Afropolitan Journals

ISSN: 2780-5981X www.afropolitanjournals.com

Effect of Collaborative Learning Strategy on Students' Attitude and Achievement in Energy in Nasarawa State, Nigeria

Aku Philip Eggon PhD, Hussaini Pwatiye Simon and Gabi Samson Suleiman

Department of Science, Technology and Mathematics Education Faculty of Education, Nasarawa State University Keffi, Nigeria.

Corresponding author: akuphilip123456@gmail.com

Abstract

The study investigated the effects of collaborative learning strategy on students' attitude and achievement in energy in Nasarawa state, Nigeria. The population of the study consisted of 31,731 Junior Secondary School Students in Nasarawa State Nigeria. The sample comprised two intact classes with 138 JSII Students. The design used was a quasi- experimental pre-test, post-test post post-test non- equivalent control design. Two research questions were raised in relation with two objectives of the study and two correspondent hypotheses. A multistage random sampling technique was used for the study. The instruments used were: Energy Achievement Test (EAT) and Energy Attitude Scale (EAS). The validity indexes were 0.83 EAT and 0.89 EAS respectively. The reliability co-efficient of the instruments was determined using Kuder- Richardson K_R21 formula for EAT and Cronbach Alpha. Their reliability indexes were 0.81 for EAT and 0.79 for EAS. Description statistics of mean and standard deviation were used to answer the research questions, while inferential statistics of ANCOVA was used to test the hypothesis at 0.05 level of significant. The findings revealed that students who were taught Energy using collaborative learning strategy performed better than those taught using conventional method. ($F= 100.938$; $p = 0.000 < \alpha = 0.05$) for attitude and $F=13.453$; $P= 0.000 < \alpha = 0.05$ for achievement. The study therefore concludes that teaching students of Basic Science using collaborative strategy improved their attitude, academic achievement of knowledge in Energy. Based on this finding, it is recommended among others that Basic science teachers should be encouraged to develop and adopt the use of collaborative learning strategy in teaching Energy at the junior secondary school. Government should endeavour to organize regular workshops to train teachers on the development and use of this strategy at JSII level.

Keywords: Collaborative, learning, strategy, attitude, achievement.

Introduction

In this twenty first century, the general objective of the Basic Science education is to enable students observe and explore the environment using their senses and their hands. The objective specifically aims at enabling the learners to develop interest in science and technology, to acquire basic knowledge and skills in science and technology, apply their scientific and technological knowledge and skills to meet their societal needs, take advantage of the numerous career opportunities offered by science and technology and become prepared for further studies in science and technology (NERDC, 2012).

The main purpose of teaching is transmission of knowledge to the learners. For effective teaching and learning to take place, the teacher needs to use different methods and techniques in teaching. Unfortunately, this has not been so. Therefore, poor achievement in Basic Science has been attributed to poor approach to teaching strategies employed by teachers (Samuel, 2017; Alabi, 2014;

Osokoya, 2013). The present Nigerian Basic Science classroom does not provide hand-on-mind-on challenging, interactive and collaborative environment needed by new generation of students. The problem of students' underachievement can be solved using student-centered learning approaches. Collaboration as a classroom strategy is essential to becoming a successful learner. It is primarily through dialogue and examining different perspectives that students become knowledgeable. Collaborative classrooms seem to have four general characteristics. The first two capture changing relationships between teachers and students. The third characterizes teachers' new approaches to instruction. The fourth addresses the composition of a collaborative classroom. According to Siddiqui (2015), interaction between students and teachers is an essential part of teaching and learning process. Interaction promotes involvement and enhances learning and motivates the students. Interaction promotes a shift from teacher centered to a student-centered environment while maintaining a teacher led activity (David, 2013). Interaction strategy is therefore those techniques or tactics, or approaches to communication, collaboration, support, and feedback that are used to support teaching and learning.

There are many different forms of energy, including: Heat energy, Light energy, Motion energy, Electrical energy, Chemical and Gravitational energy. These forms of energy can be grouped into two: Potential or stored energy and Kinetic or working energy. Andrew, (2018) defined energy as the capacity of a physical system to perform work. Modern civilization is possible because people have learned how to change energy from one form to another and then use it to do work. Energy is an abstract concept treated in junior secondary school. Walker et al, (2014) asserted that "Energy is a number that we associate with a system of one or more objects. Energy can be transformed from one type to another and transferred from one object to another, but the total amount is always the same (energy is conserved). No exception to this principle of energy conservation has ever been found."

Conventional/lecture method as the name implies is a monologue teacher-oriented instructional practice. This method was used for the control group to cover the study, motivating students to learn on their own, and teaching them on note-taking skills and study from rotes. It is effective for providing information or development step-by step ki1ls, introducing of new subject matter, providing an overview of subject matter and stimulating interest in it, summarizing ideas, showing relationship between theory and practice, re-emphasizing main points (Gibbs, 2011).

Academic achievement refers to the extent to which a student teacher or institution has achieved the educational goal. The meaning of academic achievement can be appreciated in how well one does in school and how students in particular deal with their studies. It is however important to note that all students are required to maintain a satisfactory academic record and meet the obligations of the courses for which they enroll. Consequent upon the observed deterioration in the academic achievement of secondary school students in public secondary schools, one wonders if the high failure rates and the poor quality of the students are not a reflection of the consequences of their unhealthy and discouraging disposition toward academics. In other words, the widely acclaimed deteriorated standard of education in Nigeria, to a large extent, depends on factors resident in learning strategy (Gibbs, 2011).

Attitude is defined as feelings that can be unfavorable or favorable, positive or negative, and are typically directed towards some specific object (Stiggins, 2016). Attitude implies a psychological construct which is inferred from responses to a given stimuli (Ayodele & Olatunbosun, 2015). There are six dimensions regarding attitudes: confidence, anxiety, value, enjoyment, motivation and expectations (Martha & George, 2014). Students' attitude towards science varies among students

depending on several factors. First, factors that is associated with the teacher, such as teaching methods, classroom management, and teachers' content knowledge and personality; second, factors that are related to the environment, such as educational background of parents and parental expectations; third, factors that comes from students including students' achievement, anxiety, extrinsic motivation, and experiences (Nelson & Nelson 2010). When students are motivated positively to learning, their attitudes to learning also change positively.

Globally, there have been debates on students' achievement in science with respect to gender, which has continued to be of interest (Akani, 2017). Alabi (2014) observed that male students achieve better in science than their female counterparts. Cases where female students dominate their male counterparts in terms of achievement in science are rare. Many factors responsible for the dominance of male students in science are; gender imbalance, task difficulty, cognitive competence, perceived negative attitude toward female students by their teachers amongst others (Udo, 2010). Poor approach to teaching invariably translates to students' inability to put into practice what they have learnt. In most cases, what is taught in the classroom cannot be transferred to real life situations by the students. The under-achievement in Basic Science among JS 2 students raises doubt on the efficacy of the learning strategies utilized by Basic Science teachers which if not mitigated will jeopardize the students' placement of 60:40 in favour of the sciences at the tertiary level of learning as stipulated in the National Policy on Education. This will affect the competitiveness required to develop national capability and self-sufficiency in Science, Technology and Innovation.

Basic Science teachers still employ conventional teaching method in teaching; these methods are perceived as not encouraging, promoting and improving learners' understanding of the subject, as such students' achievement is not as desired as students are not equally interested. Basic Science concepts cannot be taught in abstract form, there is need for students to conduct themselves in small groups to exchange ideas on given concepts for better understanding and retention. Therefore, students' activity-based learning which will result in the use of mind-on; hands-on activities need to be encouraged. This study therefore was set out to find the Effect of Collaborative learning strategy on students' attitude and achievement in Energy in Nasarawa state, Nigeria.

Theoretical Framework

This study anchored Vygotsky's Social Learning Theory (1978). Which stated that "Children learn such higher functioning from interacting with the adults and other children around them". Consequently, teachers can create a learning environment that maximizes the learner's ability to interact with each other through collaboration and feedback.

Literature Review

Researchers argued about the superiority and effectiveness of collaborative teaching strategy over conventional teaching methods (Asmi, 2011). Danjuma (2015) observe that collaborative learning strategy enhanced students' interest and achievement in Basic Science as well as reduced the gender gap that existed between male and female students in Basic Science. The researcher among others recommended that Basic Science students should be encouraged to develop and adopt the use of collaborative learning strategy in learning basic science. Olatoye, Aderogba and Asmi (2011) recommended that Chemistry teachers should expose the students to co-operative method so as to encourage social interaction, active engagement and self-motivation among learners. Also, Ishaq (2015) recommended that curriculum planner's and basic science teachers should in-cooperate

collaborative teaching strategy for the teaching of Basic Science concepts among low ability students. Kolawole (2010) revealed that classroom interaction learning strategies is more effective than conventional method and that boys performed significantly better than girls in both learning methods. Bukunola and Idowu (2012) discovered that cooperative teaching strategies were found to be more effective in enhancing students' academic achievement and retention in Basic Science than the conventional-lecture.

Statement of the Problem

In Nigeria, the learning of Basic Science at the junior secondary education level over the years has been a matter of serious concern to stakeholders. The problem is largely results to students' underachievement in the subject. This situation is coupled with students' declining attitude towards the subject. One reason for this is that the instructional strategies used by teachers do not seem to adequately enhance and improve Basic Science students' attitude and achievement. Basic Science teachers still employ conventional teaching method in teaching; these methods are perceived as not encouraging in promoting and improving learners' understanding of the subject, as such, students' achievement is not as desired, students are equally not interested. Basic Science concepts cannot be taught in abstract form, there is need for students to conduct themselves in small groups to exchange ideas on given concepts for better understanding and achievement. Therefore, students' activity-based learning which will result in the use of mind-on; hands-on activities need to be encouraged. The problem of this study therefore was to find out the Effects of Collaborative Learning Strategy on Students' Attitude and Achievement in Energy in Nasarawa state, Nigeria.

Research Questions

1. What are the attitude mean scores of students taught energy using collaborative learning strategy and those taught using conventional method?
2. What are the achievement mean scores of students taught energy using collaborative strategy and those taught using conventional method?

Objectives

1. Compare the effects of the achievement mean scores of collaborative learning strategy and conventional method on students' attitude in energy.
2. Compare the effects of the achievement mean scores of students taught energy using collaborative learning strategy and conventional method.

Hypotheses

1. There is no significant difference in the attitude mean scores of students taught energy using collaboration strategy and those taught using conventional method.
2. There is no significant difference in the achievements mean scores of students taught energy using collaboration learning strategy and those taught using conventional method.

Methodology

This study adopted a quasi-experimental research of pre-test, post-test, post-post-test, non-equivalent, non-randomized control group design. Quasi-experimental research design was used because it was not possible to randomize individuals to treatment and control groups, as intact classes were used. A 2x2 factorial design was used in the study. This represents one treatment groups and one control group, Collaborative and control group. All students in the two intact classes were

pre-tested to determine their entry level behaviour or status. The experimental groups received treatment on Collaborative strategy, while the control group did not receive any treatment. Also, all the groups were subjected to posttest to determine the effect of the treatment on students' achievement and post-posttest (to determine the effect of the treatment on their retention ability.

The population of this study consists of all junior secondary school students in Nasarawa state which according to the Nasarawa State Ministry of Education Nasarawa schools' Board was 31,731 for the 2020/2021 academic session. The choice of JS II students is because the units taught in this study are contained in JS II scheme of work. A sample of 138 JS II students of upper basic science students was used for this study. A Multi-stage random sampling technique was used to select students for the study. At first stage, 2 Senatorial Districts were randomly selected, namely: Nasarawa West and Nasarawa North. At the second stage, the schools were cluster into Local Government Areas and proportionate sampling technique was adopted to select the schools. At the third stage, 2 junior secondary schools were randomly selected from the two Senatorial Districts. Finally, 2 intact classes were randomly sampled for the study using simple random sampling technique. One intact class was randomly assigned to experimental group while the other one was assigned to the control group. In order to consider gender as one of the moderator variables in this study, stratified random sampling technique was used to stratify male and female students into strata. This sampling technique gives the target population equal opportunity of being selected thereby reducing the bias effect that may interfere with the validity and reliability of the study.

Two instruments were used for collection of data. They include: Energy Achievement Test (EAT) and Energy Attitude Scale (EAS). The EAT is a 40-item multiple choice test on Kinetic energy, heat flow, and thermal energy. A table of specification covering the 40 multiple choice items based on modified Blooms' taxonomy was developed to ensure adequate representation and coverage of the content of the items. Energy Attitude Scale (EAS) was designed to assess students' attitude to energy in Basic science on four-point likert-type rating scale of Strongly Agree (SA), Agree (A), Strongly Disagree (SD) and Disagree (D). The responses strongly agree, agree, strongly disagree and disagree were assigned with value point of 4, 3, 2 and 1 respectively.

Two of the experts were from the Department of Science Technology and Mathematics Education and one from Educational Measurement and Evaluation.These instruments were validated and piloted using content and construct validity with that of Kuder-Richardson formula 21 ($K\text{-}R_{20}$) and Cronbach's Alpha in order to establish validity and reliability indices of 0.81 and 0.79 and 0.83 and 0.89.

Results

Research Question One: What are the attitude mean scores of students taught energy using collaborative learning strategy and those taught using conventional method**?**

Table 1: Pre-Attitude and Post Attitude Mean Scores and Standard Deviation of Students in Energy Attitude Scale (EAS)

Group		Pre-attitude	Post attitude
Collaborative Strategy	N	45	45
	Std. Deviation	2.324	2.924
	Mean	31.26	43.28
Conventional Method	N	46	46
	Std. Deviation	2.200	2.037
	Mean	30.28	40.83

Table 1 shows the pre-attitude and post attitude mean scores and standard deviation of Basic Science students in the experimental and control groups. From Table 1 it could be seen that the pre-attitude and post attitude mean scores of students taught energy concept using collaborative strategy are 31.26 and 43.28 respectively and the standard deviations are 2.32 and 2.924. For students that were taught using conventional method, their mean scores were 30.28 and 40.83 and standard deviations of 2.200 and 2.037 in pre-attitude and post attitude respectively.

H_{01}: There is no significant difference in the attitude mean scores of students taught energy using collaborative strategy and those taught using conventional method.

Table 2: ANCOVA Results of the Mean Attitude Scores of Students Taught Energy Using Collaborative Strategy and Conventional Method

Source	Type III Sum of squares	Df	Mean square	F	Sig (P-value)
Corrected model	7708.587[a]	3	2569.532	114.802	.000
Intercept	2094.157	1	2094.157	93.563	.000
Pre-Attitude	40.353	1	40.353	1.803	.182
Group	4518.473	2	2259.236	100.938	.000
Error	2999.229	134	22.382		
Total	339698.000	138			
Corrected Total	10707.826	137			

Table 2 shows the summary of the one-way Analysis of Covariance (ANCOVA) result on mean attitude scores of students taught energy. The result indicated that the difference between attitude scores of the three groups is not significant at 0.05 alpha levels. This is from the fact that the F value is 100.938 and P = 0.000 <0.05. The null hypothesis that there is no significant difference in the attitude mean scores of students taught energy using collaborative learning strategy was therefore accepted indicating that there was no significant difference.

Research Question Two: What are the achievement mean scores of students taught energy using collaborative strategy and those taught using conventional method?

Table 3: The Achievement Mean Scores of Students Taught energy Using Collaborative and Conventional

Group		Pre-test	Post-test
Collaborative	N	45	45
	Std Deviation	4.105	4.280
	Mean	19.52	25.65
Conventional	N	46	46
	Std Deviation	3.800	4.200
	Mean	18.76	20.09

Table 3 shows that the achievement mean score ratings of students taught energy using collaborative strategy are 19.52 and 25.65 with standard deviations of 4.105 and 4.280 in pre-test and posttest respectively and students taught using conventional method had pretest and posttest mean achievement ratings of 18.76 and 20.09 respectively and with standard deviations of 3.800 and 4.200 in pretest and posttest respectively.

H_{02}: There is no significant difference in the achievement mean scores of students taught energy using collaboration learning strategy and those taught using conventional method.

Table 4: ANCOVA Results of the achievement mean Scores of students taught Energy Using Collaborative Strategy and those Taught Using Conventional Method.

Source	Type III sum of squares	Df	Mean square	F	Sig.
Corrected mode 1	800.466	3	266.822	14.235	.000
Intercept	3831.850	1	3831.850	204.434	.000
Pretest	296.607	1	296.607	15.824	.000
Group	504.311	2	252.156	13.453	.000
Error	2511.657	134	18.744		
Total	118733.000	138			
Corrected total	3312.123	137			

S = Significant at p < 0.05

Table 4 shows the summary of one-way analysis of covariance (ANCOVA). The F-value is 13.453 and p = .000 < = .05. The null hypothesis that there is no significant difference in the achievement mean scores of students taught energy using collaborative learning strategy and those taught using conventional method was rejected. This implies that there was a significant difference in the achievement means scores of students taught basic science using collaborative learning strategy and those taught using conventional method. Students taught using conventional method had the lowest mean achievement scores.

Discussion of Findings

The finding of this study revealed that there was no significant different between students' attitude who were taught energy using collaborative learning strategy and those taught using conventional method. There was significant difference among student's attitude, and achievement in collaborative strategy and the conventional method in favour of collaborative strategy. The findings on student's attitude in collaborative learning strategy is in agreement with the earlier findings of Danjuma (2015), who found out that the student's taught Basic Science using collaborative learning

strategy achieved better than those taught using conventional method. Also, Kolawole (2010) reported that students taught Basic Science subject using collaborative learning strategy achieved better than those taught Basic Science using conventional method. The trend of improved attitudes by the treatment group could be as a result of carefully planned instructions, enabling learning environment where students worked together, explaining and encouraging one another to learn. The treatment allowed the learners to take charge of their learning and offered opportunity to develop cognition.

There was a significant difference between the achievement mean scores of students in collaborative learning strategy and conventional method in favour of collaborative strategy. This implies that the collaborative strategy can be used to teach energy in JS II Basic science. This finding is in agreement with Laatsch-Lybech in (2010) who found out that students achieve better when individual learning strategies are used in teaching students with different learning ability. The differences between collaborative and conventional method showed that the teacher identified and catered for the student's needs and provided a friendly learning environment, respecting the student's inputs which made the students more confidence.

Conclusion

Based on the findings of this study, collaborative learning strategy enhanced students' achievement and attitude. These results imply that the learning approaches employed by Basic Science teachers in teaching might have been partly responsible for the persistent under-achievement and attitude in Basic Science since they were using the conventional methods most of the time. The implications of this study depend on the development of more virile learning approaches for teaching Basic Science. Teaching of Basic science students using collaborative strategy was found to be better in terms of students' attitude and achievement.

Recommendations

1. Basic Science teachers should adopt activity-based method such as collaborative learning strategy as this encourages and motivates the students in the learning process, promote learning attitude by doing, allows the students to discover facts for themselves.
2. Basic Science teachers should be dissuaded from utilizing conventional teaching method which promote rote learning and make learners passive rather than active learners in Basic Science classrooms.

References

Akani, O. (2017). Effect of guided discovery method of instruction and students' achievement in chemistry at the secondary school level in Nigeria. *International journal of scientific research and education,* 5(2) 6226-6234.

Alabi, O. A. (2014). Effect of activity-based teaching strategy on students' achievement of secondary school students in chemistry. *Journal of education and policy review,* 6(2) 119-130.

Andrew,Z.J.,(2018). Energy retrieved, march, 2022, from *https://www.thoughtco.com/energy-definition-and-examples-2698976*.

Ayodele,T & Olatunbosun, S. M. (2015). Gender differences in students' attitude towards basic science in junior secondary school. *international journal. Contemporary Applied. Science*.2, 11420.

Bukunola, B- A. J. & Idowu, O. D. (2012). Effectiveness of cooperative learning strategies on Nigerian junior secondary students' academic achievement in basic Science. *British Journal of Education, Society & Behavioral Science 2(3) 307-325,*

Danjuma, S. G. (2015). Problems militating against the teaching of Integrated Science and student's achievement in Taraba State Junior Secondary School (Unpublished Master's Thesis). National Open University of Nigeria.

David, U. (2013). "Using interviews in qualitative research", in cassell, C. & Symon, G.(eds), *essential guide to qualitative methods in organizational research*.

Gibbs, G. (2011). *Assessing student-centred courses*: Oxford

Ishaq- (2015). Effectiveness of demonstration and guided discovery methods on interest and achievement of upper basic science students in Taraba state, Nigeria. unpublished masters work.

Kabutu, F.R., Oloyede, O.I. & Bandele, M.F.O. (2015). An investigation into the achievement of junior secondary school students taught Integrated Science using the cooperative learning strategy in Nigeria. *European journal of physics and chemistry education*, 7(2), p.63-73.

Kolawole, E. B. (2010). Effects of competitive and cooperative learning strategies on academic performance of Nigerian students in Mathematics. *Educational Research and Review,* 3(1),33-3 7

Laatssh-& Lybeck, L.J. (2010). Effects of cooperative learning on achievement and attitudes towards team work in Medical technology students. Dissertations (1962-2010) access via proquest Digital Dissertations. Retrieved from *http://epublications.marquette.edu/chissertarton/AA19991610*.

Martha, R. & George, R. (2011). Why is biology important? Retrieved from http*://www.life123.com/parenting/education/why is biologyimportant.html*.

Nelson, & Nelson, (2010). The effect of individualized cooperative and individualistic classroom interaction models on learning outcomes in mathematics in Nigerian senior secondary schools. *Journal of Education Research*. Hindawi publishing cooperation.

NERDC. (2012). 9-year basic education curriculum: basic science and technology. Lagos: NERDC Press.

OLatoye, R A., Aderogba, A. A & Asmi E. M. (2011). Effect of co-operative and individualized teaching methods on senior secondary school students Achievement in organic chemistry *Journal of science and technology, 87(2), 71-86*.

Osokoya, J. (2013). Teacher influences on students' attachment to school. *Sociology of Education*, 81(3), .271-283.

Samuel, I.R. (2017). Assessment of basic science teachers' pedagogical practice and students' achievement in Keffi Educational Zone, Nasarawa State, Nigeria. Unpublished Masters dissertation, Nasarawa State University, Keffi

Siddigui, I. (2015). *A* survey of teacher –student relations in secondary schools.retieved february 4, 2017 from *http://cwx.Prenhall.com/bookbind/pubbook/aronson/chapter/custom3/deluxe-content.html*.

Stiggins, A. (2016), Ajzen, M., Disitheiri, G. (1975) & Travers, R. (1977). Reports the results of two experiments involving the study of ecology by sixth graders Udeani, H. (2013). what great principals do differently; NY.

Udousoro, U. J. (2010). The effect of gender and school location on students' achievement in mathematics. international journal of chemical, environmental and pharmaceutical research. Vol. 1, No. 3, 165 – 170 (2010) special issue.

Vygotsky, L.S. (1978). Mind in society the development of higher mental processes: Harvard University Press.

Walker J., Halliday D., and Resnick R. (2014). Principles of physics. 10th ed., international student version, Wiley,ISBN: 978-1-118-23074-9.