earlier learned by making the same level or almost the level of achievement after a period of time, it entails retention. It takes place when learning is coded in memory. Bouman (2012) opines that the ability to remember takes place more effectively when experiences are passed across the learners via an appropriate instructional method. Obeka (2010), identified factors that affect retention. These factors include the content or tasks to be performed, learners past experiences, the interval between lesson and evaluation and instructional strategies employed. Dajal, Ogar and Sunday (2019) found that learning-together-model of cooperative learning enhanced students' performance and retention. Based on the above backdrop, therefore, this study investigated the impact of learning-together-model of cooperative learning on performance and retention of upper basic science students in Kabba Metropolis.

Purpose of the Study

The purpose of the study is to examine the impact of learning-together-model of cooperative learning on performance and retention of upper basic science students in Kabba Metropolis. Specifically, the objectives of the study were to:

i. examine the impact of learning-together-model of cooperative learning on students' performance in basic science.
ii. determine the impact of learning-together-model of cooperative learning on students' retention ability in basic science.

Research Questions

The study was guided by the following research questions:

i. What is the difference between the mean performance scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method?
ii. What is the difference between the retention ability scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method?

Research Hypotheses

The following research hypotheses were formulated and tested at $p \leq 0.05$ level of significance:

$H0_1$: There is no significant difference between the mean performance scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method.

$H0_2$: There is no significant difference between the retention ability scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method.

Methodology

The study adopted quasi-experimental involving pretest, posttest and post posttest control group design. The population of the study comprised all public junior secondary schools II (JSS II) students in Kabba Metropolis, Kogi State. A total of 1450 JSS II students constituted the target population out of which 134 students were randomly selected as sample for the study using simple random sampling technique, 66 for the experimental group and 68 for the control

group. The study comprised of two groups, experimental group (EG) and control group (CG). Both groups were pretested on Performance before the administration of treatment. The experimental group was taught Basic Science using Learning-Together-Model of cooperative learning, while the control group was taught Basic Science using conventional teaching method. Each of the groups, experimental and control were taught for six weeks. At the end of six weeks, a posttest on the performance was administered to the subjects of both groups to determine their performance. After a period of two weeks, a post-post-test was administered to the subjects of both groups to determine their retention ability level. The instrument used for data collection was Basic Science Performance Test (BSPT). The instrument was duly validated and the reliability coefficient of the instrument was found to be 0.84. The data obtained from the administration of the instrument were collated and subjected to data analysis using SPSS statistical package version 23. The research questions were answered using descriptive statistics of mean and standard deviation, while the research hypotheses were tested using independent t-test at $p \leq 0.05$ level of significance.

Results

Research Question One: What is the difference between the mean performance scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method?

To answer research question one, data generated from the post-test scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method on Basic Science Performance Test (BSPT) were subjected to descriptive statistic of mean and standard deviation. Summary of the analysis is presented in Table 1

Table 1: Summary of Mean and Standard Deviation of Posttest Mean Performance Scores of Students in Experimental and Control Groups

Groups	N	Mean	Standard Deviation	Standard Error	Mean Diff.
Experimental	66	43.23	3.81	0.65	
					14.36
Control	68	28.87	5.98	0.97	

Table 1 shows that the students exposed to learning-together-model of cooperative learning (experimental group) and those exposed to conventional teaching method (control group) recorded the mean performance scores of 43.23 and 28.87 respectively, with a mean difference of 14.36 in favour of experimental group. The mean score of students exposed to learning-together-model of cooperative learning (experimental group) is higher than the mean score of students exposed to conventional teaching method (control group). This means that learning-together-model of cooperative learning enhanced students' performance in Basic Science. Therefore, the higher mean score recorded by experimental group is due to students having access to group discussion with their teammates which increases their curiosity to learn and bring about face to face interaction that helps to facilitates mutual success among the group members. To ascertain if the difference in the mean performance scores between the students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method is statistically significant, the corresponding research hypothesis was subjected to t-test statistical tool.

Hypothesis One: There is no significant difference between the mean performance scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method.

In order to test research hypothesis one, data collected from the responses of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method on Basic Science Performance Test (BSPT) were subjected to t-test statistic. Summary of the analysis is presented in Table 2.

Table 2: Summary of t -test Analysis of Mean Performance Scores of Students in Experimental and Control Groups

Group	N	Mean	Std. Deviation	Df	t-Cal	p-value	Remark
Experimental	66	43.23	3.81				
				132	10.83	0.01	Significant
Control	68	28.87	5.98				

Significant at p= 0.05 level

Table 2 reveals the summary of t-test analysis of students exposed to learning-together-model of cooperative learning (experimental group) and those exposed to conventional teaching method (control group). From the results obtained in Table 2, it was observed that t-value of 10.83 was obtained and p-value of 0.01 was observed at 132 degrees of freedom. The p-value of 0.01 is less than 0.05 level of significance. This implies that there is a significant difference between the performance of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method. The significant difference is in favour of experimental group. Therefore, the research hypothesis which states that there is no significant difference between the mean performance scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method is hereby rejected. This means that, learning-together-model of cooperative learning significantly enhanced the performance of students in Basic science.

Research Question Two: What is the difference between the retention ability of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method? In order to answer research question two, data obtained from the post posttest scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method on Basic Science Performance Test (BSPT) were subjected to descriptive statistic of mean and standard deviation. Summary of the analysis is presented in Table 3

Table 3: Summary of Mean and Standard Deviation of Rete ntion Ability Scores of Students in Experimental and Control Groups

Groups	N	Mean	Standard Deviation	Standard Error	Mean Diff.
Experimental	66	49.86	3.13	0.53	
					17.81
Control	68	32.05	4.89	0.79	

Table 3 reveals that students exposed to learning-together-model of cooperative learning (experimental group) and conventional teaching method (control group) recorded the mean retention scores of 49.86 and 32.05 respectively, with a mean difference of 17.81 in favour of experimental group. The mean retention score of students exposed to learning-together-model of cooperative learning (experimental group) is higher than the mean retention score of students exposed to conventional teaching method (control group). This means that learning-together-model of cooperative learning improved students' retention ability in Basic Science. Therefore, the higher retention score recorded by experimental group is due to the treatment administered. To ascertain if the difference in the retention scores between experimental and control groups is statistically significant; the corresponding research hypothesis was subjected to t-test statistical tool.

Hypothesis Two: There is no significant difference between the retention ability of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method. In order to test research hypothesis two, data obtained from the post posttest scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method on Basic Science Performance Test (BSPT) were subjected to independent t-test statistic. Summary of the analysis is presented in Table 4

Table 4: Summary of t -test Analysis of Retention Ability Scores of Students in Experimental and Control Groups

Group	N	Mean	Std. Deviation	Df	t-Cal	p-value	Remark
Experimental	66	49.86	3.13				
				132	14.24	0.01	Significant
Control	68	32.05	4.89				

Significant at p= 0.05 level

Table 4 reveals the summary of t-test analysis of retention ability scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method. From the results obtained in Table 4, it was observed that t-value of 14.24 was obtained and p-value of 0.01 was observed at 132 degrees of freedom. The p-value of 0.01 is less than 0.05 level of significance. This implies that there is a significant difference between the retention ability of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method. The significant difference is in favour of experimental group exposed to learning-together-model of cooperative learning. Therefore, the research hypothesis which states that there is no significant difference between the retention ability scores of students exposed to learning-together-model of cooperative learning and those exposed to conventional teaching method is hereby rejected. This means that, learning-together-model of cooperative learning significantly improved the retention ability of students in Basic science.

Discussion of Findings

The result from research question one and hypothesis one as shown in Tables 1 and 2, revealed that experimental group who was exposed to Learning-Together-Model of cooperative learning performed significantly better in Basic Science than in the control group who was exposed to conventional teaching method. The significant difference is in favour of students in experimental group. This could be as a result of students having access to group discussion with their teammates which increases their curiosity to learn and bring about face to face interaction that helps to facilitates mutual success among the group members. This finding is in line with that of Gokkurt, Dundar, Soylu and Akgun (2012), Elis (2018), Hobri, Dafik and Anowar, (2018), Ahmed and Lawal (2020) who reported that Learning-Together-Model of cooperative learning has positive effect on students' performance. The finding is also in line with that of Ahmed and Lawal (2020) who found that Learning-Together-Model of cooperative learning promotes students understanding of the concept, critical thinking skills and problem-solving skills.

The result from research question 2 and hypothesis 2 as shown in Tables 3 and 4, showed that there was a significant difference between the retention ability of students exposed to Learning-Together-Model of cooperative learning and those exposed to conventional teaching method. The significant difference is in favour of students exposed to Learning-Together-Model of cooperative learning. This implies that the use of Learning-Together-Model of cooperative learning improved students' retention ability in Basic Science. This finding is in agreement with that of Dajal, Ogar and Sunday (2019) who reported that Learning-Together-Model of cooperative learning allows active participation of students in the learning process which makes it possible for the students to have control over their learning and equally leads to improvement in students' performance and retention.

Conclusion

Based on the findings of this study, it was concluded that students in the experimental group performed significantly better as a result of the treatment with Learning-Together-Model of cooperative learning. This is an indication that learning-together-model of cooperative learning is effective in enhancing students' performance in Basic Science. Also, Learning-Together-Model of cooperative learning promoted high level of students' performance and knowledge retention in Basic Science than Conventional teaching method.

Recommendations

Based on the findings of the study, the following recommendations was made:

i. Training, seminars, workshops and conferences should be organized for secondary school teachers on the implementation of learning-together-model of cooperative learning so as to improve students' performance and retention in Basic Science and other field of sciences such as Biology Chemistry and Physics.

ii. Basic Science teachers should be encouraged to use Learning-Together-Model of cooperative learning that allow students to actively construct their own learning along with actively participating in class.

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