INFLUENCE OF COOPERATIVE LEARNING AND GENDER ON TECHNICAL COLLEGE STUDENTS' ACADEMIC ACHIEVEMENT AND INTEREST IN BASIC TECHNOLOGY IN NIGER STATE

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Abstract: *Design for the study is a quasi-experimental non-equivalent control group pre-test and post-test design. The population for this study consisted of all the seven technical colleges in Niger State. Sample size for this study was 160 students from four selected technical colleges sampled from the population. The two instruments used for the study are Basic Technology Achievement Test (BTAT) and Basic Technology Interest Test (BTIT). The instrument (BTAT and BTIT) were subjected to trial testing. The research instruments validated by three (3) experts in measurement and evaluation in the Niger State College of Education, Minna and trial tested at Government Technical College, Lafiagi which is not part of the study. The Kuder Richardson 20 (K-R20) was employed for determining the reliability of the Basic technology achievement test at 0.78 while Cronbach alpha reliability method was used to determine the internal consistency of the Basic technology interest test and 0.75 was obtained. Data for the study was collected through pre-and post-tests using the BTAT and BTIT. Mean and standard deviation was used to answer the research questions while Analysis of Covariance (ANCOVA) was used in testing the hypotheses at 0.5% level of significance. Findings of the study revealed, among others, that cooperative learning method of teaching enhanced students' achievement in basic technology. However, there was no significant difference between the effect of cooperative learning and gender on students' interest in basic technology. Hence, it was recommended among others, that Basic technology teachers should be encouraged to employ it more in the teaching of Basic technology.*

Keywords: *Cooperative Learning, Achievement, Interest, Gender, Basic Technology*

Introduction

The main objectives of teaching and learning of Basic Technology in Nigeria schools as stipulated by Nigerian Educational Research and Development Council (2012) is that learners are expected to develop interest in science and technology; acquire basic knowledge and skills in science and technology; apply scientific and technological knowledge and skills to meet contemporary societal needs; take advantage of the numerous career opportunities provided by science and technology; become prepared for further studies in science and technology; avoid drug abuse and related vices; and to be safety and security conscious. Basic technology is a foundation subject on which future technological development of students are built for those interested in vocational technical courses or engineering in higher institutions. According to the Federal Republic of Nigeria (2013), basic technology is a compulsory subject in the 9-year basic education programme. Basic technology according to the Nigerian Educational Research and Development Council (2012) became necessary due to technological development and increased national policy orientation towards vocational and technical education development. The desired development of technical education system can only be achieved through effective implementation of basic technology technical colleges. Technical college are post basic education schools, where students learn skills in various occupations. Technical Colleges offer to the National Board for Technical Education (NBTE, 2014), the aim of technical college is to give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant. According to Bakare (2016), technical colleges are charged with the production of craftsmen and technicians. Akpan (2013) said that technical colleges and attitude required as craftsmen and technicians at sub-professional levels. Okoro (2006) pointed out that Technical Colleges are regarded as the principal Vocational Institutions in Nigeria that gives full vocational training intended to prepare students for entry into various occupations as artisans and craftsmen.

The conventional method of teaching in technical colleges is an old teaching method used by teachers to impart knowledge to students, it includes lecture method, descriptive method of teaching and dictation method of teaching. Lecture teaching method is concerned with the teacher being the controller of the learning environment. Power and responsibilities are held by the teacher and they play the role of instructor (in the form of lectures) and decision makers (in regards to curriculum content and specific outcome) They regard students as having knowledge holes that needs to be filled with information. The traditional teacher view is that the teacher causes learning to occur, (Novac, 2012). According to Awodi and Timothy (2011), the lecture method is mainly teacher-centered, with students being constantly passive and contents are constantly taught as absolute knowledge irrespective of the above comments on lecture method of teaching.

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.

Achievement according to Adeyemi (2012) is the scholastic standing of a student at a given moment. It has to do with the successful accomplishment of goal(s). The purpose of testing an achievement is to help the teacher and the students evaluate and estimate the degree of success attained in learning a given concept. It is equally appropriate in determining the efficiency of instruction. One of the issues at stake in education today is students' achievement measure in relation to teaching and the overall success of learning outcome, use of cooperative learning method in teaching simple machine by basic technology teachers may make basic technology lesson objective stimulating and interesting to the students.

Interest is an important factor in learning, it is viewed as the feeling that an individual has when he or she wants to know or learn more about something such as basic technology. The conventional teaching methods (such as lecture and demonstration methods) adopted by most basic technology teachers in technical colleges seem inadequate for equipping the craftsmen with the workplace skills such as flexibility, adaptability and creativity. These teaching/learning methods are teacher-centred, hence, do not give students enough opportunities to think for themselves and actively participate in the learning process.

An issue of contention in Nigeria today is the issue of gender in our society including the educational system. In recent times educators have expressed diverse views about gender and achievement especially in sciences. While some are of the view that males do better than females, others disagree with this view, arguing that achievement is a factor dependent on several factors such as socio –economic background, teaching method among others. In view of the issues on the use of self-monitoring strategy and lecture teaching method on students' achievement and achievement in sciences in senior secondary schools. The researcher wishes to investigate the above teaching methods on student's achievement in secondary schools' basic technology irrespective of gender. Gender refers to all the characteristics of men and women which a particular society has determined and assigned each sex, while sex is the biologically determined characteristics of men and women, boys and girls. Gender is a psychological and sociological term, which describes behaviour and attributes expected of individuals on the basis of being either a male or female in a given society.

Students' gender may have effect on academic performance in basic technology notwithstanding that the Federal Republic of Nigeria (2013) provided for equal educational opportunities for all citizens, male and female, to study all subjects. The guidelines for the implementation of the national policy of education also established no restrictions on educational access. Gender equality as it relates to technical education (in which Basic technology is embedded) in Nigeria was silently guaranteed. There are many inhibitions posed by gender on achievement of students which relate to sex-role differentiation in which certain activities are recognized as masculine and others as feminine, such that notwithstanding the objectives of Basic technology, the teaching of this course may not be as emphasized for females as for males. It becomes necessary to provide information and evidence on the influence of influence of cooperative learning and gender on technical college students' academic achievement and interest in basic technology in Niger State.

Statement of the problem

There is high rate of poor achievement of students in basic technology over the years. This could be as of the teachers use ineffective methods and strategies in basic technology teaching which among other factors have contributed to the student's poor achievement and interest in basic technology at technical colleges in Niger State. This poor achievement in basic technology has necessitated the need for the use of effective teaching method in teaching basic technology in technical colleges by the Federal Government. The available literature on methods of teaching in science and technology education suggests the need to employ new and innovative teaching strategy such as cooperative learning.

Purpose of the study

The purpose of this study was to investigate the influence of influence of cooperative learning and gender on technical college students' academic achievement and interest in basic technology in Niger State. Specifically, it sought to find:

1. The influence of cooperative learning on students' academic achievement in basic technology in technical colleges in Niger State.
2. The influence of cooperative learning on students' interest in basic technology in technical colleges in Niger State.
3. The influence of gender on the academic achievement of technical college students taught basic technology in Niger State.

Research questions

1. What is the influence of cooperative learning in achievement scores of students in basic technology in technical colleges in Niger State?
2. What is the difference in the mean interest of students taught basic technology using cooperative learning in technical colleges in Niger State?
3. What is the mean achievement score of male and female students taught basic technology using cooperative learning method in technical colleges in Niger State?

Hypotheses

H_{O1}: There is no significant difference in the mean achievement scores of students taught basic technology with cooperative learning and those taught with conventional method.

H_{O2}: There is no significant difference in the mean interest ratings of students taught basic technology with cooperative learning and those taught with conventional method.

H_{O3}: There is no significant difference in the mean achievement scores of male and female students taught basic technology with cooperative learning method.

Methodology

The design of the study is quasi experimental study. The population for this study consisted of all the seven technical colleges in Niger State. Sample size for this study was 160 technical colleges students from four selected technical colleges sampled from the population. The two instruments used for the study are Basic Technology Achievement Test (BTAT) and Basic Technology Interest Test (BTIT). The researchers have guided the regular Basic Technology teachers (research assistants) in the sampled schools for both experimental group I and II. The instrument (BTAT and BTIT) were subjected to trial testing. The research instruments were given to a panel of three (3) experts in measurement and evaluation in the Niger State College of Education, Minna. Their criticisms and advice were used in modifying the items. BTAT and BTIT were administered to 40 technical colleges from Government Technical College, Lafiagi which is not part of the study. The Kuder Richardson 20 (K-R20) was employed for determining the reliability of the Basic technology achievement test at 0.78 while Cronbach alpha reliability method was used to determine the internal consistency of the Basic technology interest test and 0.75 was obtained. Data for the study was collected through pre-and post-tests using the BTAT and BTIT. Mean and standard deviation was used to answer the research questions while Analysis of Covariance (ANCOVA) was used in testing the hypotheses at 0.5% level of significance.

Results

Table 1: Mean and Standard Deviation of Students' Academic Achievement in Basic Technology in Both the Experimental and Control Groups

Group	N	Pre test		Post test		Mean Gain
		Mean	SD	Mean	SD	
Experimental	107	9.85	2.94	15.38	5.23	5.53
Control	81	11.14	2.96	10.85	4.86	0.29

The summary of result presented in T able 1 shows the mean achievement score of students taught with cooperative learning and lecture method of teaching. Students in the cooperative learning method had a mean score of 9.85 and standard deviation of 2.94 for pre-test while a mean score of 15.38 and standard deviation of 5.23 were obtained in their post-test. On the other hand, students in the lecture method recorded a mean of 11.14 and standard deviation of 2.96 in their pre-test and on the post-test they had a mean score of 10.85 and standard deviation of 4.86. Comparatively the achievement means score of students taught with cooperative learning is higher than those taught with lecture method. The gain score of cooperative learning group is higher than the lecture group which indicates that the cooperative learning group gained more than the lecture group.

Table 2: Mean and Standard Deviation of Students' Interest in Basic Technology in Both the Experimental and Control Groups

Group	N	Mean	SD
Experimental	107	2.97	0.30
Control	81	2.97	0.28

Table 2 shows the interest of students taught basic technology using Cooperative learning and conventional method. Cooperating learning students obtained mean achievement of 2.97 with a standard deviation of 0.30 while students in the lecture method had a mean achievement of 2.97 and a standard deviation of 0.28. Comparatively students in the cooperative learning and lecture method had the same interest mean score in basic technology. Therefore, there is no difference in the interest of students when taught using cooperative learning and lecture method.

Table 3: Mean and Standard Deviation of Male and Female Students' Academic Achievement in Basic Technology when Taught Using Cooperative Learning (Experimental Group)

Gender	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Female	59	10.22	2.83	15.90	5.01	5.68
Male	48	9.40	3.04	14.75	5.48	5.35

The data in Table 3 show the effect of cooperative learning on male and female students' achievement in basic technology. The male students had pre-test and post-test mean scores of 9.40 and 14.75 respectively and standard deviation of 3.04 and 5.48 respectively as opposed to their female counterparts who had pre-test and post-test mean scores of 10.22 and 15.90 with a corresponding standard deviation of 2.83 and 5.01 respectively. The female students had a higher achievement mean scores than the male students in their pre-test and post-test. The female students who were taught with cooperative learning method had a gain score of 5.68 while their male students recorded a mean gain score of 5.35 The higher gain score in favour of female students shows that there is difference in the mean achievement score of male and female students in basic technology.

Table 4: Summary of Analysis of Covariance (ANCOVA) Test of Significant Difference in the Mean Achievement Scores of Students Taught Basic Technology With Cooperative Learning and Those Taught With Conventional Method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	3739.715[a]	5	747.943	68.118	.000
Intercept	896.942	1	896.942	81.688	.000
Pre test	283.964	1	283.964	25.862	.000
Gender	22.276	1	22.276	2.029	.156
Method	724.339	1	724.339	65.968	.000
Location	2073.699	1	2073.699	188.859	.000
Method	6.294	1	6.294	.573	.450
Error	1998.386	182	10.980		
Total	39651.000	188			
Corrected Total	5738.101	187			

a. R Squared = .652 (Adjusted R Squared = .642)

Table 4 shows the significant difference in the mean achievement score of students exposed to cooperative learning and those taught with lecture method. The obtained value of F(1,182) = 65.968 is significant 0.000 for method main effect (P< 0.05), thus the null hypothesis $\mathbf{H_{O1}}$ is rejected and the researchers conclude that there is significant difference in the mean achievement score of students taught basic technology using cooperative learning and those taught with conventional method. Since the obtained value of F (1, 182) = 2.029 is not significant at 0.156 for gender main influence (P>0.05), thus the null hypothesis $\mathbf{H_{O3}}$ is accepted and the researchers conclude that there is no significant difference in the mean achievement score of male and female students exposed to cooperative learning method.

Table 5: Summary of Analysis of Covariance (ANCOVA) Test of Significant Difference in the Mean Interest Ratings of Students Taught Basic Technology with Cooperative Learning and Those Taught with Conventional Method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.000[a]	2	.000	.001	.999
Intercept	120.054	1	120.054	1439.213	.000
Pre test	.000	1	.000	.002	.968
Method	.000	1	.000	.000	.990
Error	15.432	185	.083		
Total	1669.250	188			
Corrected Total	15.432	187			

a. R Squared = .000 (Adjusted R Squared = -.011)

Table 5 shows the significant difference in the mean ratings interest scores of students taught basic technology with cooperative learning and those taught with conventional method. The obtained value of F (1,185) = 0.000 is not significant at 0.990 for the method main effect (P>0.05), the null hypothesis $\mathbf{H_{O2}}$ is accepted and the researchers conclude that there is no significant difference in the mean interest ratings of students taught basic technology with cooperative learning and those taught with conventional method.

Findings

1. Students in the cooperative learning achieved higher than those in the conventional method. Hence, there is significant difference in the mean achievement scores of students taught basic technology with cooperative learning and those taught with conventional method.
2. Female students performed higher than male students' in basic technology when taught using cooperative learning method
3. There is no significant difference in the mean interest ratings of students taught basic technology with cooperative learning and those taught with conventional method
4. There is no significant difference in the mean achievement scores of male and female taught basic technology with cooperative learning.

Discussion of the findings

The findings of this study reveal that students in the cooperative learning performed better than the students in the conventional group. However, there is a significant difference in the mean achievement scores of students taught Basic technology using cooperative learning method and conventional method. The trend of the high performance by the cooperative learning could be that the method helped the students to actively participate in the class (to do it themselves) and to discover new things through their prior knowledge.

It could have also encouraged the students to internalize what they have learnt. The findings of this study is in line with the finding of Boaler (2012) who in their studies shows that cooperative learning method improves students' achievement in sciences. And also this study agrees with the findings of Olatoye and Adekoye (2010) who reported significant effect of treatment on students' achievement in an aspect of agriculture science.

The findings of this study shows that there is no significant difference in the mean interest of students taught Basic technology using cooperative learning and those that taught using conventional method. The findings of this study is disagreement with the findings of Ezeudu (2010) who carried out a study to determine the effect of concept map on students' achievement, interest and retention in selected units of organic chemistry and found that male students taught with concept mapping had a higher mean interest score than female students. Also the result of this contradicts the findings of Boaler (2012) that show cooperative learning method motivates students' interest in mathematics.

Conclusion

The findings of this study revealed that female students performed better than the male students in basic technology although; there is a slight mean difference in favour of the female students. A further analysis was carried out using analysis of covariance (ANCOVA) which indicates that gender has no influence on students' achievement in basic technology; therefore, the observed difference in favour of female students early identified occurred as a result of chance. The study has proven that gender does not influence students' achievement in basic technology when taught with Cooperative learning. This shows that cooperative learning method is not gender biased in basic technology.

Recommendations

1. Since cooperative learning method has been found to improve students' achievement in Basic technology, teachers should be encouraged to employ it more in the teaching of Basic technology.
2. Basic technology teachers should not introduce gender discrepancies in the classroom. They should as much as possible eliminate contents, instructional techniques and materials that may bring about gender differences in the classroom.
3. The curriculum planners should modify senior secondary school Basic technology curriculum to include the use of innovative teaching method like the cooperative learning method in order to enhance the participation and achievement of students in Basic technology.
4. The ministry of education in Nigeria should organize seminars, workshops and conferences for Basic technology teachers on how to use cooperative learning method in teaching Basic technology.

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