EFFECTS OF COOPERATIVE LEARNING METHOD ON ACADEMIC ACHIEVEMENT AND RETENTION OF STUDENTS IN BASIC TECHNOLOGY IN OYO STATE

Prof. T. I. Eze
Department of Technology and Vocational Education, Faculty of Education, Nnamdi Azikiwe University, Awka, Anambra State

&

Lasisi, Basiru Toyin (PhD)
Department of technical education, School of vocational and technical education, Emmanuel Alayande college of education, oyo, oyo state.

Abstract
This study was necessitated by persistent declining in the academic achievement in Basic Technology in public examinations by junior secondary school students. The study determined the effects of cooperative learning method (CLM) on academic achievement and retention in Basic Technology in Oyo State. Three research questions guided the study and three null hypotheses were tested at 0.05 level of significance. The population of the study was 19,892 JSS II Basic Technology students in Oyo State. The purposive sampling technique was used to select 114 students for the study. Pre-test, Post-test and non-equivalent group quasi-experimental research design was used for the study and the instrument for data collection was Basic Technology Achievement Test (BTAT) which was validated by three experts. A reliability correlation coefficient of 0.82 was obtained for the test items using test re-test and Pearson Product Moment Correlation. Mean was used to analyse data relating to the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. Findings revealed that students taught Basic Technology using CLM performed better with higher post-test scores than those taught using conventional teaching method (CTM). Findings also indicated that retention mean score of students taught Basic Technology using CLM was higher than those taught using CTM, both high and low achieving students were favoured by the use of CLM but low achieving students were slightly favoured by the use of CLM but low achieving students were slightly favoured more. The interaction effect of teaching methods and gender was not significant on students' academic achievement and retention in Basic Technology. Hence, it was recommended among others that school administrators should provide opportunities for in-service training for Basic Technology teachers in order to equip them with competencies needed in the use of CLM for teaching the subject.

Keywords: Cooperative learning, achievement, retention, Oyo State

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Introduction

In a developing country like Nigeria, there is need for efficient and well-trained individuals who would be able to cater for themselves and participate productively in the development of the society. From the ancient societies to modern nations, education proved to be a most potent tool for survival, growth and development. Agbatogun (2010) conceived education as a systematic action of imparting knowledge, skills and habits to the learners in their preparation for meaningful life and contribution to better society.

Education according to Lawal (2013) is the act of giving knowledge to or developing the abilities of people by teaching, training or schooling. It is an instrument for helping both individuals and society to re-orient themselves towards more positive beneficial and more productive services. Eze (2013) affirmed that education, particularly technical vocational education and training is a veritable tool for achieving the much needed economic and technological development. it is a fulcrum on which all other developmental facets are hinged.

Technical and Vocational Education and Training is the process of acquiring knowledge, skills, attitudes, interests, abilities, competencies, and norms of a society by people to enhance perpetual development. In order to achieve this, the individual is exposed to different learning experiences ranging from individual's culture, polity, knowledge, management, partnership, negotiation, communication and information technology skill. It is in recognition of the importance of education that Nigeria has continue to make serious efforts towards providing the citizens with quality and functional education for social, economic and political development. In making effort towards qualitative and functional education, the Federal Republic of Nigeria (2013) in her National Policy on Education stated that one of the aims and objectives of education in Nigeria is to help the child acquire appropriate productive skills, abilities and competencies, both mental and physical as qualities for the individual to live and contribute to the development of the society. The skills, abilities and concept could be acquired through the training provided in the schools and colleges.

The implication of all these for teachers is that they should develop and employ learning approaches which should encourage learners to participate actively in the learning processes. Teachers are to promote learning methods which bring about interaction among students and improve on their relationship with individuals in the classroom. Igboko and Ibeneme (2006) pointed out that traditional education practices such as demonstration and lecture method alone have proved incapable of producing skills required for coping with the challenges posed by rapid technological development. Igboko and Ibeneme noted that teachers are strongly encouraged to use the students' activity-based and inquiry mode, involving substantial workshop activities in teaching to ensure achievement and retention of concepts in technology. One of the such methods in this regard is cooperative learning.

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Cooperative Learning refers to instructional method in which pair or small group of learners with different level of ability work together to accomplish a shared goal (Iqbal, 2004). In the view of Amita (2006), cooperative learning refers to a situation where a small dedicated group of students learn together and take advantages of each other's expertise to achieve a common goal. Mckeachie (2009) explained that in a Cooperative learning class, students often elaborate on the concept being taught to achieve what is expected. Elaborations not only enhance the learning of students who receive the explanation but could also deepen the understanding of the student providing the explanation.

Cooperative learning comprises instructional method in which teachers organize the students into small groups which then work together to help one another learn some academic content (Slavin, 2011). It is a kind of learning method in which students study together and complete goals. Each student contributes effort in small groups to promote all students' achievement. Slavin further posited that it could produce positive effect on student academic achievement and retention.

Academic achievement is defined as learning outcomes of the student in terms of level of skills, knowledge and ideas necessary for gainful employment in related occupations (Epunam, 2009). The author further noted that academic achievement connotes performance in a school subject as symbolized by scores or marks in an achievement test. Abdullahi (2013) described poor academic achievement as any performance that falls below a desired standard. The classroom teacher is therefore faced with the challenge of teaching to attain effective conceptual change, high academic and skill achievement. Learning occupies a very important place in one's life. It is the basis of human survival as well as the development and progress of the society.

However, the best efforts in learning may turn into a futile exercise, if the products of learning are not utilized at a later stage by the learner. For making use of material learnt it must remain in the learner's mind, stored up somehow, to be used when the need arises. This process is called retention. Retention of learning according to Ausubel and Robinson (2002) is the repeated performance of behaviour earlier acquired by the learner and elicited after an interval of time.

Retention with respect to technology means that a student has as an ability to recall or recognize the basic technology concepts which have been learned before. Technology involves the academic and practical study of materials, source of energy and natural phenomena with the ultimate intention of applying these to the service of man to make life more comfortable (Bamiro, Nurudeen & Akuru 2014). It is a major determinant of economy growth in the country. Basic Technology (encapsulated in technology education) is a compulsory subject in the Nine Year Basic Education programme. Its purpose is to contribute to the achievement of the national education goals by inculcation of technology literacy, that is, basic understanding of and capability in technology, exposure of students to the world of work to match their talents and interests for wise vocational choice; and inculcation of positive attitudes

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towards work as a source of human identity, livelihood and power (National Education Research Development Council, NERDC, 2007).

The aim of Basic Technology is to introduce students to technology right at the beginning of their junior secondary school career. The typical junior secondary Basic Technology curriculum consists of various topics, for the purpose of this study the following are captured thus: You and Technology, Safety, Material and processing, Drawing practice, Tools and machines, Applied Electricity and Electronics, Energy and power, Maintenance and building. The quality of basic technology teaching and learning in junior secondary school has a great influence and motivation on the achievements of students at the senior secondary or technical college. The effective teaching and learning of Basic Technology will expose students to the world of work and eventually qualify them to proceed to higher educational level so that they could become middle level manpower who are knowledgeable in the field of technology and possess the skills and ability to solve societal problems. Basic Technology students are therefore expected to have competencies in technology including the ability to develop functional knowledge of basic technology concepts and principles, observe and explore the technological environment, apply the skills and knowledge gained through the study of Basic Technology to solve day to day problem, develop scientific and technological attitudes such as curiosity and precision, manipulate simple tools for the purpose of demonstrating processes, and improvise simple equipment or machine from available resources in the immediate environment to solve societal problems (Federal Republic of Nigeria, FRN 2013).

Achieving these competencies therefore means that every student must be taught the basic technology so as to understand and master all the concepts in the Junior Secondary School Curriculum. The junior secondary schools do end with final external examination, which is normally conducted by National Examination Council (NECO) or State Ministry of Education. Students whether male or female register for the two external examinations or either as the case may be.

According to Safo, Ezenwa and Wushishi (2013), gender is the property that distinguishes organism on the basic of their reproductive roles as female and male. Studies on gender differences on academic achievement have presented mixed result. The belief that males perform better than the females in technical subject is being debunked by recent studies (Esiogbu, 2011; Eze, Ezenwafor, Obidile, 2016). The above views indicated that there are needs to re-examine the method of imparting the concept of basic technology to the students, so that the acquired knowledge would assist students to solve the day-to-day problem of real life situation. The classroom teacher is therefore faced with the challenge of teaching to attain effective conceptual change, high academic and skill achievement. Hence the researcher intends to find out the effect of cooperative leaning method (CLM) on academic achievement and retention of students in basic technology in Oyo State.

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Statement of the Problem

There are opinions that associate poor academic achievement of students to poor method and approaches to teaching, lack of instructional materials and wrong method of teaching, which are teacher-centred and often create frustration, learning difficulties and do not encourage active participation of students. The traditional or conventional methods probably do not sufficiently give students the opportunity to participate in the classroom activities and as such students do not adequately acquire skills and knowledge required.

These methods do not seem to be yielding the expected results currently. There is observable declining trend in the academic achievement in Basic Technology by Junior Secondary Certificate (JSIII) students.

Between 2011 and 2015, 35% students out of those who sat for Basic Technology external examination passed at credit level (Federal Ministry of Education, 2013). Could this poor academic achievement be traceable to inappropriate method of teaching Basic Technology. There are opinions that student-centred methods could improve students' academic achievement more than conventional methods.

Based on the above view, there is therefore, the need to carry out a study on an innovative and participatory teaching method where students are helped to become active rather than passive learners. One of the teaching methods proposed by Slavin, (2011) that could produce positive effects on students' academic achievement and retention is cooperative learning method. It is on this basis, the study was conceived to determine the effects of cooperative learning method on academic achievement and retention of students' in Basic Technology when compared with conventional teaching method.

Purpose of the Study

The main purpose of the study was to determine the effects of cooperative learning method on the academic achievement and retention of students in Basic Technology. Specifically, the study determined the:

1. Pre-test and post-test achievement mean scores of students taught Basic Technology using conventional teaching method and those taught using cooperative learning method.
2. Academic retention mean scores of students taught Basic Technology using conventional teaching method and those taught using cooperative learning method.
3. Interaction effects of teaching methods and gender on students' academic achievement in Basic Technology.

Research Questions

The following research questions guided the study

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1. What are the effects on academic achievement of students taught basic technology using conventional teaching method and those taught using cooperative learning method?

2. What are the effects on the academic retention means scores of students taught basic technology using conventional teaching method and those taught using cooperative learning method?
3. What are the interaction effects of teaching methods and gender on students' academic achievement in basic technology?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance

1. There is no significant difference between the pre-test and post-test academic achievement mean scores of students taught basic technology using conventional teaching method and those taught using cooperative learning method.
2. There is no significant difference between the academic retention mean scores of students taught basic technology using conventional teaching method and those taught using cooperative learning method.
3. There is no significant interaction effect of the teaching methods and gender on students' academic achievement in basic technology.

Method

The population of the study was 19,892 (9,842 males and 10, 050 females) JSS II Basic Technology students in Oyo State. The purposive sample was used to select a sample of 114 (44 males and 70 females) students for the study. Pre-test, Post-test and non-equivalent group quasi-experimental research design was used for the study and the instrument for data collection was Basic Technology Achievement Test (BTAT) which was validated by three experts. A reliability correlation coefficient of 0.82 was obtained for the test items using test re-test and Person Product Moment Correlation. Mean was used to analyse data relating to the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results

Research Question 1: What are the effects on academic achievement of students taught basic technology using conventional teaching method and those taught using cooperative learning method?

Table 1

Mean Achievement Scores of Students Taught Basic Technology Using Conventional Method and Cooperative Learning Method.

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Groups	N	Pre-Test $\overline{X}_2$	Post-Test	Mean Difference $\overline{X}_D$
Control Group	56	27.46	33.95	22.84
Experimental Group	58	32.25	56.79	

Table 1 shows control and experimental groups post-test mean achievement scores of 33.95 and 56.79 respectively with a mean difference of 22.84. The result shows that after treatment, the students in the experimental group achieved higher than those in the control group. This indicated that cooperative learning method could be effective.

Research Question 2: What are the effects on the academic retention means scores of students taught basic technology using conventional teaching method and those taught using cooperative learning method?

Table 2
Mean retention scores of students in Basic Technology taught using conventional method and those taught using cooperative learning method.

Methods		Post-test	Delayed Post-test	Mean Difference $\overline{X}$D
Control Group	56	33.95	32.68	32.80
Experimental Group	58	56.79	65.48	

Table 2: shows control and experimental groups' delayed post-test mean achievement scores of 32.68 and 65.48 respectively with a mean difference of 32.80. The result shows that the students in the experimental group had higher mean retention scores than those in the control group.

Research Question 3: What are the interaction effects of teaching methods and gender on students' academic achievement in Basic Technology?

Table 3
Interaction Effects of Teaching Methods (CLM and CTM) and Gender on Students' Achievement in Basic Technology

Group	Pre-test		Post-test		Mean Difference
	N	Mean $\overline{X}$	N	Mean $\overline{X}$	$\overline{X}$D

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Experimental					
Male	30	32.77	30	58.07	25.30
Female	28	28.75	28	55.43	26.68
Control					
Male	24	34.08	24	35.21	1.13
Female	32	30.28	32	33.00	2.72

Table 5 indicates that experimental groups pre-test mean scores for male (32.77) and female (28.75) were very close as well as the control groups mean scores for male (34.08) and female (30.28). After the treatment, the male students in the experimental group had a higher post-test mean scores of (58.07) than their male counterparts in the control group (35.21) while female students in the experimental group got a higher post-test mean score (55.43) than their female counterparts in the control group (33.00). There was an increase in the mean achievement scores across both teaching methods and gender. The post-test mean achievement scores of students taught basic technology across the two teaching methods show that male and female benefited from the teaching methods. This suggests there was no interaction between methods of teaching and gender.

Hypotheses 1: There is no significant difference between the pre-test and post-test academic achievement mean scores of students taught basic technology using conventional teaching method and those taught using cooperative learning method.

Table 4
ANCOVA Summary on Difference in Achievement Scores of Student's taught with Conventional Method (CTM) and those Taught with Cooperative Learning Method (CLM).

Source	Type III sum of squares	Df	Mean square	F	P -value	Decision
Corrected model	14871.582	1	14871.582	132.778	.000	
Intercept	1389.473	1		12.406	.000	S
Group	14871.582	1	1389.473	132.778	.000	
Error	12544.357	112	14871.582			
Total	264153.000	114	112.003			
Corrected Total	27415.939	113				

Table 4 shows that at 0.05 level of significance and 1 df, the p value is 0.000 which is lower than the level of significance 0.05. This means that there was significant difference between the post-test academic achievement mean scores of students taught basic technology using conventional teaching method and those taught using cooperative learning method. This null hypothesis was therefore rejected.

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Hypothesis2: There is no significant difference between the academic retention mean scores of students taught Basic Technology using conventional teaching method and those taught using cooperative learning method.

Table 5
ANCOVA Summary on Difference in Retention Scores of Students' taught with Conventional Teaching Methods (CTM) and those taught with Cooperative Learning Method (CLM).

Source	Type III Sum of squares	df	Mean Square	F	P-value	Decision
Corrected Model	4065.173[a]	1	4065.173	11.998	.001	
Intercept	52437.667	1	52437.667	154.768	.000	S
Groups	4065.173	1	4065.173	11.998	.001	
Error	37949.353	112	338.816			
Total	319858.000	114				
Corrected Total	42012.526	113				

Data in Table 5 show that at 0.05 level of significance and 1 df, the p- value is 0.001 which is also lower than the level of significance 0.05. This means that there was significant difference in the retention mean scores of students taught basic technology using conventional teaching method and those taught using cooperative learning method. The null hypothesis was therefore rejected.

Hypothesis3: There is no significant difference between the academic retention mean scores of male and female students' taught Basic Technology using cooperative learning method and those taught using conventional teaching method.
Data utilised to test Ho are presented in Table 9.

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Table 6
ANCOVA Summary on Difference between the Mean Retention scores of Male and Female Students' taught Basic Technology with (CLM).

Source	Type III Sum Square	df	Means square	F	P-Value	Decision
Corrected Model	5676.735[a]	3	1892.245	8.336	.000	
Intercept	381.874	1	381.874	1.682	.197	NS
Gender	1064.584	1	1064.584	4.690	.032	
Group	219.105	2	109.552	.483	.618	
Error	24968.282	110	226.984			
Total	216582.000	114				
Corrected Total	30645.018	113				

From table 6: It was discovered that 0.05 level of significance and 2 df the P-value is 0.618 which is higher than the level of significance 0.05. This shows that there is no significant difference in the academic achievement retention mean scores of male and female students' taught Basic Technology using cooperative learning method. The null hypothesis was therefore not rejected.

Discussion

Students taught basic technology using cooperative learning method (CLM) performed significantly higher in their post-test scores than those taught with conventional teaching methods. This is in agreement with the findings of; Eze, Ezenwafor and Obidile (2006) who reported that CLM had significant effect on the post-test achievement scores of students. This could be as a result of students' active involvement in the teaching and learning process when CLM is used.

Male and female students taught basic technology did not perform significantly higher in their post-test score than those taught basic technology using conventional teaching method this finding agreed with the report of Esiogbu (2011) which revealed that no gender related differences in academic achievement between male and female students. Thus, from the literature there are conflicting reports on gender related differences in achievement in school science.

High and low academic achievement students taught basic technology with cooperative learning method performed significantly higher in the post-test than those taught with conventional teaching method. The high level of improvement in academic achievement of low achiever taught basic technology with cooperative learning method could be as a result of self motivation of student created by the teaching method. However, the report of Safo, Ezenwa, and Wushishi (2013)

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disagreed with the findings current study. The author posited that academic achievement in examination is not influenced by motivating factors but a function of students' participatory.

The interaction effects of treatments and gender on students' academic achievement in basic technology is not significant. This is in agreement with the report of Ausubel and Robinson (2002). The present study has approved that assertion wrong. The significant improvement noted in the male and female interaction significantly improved the academic achievement of the students this could be as a result of one of the advantages derivable from using cooperative learning method.

Conclusion

Based on the findings of this study, it was concluded that cooperative learning method is an effective method in the teaching of basic technology. Therefore, cooperative learning method could be effective method for improving students academic achievement and knowledge retention in basic technology.

Recommendations

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

1. Teachers of Basic Technology should acquire the knowledge and skills for using Cooperative Learning Method through is-service training, conferences, seminars and workshops
2. School administration should encourage Basic Technology teachers to use cooperative learning method by providing opportunities for in-service training to equip them with competencies needed in it.
3. Curriculum designer should incorporate cooperative learning method in the Basic Technology curriculum and emphasize activities of teachers and students.
4. Education stakeholders and relevant professional associations such as Nigerian Association of Teachers of Technology (NATT), Association of Vocational and Technical Educators of Nigeria (AVTEN) should sponsor further research on the efficacy of cooperative learning method on other technology subject areas so as to arrest the declining academic achievement and enrolment pattern of students in technology and vocational education programme.
5. Government, through the Ministry of Education should ensure the provision of adequate instructional materials at secondary education level to facilitate the use of CLM in the teaching of Basic Technology.

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