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Effects of Inquiry Teaching Method on Students' Performance in Bricklaying, Blocklaying and Concreting Trade In Technical Colleges Of Gombe State Nigeria

By

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**ABSTRACT**

*This study determined the effects of inquiry teaching methods on students' performance in bricklaying, Blocklaying and concreting trade in technical colleges of Gombe State Nigeria. The population of the study is made up of 180 subjects while 50 NTC II BBC students made up the sample for the study. Multistage sampling technique was used for the study. The subjects were separated into two groups; the experimental group (N= 28) and the control group (N=22). The study adopted pretest, posttest, quasi-experimental and control group design. The topics taught were foundation of building construction and bonding concepts and skills. Two instruments, specifically Bricklaying, Blocklaying and Concreting Achievement Test (BBCAT) and Bricklaying, Blocklaying and Concreting Practical Performance Test (BBCPPT) were used for data collection. Five research questions and three hypotheses guided the study. The research questions were answered using mean and standard deviation while hypotheses were tested using Analysis of Covariates (ANCOVA) at 0.05 alpha level. The findings showed that (i) There is a significant difference in the performance of students taught Bricklaying, Blocklaying and concreting using inquiry and demonstration teaching methods, There is no significant difference between male and female Bricklaying, Blocklaying and concreting students' performance  $F, (df=1, 50) = 0.1420, p > 0.05$ , thus the computed  $p$ -value (0.707) is,  $> 0.05$  level of significant. (iii) There is no significant interaction effect of teaching methods and gender on students' performance  $F (df = 2, 50) = 0.516, p > 0.05$ , thus the computed  $p$ -value (0.599) is  $> 0.05$  level of significant. Recommendations based on the findings showed that inquiry teaching method improved students' performance. The use of activity based methods in teaching and learning of Bricklaying, Blocklaying and concreting should be given priority. On-the-job training for technical teachers in form of seminars, workshops and conferences should be organized on how to use inquiry teaching method for teaching Bricklaying, Blocklaying and concreting. There should be proper supplies of facilities, tools and equipment, necessary for teaching Bricklaying, Blocklaying and concreting trade effectively.*

**INTRODUCTION**

Inquiry teaching method comes out from the traditional lecture method and allows students to take active role in their learning activities. Inquiry learning begins when students are presented with a problem

and some suggestions with tools for finding the answer to that problem. The students struggle with their teacher, until they get the answer by themselves. Neuby (2010) "states that inquiry teaching involves creating, conducting and evaluating learning

experiences that require students to go through the processes, develop or employ the same knowledge and attitudes they would use if engaged in independent rational inquiry". People learn by moving from principle to practice and by collecting pertinent facts in a logical order. Inquiry requires the identification of facts and assumption, the use of critical thinking, consideration of range of alternatives and stimulates the mental process towards synthesis of information, application of principle and evaluation of what has been done (French, Vega and Taylor in Neuby (2010). Students become more engaged in their learning by taking an active role in their lesson. The National Survey of Student's Engagement (NSSE) supports the findings that, doing rather than thinking promote positive outcomes (Gordon, Ludlum, and Hoey, 2008). Inquiry teaching method keep learners 'actively engaged as stated by Flubs & Freed (2000). (French, 2005) Support collaborative learning and social skills, and enlist more cooperation among students than would be achieved by a lecture. The teacher helps students to understand any assumptions that may surface.

Bulbul (2010) states that there are different forms of inquiry learning, such as; structured and open inquiry. In structured inquiry, the teacher provides the input for the students with a problem to investigate along with the procedures and materials. This type of inquiry learning is used to teaching a specific concept, fact or skill and leads to open inquiry where the student formulates his own problem to investigate. Bybee (2006) suggested five discrete elements of inquiry cycle as learning model such as: Engagement: The teacher or a

curriculum task accesses the learners' prior knowledge and helps them become engaged in a new concept through the use of short activities that promote curiosity and elicit prior knowledge. Exploration: provides students with a common base of activities within which current concepts (particularly Misconceptions), Processes and skills are identified and conceptual change is facilitated. Explanation phase focuses students' attention on a particular aspect of their engagement and exploration experiences provide opportunities to students to be able to demonstrate their conceptual understanding, process skills, or behaviors. This phase also provides opportunities for teachers to directly introducing a concept, Process, or skill. Elaboration: After receiving explanations about main ideas and terms for their learning tasks, it is important to involve the students in further experiences that extend, or elaborate, the concepts, Processes or skills. This elaboration phase facilitates the transfer of concepts to closely related but new situations. On some cases, students may still have misconceptions, or they may understand a concept in terms of the exploratory experience. Evaluation: is the important opportunity for students to use the skills they have acquired and evaluate their understanding.

According to Odu (2011) Technical Vocational Education and Training (TVET) refers to all those experiences whereby an individual learns to carry on successfully any useful occupation. These experiences may be organized and institutionalized or unorganized and haphazard. Technical Vocational Education and Training (TVET) is that aspect of education that exposes the learner to acquisition of demonstrable skills

that could be transformed into economic benefits (Akerele, 2007). However, United Nation Educational Scientific and Cultural Organization (UNESCO 2002), Sees TVET as a comprehensive term which encompasses the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge related to occupations in various sectors of economic and social life. Technical and Vocational Education and Training (TVET) is defined by kutz (2001) as an education which prepares individuals for the world of work. It is also a viable tool for sustainable development. According to Man (2005), Technical Vocational Education and Training (TVET) is the systematic and orderly transmission of knowledge, skills, and values to develop a workforce that is able to enhance productivity and sustain competitiveness in the global economy. It encompasses the ability to accelerate economic growth, provide marketable labour supply, minimize unemployment and underemployment, infuse technical knowledge and reduce poverty.

Bricklaying, blocklaying and concreting is among the trade components of vocational and technical education offered in technical college aimed at giving students adequate knowledge and skills for securing employment in building construction related fields in any society. The aims of bricklaying, blocklaying and concreting according to National Business and Technical Examination Board (NABTEB) in John (2004) Bricklaying, Blocklaying and Concreting trade is designed to Introduce the trainee:

i. to the basic construction principles, materials and methods so that they may be able to appreciate the roles of

the various trades in the building industry.

- ii. With the essential knowledge and skill that will enable him perform completely all aspects of brickwork in the construction industry.
- iii. With the essential knowledge and skill that will enable him perform proficiently all aspects of block layers work in the construction industry.
- iv. With the basic knowledge of the properties and applications of concrete as well as the skills in the production of sound concrete structures.
- v. With the basic knowledge of finishing materials related to the buildings work and to enable him apply such finishes proficiently.
- vi. With the basic knowledge and skills of plumbing for water services in building.

Gender refers to male or female in relation to learning of vocational and technical education in technical colleges. Gender has had significant effect on students' performance particularly in technical education. There is a societal feeling that technical skills are only suitable for the males, and the females counterparts are discriminated against and discouraged from such type of career.. There is also a negative societal perception that technical and vocational skills acquisition are incompatible with mother's role, at home and that girls who take to such careers have small chances to get married. These negative thoughts may influence the interest and self-confidence of the female folk and reduce their ability and motivation to opt for careers in technical skills acquisition programmes. The methods that some teachers employ in

teaching technical trade complicate and disguise the learners' interest in the pursuit of technical education and unfortunately are attributed to gender which completely do not have any significant effect on gender on student performance, social, political and cultural life of their communities and their nations in general.

According to United Nation Education Scientific and Cultural Organization, UNESCO (2004) state that, one of the most urgent challenges facing the world today, is the growing number of people that are excluded from meaningful participation in the economy such a society is neither efficient nor safe. Educational discrimination in favour of male in male dominated occupations and female in female dominated occupations can prevent the society from achieving the quest for rapid social and economic development. Egun and Tibi (2010) acknowledged that perception, belief system existing life studies life goal, needs and drive influence choice and entrance into occupation and profession thus giving meaning to human experience and the manner in which people think fully and act within their environment. One of such areas that have been so affected by these factors is the girl- child access to the study of science and technical subjects, thereby creating a gap in male - female ratio in vocational and technical education.

In Gombe state, technical colleges' products appears not demonstrating the expected skills in their service places after graduation. This perceived in-effectiveness of the technical colleges students to perform practical work may be attributed to inadequate facilities or in appropriate teaching methods by the teachers. The resultant effect is students' inability to

perform practical skills and poor achievement.

Technical colleges were mainly established for the training of students to acquire Practical skills, knowledge and attitudes essential for employment in a given occupation. Unfortunately, these skilled job opportunities in industries are not filled up because technical college graduates are not technically competent enough to take up the available skilled jobs Okorie in John, (2004). Technical college graduates are weak in the practice of their trades (Oranu, 2001). Furthermore, the standard of performance of Nigerian technicians in general, is at the moment very low, thereby retarding the overall productivity of the Nigerian economy (Okorie, 2001)

According to National Business for Technical Examination Board NABTEB (2002) Poor or inappropriate teaching methods employed by teachers to teach technical colleges students is one of the probable cause of high failure of students. There is a common believes by general public and most especially the employers of labour that technical college products are incompetent, half-baked and have inadequate practical skills. Adebayo (2010), state that poor performance of many technical colleges' students may be attributed to neglect, poor funding, and inadequate resources and inappropriate teaching methods. Similarly, Oranu in Shirly and Benjamin (2015) Posited that the teaching methods used in teaching are lecture and demonstration method. Therefore, Poor performance of the technical college products is a problem to the national economy and technological development in Nigeria. It is against this background that the study seeks to investigate the effects of

teaching methods like project and inquiry teaching methods, which are activity based on students' academic performance in bricklaying, blocklaying and concreting trade.

### **Purpose of the Study**

The general purpose of the study is to determine the effect of inquiry teaching method on students' performance in bricklaying, blocklaying and concreting trade in technical colleges in Gombe state. Specifically the study is to:

1. Determine the effect of inquiry teaching method on students' performance in bricklaying, blocklaying and concreting trade in technical colleges.
2. Determine the effect of demonstration teaching method on students' performance in bricklaying, blocklaying and concreting trade in technical colleges.
3. Determine the effect of inquiry teaching method on male and female students' performance in bricklaying, blocklaying and concreting trade in technical colleges.
4. Determine the effect of demonstration teaching method on male and female students' performance in bricklaying, blocklaying and concreting trade in technical colleges.
5. Compare the mean difference between the inquiry and demonstration teaching methods on students' performance in bricklaying, blocklaying and concreting.
6. Determine the interaction effect of teaching methods and gender on students' performance in bricklaying, blocklaying and concreting trade in technical colleges.

### **Research Questions**

The following research questions were raised to guide the study:

1. What are the mean scores of students taught bricklaying, blocklaying and concreting using inquiry teaching method?
2. What are the mean scores of students taught bricklaying, blocklaying and concreting using demonstration teaching method?
3. What are the mean scores of male and female students taught bricklaying, blocklaying and concreting using inquiry teaching method?
4. What are the mean scores of male and female students taught bricklaying, blocklaying and concreting using demonstration teaching method?
5. What are the mean difference between the experimental and control group on students' performance in bricklaying, blocklaying and concreting?

### **Hypotheses**

The following hypotheses were formulated and tested at 0.05 level of significance.

- H<sub>01</sub>:** There is no significant difference between the performances of students' taught bricklaying, blocklaying and concreting using inquiry and demonstration teaching methods.
- H<sub>02</sub>:** There is no significant difference between the performance of males and females students taught bricklaying, blocklaying and concreting using inquiry and demonstration teaching method.
- H<sub>03</sub>:** There is no interaction effect of teaching methods and gender on

bricklaying, blocklaying and concreting students' performance.

## METHODOLOGY

The design for the study is a quasi-experimental design, which involves a pre-test, post-test and non-equivalent control group design. This design investigate the possible cause and effect as well as relationship between two or more variables by the application of treatment which cannot be resolved by mere observation or description". The experimental and control groups were pre-tested to determine the group equivalence at the start of the experiment. The design is presented diagrammatically below (Cohen, Manion and Morrison, 2007).

The area of the study is Gombe state, which is located in the Northeastern part of Nigeria sharing boundary with Adamawa by the southeast, Taraba by the south, Bauchi by the west, and Borno state by the east. Gombe state is located between latitude  $10^{\circ}$   $15$  N and longitude  $11^{\circ}$   $10$  E. There are seven Technical colleges located in five local government areas within the study area.

The target population of the study was 180 NTC II Bricklaying, Blocklaying and Concreting students of Government Science and Technical colleges of Gombe State. The reason for choosing NTCII was because; the students are stable, that they are neither new nor facing any external examination as in the case of NTC III facing External exams in the school.

The sample for the study consisted of 50 NTC II students offering bricklaying, blocklaying and concreting in the three Technical colleges of Gombe state. Multistage sampling technique was used in selecting the samples. The first stage was

stratified random sampling in which Gombe state was stratified into three educational zones. Secondly, purposive sampling was used in selecting co-educational technical college in each of the educational zone in the state, because the study is gender sensitive. One technical college was selected in Gombe central educational zone using purposive sampling, because there are three technical colleges in the zone where two are not co-educational technical colleges. Thirdly, one technical college found in Gombe south educational zone was selected using purposive sampling because it is co-educational technical college. Fourthly, simple random sampling was used in choosing one technical college from three co-educational technical colleges in Gombe North educational zone through balloting system. Finally, simple random sampling was also used in assigning experimental and control groups through balloting.

The instrument used for data collection was tagged; Bricklaying, blocklaying and Concreting Achievement/Performance Test (BBCA/PT). The instrument was adapted from NABTEB past questions in bricklaying, blocklaying and concreting from 2011 – 2016. The Bricklaying, blocklaying and Concreting Performance Test (BBCA/PT) consisted of three parts; part 1 sought for students' personal data such as; school, gender and class while part two consists of questions on the concepts of bricklaying, blocklaying and concreting and part three consists of one practical performance test question based on NTC II syllabus. The achievement test consisted of 20 multiple-choice items with four (4) options lettered A-D, which was scored two, marks each alongside with one

practical question scored 60 marks giving a total of 100 marks

The instrument was validated by three experts from Technology Education Department, Modibbo Adama University of Technology, Yola. The validators made some corrections, suggestions and determined the face and content validity of the instrument.

The bricklaying, blocklaying and concreting performance test instrument was administered to the NTC II BBC students of Government Science and Technical College, Yola for trial testing to determine the reliability of the instrument, because the students are out of the researcher's study area but with educational background similar to those in the researcher study area. The data obtained was computed using Cronbach's Alpha formula and the reliability co-efficient of 0.87 was obtained for the instrument.

One research assistant for a particular group was appointed and given induction training by the researcher for each of the technical colleges sampled, who have the same qualification and teaching experience. The experimental groups, which consist of bricklaying, blocklaying and Concreting (BBC) students were taught for a period of six weeks, using the inquiry and project teaching methods. Materials such as bricks, limestone, line and pin, trowels, spirit level, head pans, were made available to students for carrying out the practical activities. During the lesson, the students were given projects to carry out activities such as bonding of bricks, casting of different types of foundations/models for the project teaching method. While in the case of inquiry teaching method the students were given assignment on topics of foundation and bonding. They made

investigations on bricks bonding and foundation casting process skills, prepared drawings/models, presented before the class, and replicate their finding in the workshop while the teacher makes observations and corrections. The most important characteristics of the lesson, it was a students' centered. The control group which consists of the BBC students as in the experimental groups were also taught for a period of six weeks using the demonstration method of teaching, this method involves showing and telling students the process skills in bonding bricks and foundations casting.

The data collected were analyzed using Statistical Package for Social Science (SPSS) version 16.0. Mean and standard deviation were used to answer the research questions while ANCOVA was used to test the hypotheses at 0.05 level of significance. (See Appendix XII). The results obtained was used in determining whether or not there is a significant difference among inquiry, project and demonstration teaching methods on students' performance in bricklaying, blocklaying and concreting in technical colleges of Gombe state.

Decision taking on testing the null hypotheses was based on comparing the computed p-value and level of significance. If the computed p-value is greater than 0.05 level of significance the null hypothesis will be accepted and concluded there is no significant difference between the variables compared. However, if the computed p-value is less than or equal to 0.05 level of significance the null hypothesis will be rejected, and concluded that, there is significant difference between the variables compared. Post hoc analysis will also be used if the computed ANCOVA value is found to

be significant in order to determine the group that brings about the significant effect.

**RESULTS AND DISCUSSION**

**Research Question 1:** What is the difference between the pre-test and post-test mean scores of Bricklaying, Blocklaying and Concreting students taught using Inquiry Teaching Method?

**Table 1:** Mean Scores of Pre-tests and Post-Tests of BBC Students Taught using Inquiry Teaching Method

Teaching Methods	N	Pre test ( $\bar{x}$ )	S.D	Post Test ( $\bar{x}$ )	S.D	Pre-test/Post-test Mean Diff
Inquiry Teaching Method	28	28.500	6.81	60.21	11.73	31.71

The result presented in Table 1 shows that for the group of 28 students taught using Inquiry Teaching Method who scored a pre-test mean of 28.50. There is substantial improvement in their performance after the treatment with a mean post-test score of 60.21. The post-test mean scores clearly showed that the Inquiry Teaching Method had over a 100 per cent positive improvement of the students' performance.

It is therefore safe to conclude based on the analysis that Inquiry Teaching Method highly improves the academic performance of BBC Trade students in Gombe state technical college.

**Research Question 2:** What is the mean difference between pretest and post-test mean score students taught Bricklaying, Blocklaying and Concreting using Demonstration Teaching Method

**Table 2:** Mean Scores of Pre-tests and Post-Tests of BBC Students Taught using Demonstration Teaching Method

Teaching Methods	N	Pre test		Post Test		Mean dif
		( $\bar{x}$ )	S.D	( $\bar{x}$ )	S.D	
Demonstration Teaching Method	22	30.27	4.99	48.73	10.30	18.45

Table 2 indicated a result for the group of 22 students taught bricklaying, blocklaying and concreting using Demonstration Teaching Method scored a pre-test mean of 30.27. There is an improvement after the treatment with a post-test mean score of 48.73. While the pre-test and post-test mean difference for the group is 18.45. This result shows that

Demonstration Teaching Method had the least percentage in improvement of BBC students' academic performance in this study.

**Research Question 3:** What are the mean scores of male and female students taught bricklaying, blocklaying and concreting using inquiry teaching method?

**Table 3:** Mean Difference of Male and Female Students Taught Bricklaying, Blocklaying and Concreting using Inquiry Teaching method

Teaching Methods	Gender	Pretest		Posttest		Mean Gain	
		N	Me	Sd	Me		Sd
Inquiry Teaching Method	Male	26	28.846	6.903	59.846	12.125	31.00
	Female	2	24.000	4.243	65.000	0.000	41.00
	Mean difference		4.846	2.660	-5.154	12.125	-10.00

The result in Table 3 shows that male students taught bricklaying, blocklaying and concreting using inquiry teaching method had a pre-test mean scores of 28.85, there is to a large extent improvement after the treatment with a post-test mean scores 59.85. The pre-test and post-test mean gain of the group is equal to 31.00. Therefore based on this result it shows clearly that there is a positive improvement in BBC students' academic performance. The counterpart female students taught bricklaying, blocklaying and concreting using the inquiry teaching method had the pre-test mean scores of 24.00 there is a

positive improvement after the treatment with a post-test mean scores 56.00. The mean gain of 41.00 is observed which shows the magnitude of the improvement between the pre-test and post-test in BBC students' academic performance. The post-tests mean difference of -5.15 is observed between the male and female BBC students taught using inquiry teaching method in Gombe state.

**Research Question 4:** What are the mean scores of male and female students taught bricklaying, blocklaying and concreting using demonstration teaching method?

**Table 4:** Mean Difference between Male and Female Students Taught Bricklaying, Blocklaying and Concreting using Demonstration Teaching Method.

Teaching Methods	Gender	Pretest		Posttest		Mean Gain	
		N	( $\bar{x}_1$ ) S.D	( $\bar{x}_2$ ) S.D			
Demonstration Teaching Method	Male	18	30.273	4.997	49.111	10.011	18.838
	Female	4	28.000	7.439	47.000	13.038	19.000
Mean Difference			2.273	-2.442	2.111	-3.027	-0.162

The result in Table 4 presents that for group of male students taught bricklaying, blocklaying and concreting using

demonstration teaching method had a pre-test mean scores of 30.27. There is to a large extent positive improvement after the

treatment with a post-test mean scores 49.11. The pre-test and post-test mean gain of 18.84 is obtained. Therefore based on this result it clearly shows a positive improvement in BBC students' academic performance. The corresponding female students taught bricklaying, blocklaying and concreting using the demonstration teaching method had the pre-test mean scores 28.00% there is also a positive improvement after the treatment with a post-test mean scores 47.00. The mean gain of 19.00 is observed which shows the extent of the improvement

between the pre-test and post-test in BBC students' academic performance. The post-tests mean difference of 6.89 is observed between the male and female BBC students taught using inquiry teaching method in Gombe state.

**Research Question 5:** What are the mean difference between the inquiry and demonstration teaching methods on students' performance in bricklaying, blocklaying and concreting?

**Table 5:** Mean Difference between Inquiry and Demonstration Teaching Methods on Students' Performance in Bricklaying, Blocklaying and Concreting

Teaching Methods	Experimental and Control Group	
	Pre-test ( $\bar{X}$ )	Post-test ( $\bar{X}$ )
Inquiry teaching Method	28.50	60.21
Demonstration Teaching Method	30.27	48.73
Mean Difference	= -1.77	= 11.48

The result in Table 5 presented the mean difference between the experimental and control groups of BBC students taught using inquiry teaching methods (experimental groups) and demonstration teaching method (control group). The pre-test mean difference of -1.77 was obtained between inquiry teaching method group (experimental group I) and demonstration teaching method (control) which means demonstration teaching method group supersedes inquiry group by

1.77. It is therefore, seen as the groups are equivalent. Based on this it is concluded that the two groups are equivalent for comparison. Furthermore, the post-test mean difference between the Inquiry teaching method (experimental group I) and demonstration teaching method (control group) is 11.48 which shows that inquiry teaching method group supersedes demonstration in term of improving students' academic performance in bricklaying, blocklaying and concreting in Gombe state technical colleges.

**Table 6:** Summary of one - way Analysis of Covariance (ANCOVA)

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1994.787 <sup>a</sup>	6	332.465	2.404	0.037	0.189
Intercept	8028.646	1	8028.646	58.044	0.000	0.484
Pretest	33.916	1	33.916	0.245	0.622	0.004
Teaching. Methods	968.371	2	484.185	3.500	0.036	0.101
Error	8575.850	42	138.320			
Total	227515.000	50				
Corrected Total	10570.638	49				

a. R Squared = .189 (Adjusted R Squared = .110)

**Hypothesis 1:** There is no significant difference in the performance of students' taught bricklaying, blocklaying and concreting using inquiry and demonstration teaching methods.

The result in Table 6 shows that F, (df = 2, 50) = 3.500, where p < 0.05, thus indicating the computed p-value 0.036 is less than 0.05 level of significant with a medium

effect size (partial eta squared = 0.101). Therefore, the null hypothesis is rejected meaning that there is a significant difference between the performance of students taught using inquiry and demonstration teaching methods. Hence, Bonferroni multiple comparison analysis was run for comparing the teaching methods in order to determine the teaching method that is responsible for the significant difference.

**Table 7:** Bonferroni Multiple Comparisons Analysis

(I) teaching methods	(J) teaching methods	Mean Difference (I-J)	Std. Error	Sig. <sup>a</sup>
Inquiry teaching Method	demonstration teaching method	13.980 <sup>*</sup>	5.459	0.039
demonstration teaching method	inquiry teaching method	-13.980 <sup>*</sup>	5.459	0.039

\*. The mean difference is significant at the 0.05 level.

Table 7 shows the results of Bonferroni Multiple Comparisons of treatments. The result indicates that inquiry is compared with demonstration teaching method the mean difference of 13.98 is obtained with a p-

value 0.039 indicating there is a significant difference in favour of inquiry teaching method.

**Hypothesis 2:** There is no significant difference between the performance of males

and females students taught bricklaying, blocklaying and concreting using inquiry and demonstration teaching methods.

**Table 8:** ANCOVA Test of Significant Difference in the Performance of Male and Female Students Taught Bricklaying, Blocklaying and Concreting using Inquiry and Demonstration Teaching Methods

Source	Type III Sum of Squares	Df	F	Sig.	Partial Eta Squared
Corrected Model	1994.787 <sup>a</sup>	6	2.404	0.037	.189
Intercept	8028.646	1	58.044	0.000	.484
Pretest	33.916	1	0.245	0.622	.004
Gender	19.678	1	0.1420	0.707	0.002
Error	8575.850	42			
Total	227515.000	50			
Corrected Total	10570.638	49			

The result in Table 8 shows that, F (df = 1, 50) = 0.1420, p > 0.05. Thus, the computed p-value (0.707) is greater than 0.05 level of significant, therefore, the null hypothesis of no significant difference is not rejected, which means there is no significant difference between male and female

bricklaying, blocklaying and concreting on the students' performance in BBC trade.

**Hypothesis 3:** There is no interaction effect of teaching methods and gender on bricklaying, blocklaying and concreting students' performance.

**Table 9:** Two - way Analysis of Covariance (ANCOVA) Test of Interaction Effect of Teaching Methods and Gender

Source	Type III Sum of Squares	Df	F	Sig.	Partial Eta Squared
Corrected Model	1994.787 <sup>a</sup>	6	2.404	0.037	.189
Intercept	8028.646	1	58.044	0.000	.484
Pretest	33.916	1	0.245	0.622	.004
Teaching methods	968.371	2	3.500	0.036	.101
Gender	19.678	1	0.1420	0.707	0.002
Teaching methods and gender	142.869	2	0.516	0.599	.016
Error	8575.850	42			
Total	227515.000	50			
Corrected Total	10570.638	49			

Result in Table 9 reveals that  $F$ , ( $df = 2, 50$ ) = 0.516,  $p > 0.05$ . Thus, the computed  $p$  - value (0.599) is greater than 0.05 level of significance. Therefore, the null hypothesis is not rejected meaning that there is no significant interaction effect of teaching methods and gender on students' performance in the BBC trade.

### FINDING OF THE STUDY

Based on the analysis of the data in this study, the following findings were made:

1. The bricklaying, blocklaying and concreting students taught using inquiry teaching method had a highest pretest and post-test mean difference of 31.71 followed by the demonstration method of teaching with the least post-test mean difference of 18.72,
2. The male students taught bricklaying; blocklaying and concreting using inquiry teaching method had a pre-test and post-test mean difference of 31.00. Likewise, the female counterpart taught bricklaying, blocklaying and concreting with the same teaching method had the the highest pre-test mean difference of 41.00%. Therefore, the female BBC students had the highest mean in inquiry teaching method.
3. The male bricklaying, blocklaying and concreting students taught using demonstration teaching method obtained a pretest and posttest mean difference of 18.84. They had an improvement of about 19.00 over the pretest mean gain. Therefore, the female BBC students had the highest mean difference compared to the male counterpart in demonstration teaching method.
4. When inquiry teaching method is compared with demonstration teaching method a mean difference of 13.98 was obtained with a  $p$ -value 0.039 indicating there is a significant difference in favour of inquiry teaching method.
5. There is a significant difference in the performance of students taught BBC using inquiry and demonstration teaching methods,  $F$ , ( $df = 2, 50$ ) = 3.500,  $p < 0.05$ , since the computed  $p$ -value 0.036 is less than 0.05 level of significance. The null hypothesis is rejected.
6. There is no significant difference between male and female bricklaying, blocklaying and concreting students' performance that were taught using inquiry and demonstration teaching methods,  $F$ , ( $df=1, 50$ ) = 0.1420,  $p > 0.05$ . Thus, the computed  $p$ -value (0.707) is greater than 0.05 level of significant, and then the null hypothesis of no significance difference is not rejected.
7. There is no significant interaction effect of teaching methods and gender on students' academic performance,  $F$ , ( $DF = 2, 50$ ) = 0.516,  $p > 0.05$ . Thus, the computed  $p$  - value (0.599) is greater than 0.05 level of significance. Therefore, the null hypothesis is not rejected.

### DISCUSSION

This study determined the effect of inquiry teaching methods on male and female students' performance in bricklaying, blocklaying and concreting trade in technical colleges. It also determines the interaction effect of teaching methods and gender. Over the years, the performance of bricklaying, blocklaying and concreting students' is below expectation particularly in the

practical skills performance, which might be attributed to teacher, centered teaching methods instead of students centered method of teaching. Adebayo (2010) states that, poor performance of many technical college students may be attributed to neglect, poor funding, and inadequate resources and inappropriate teaching methods. In this study, therefore, the researcher used students - centered teaching methods such as inquiry method of teaching and determined its effects on students' performance.

The findings showed that inquiry teaching methods were more effective than demonstration teaching method in improving students' performance in bricklaying, blocklaying and concreting trade (BBC). The superiority of the inquiry teaching method over demonstration teaching method could be attributed to the researcher interference. Therefore, the use of inquiry and teaching methods immensely assisted the students in acquiring knowledge and skills on bonding and foundations casting during the treatment. These findings agree with the finding of Omoka and Adejo (2015) which shows that the students taught using inquiry performed significantly better than those who taught using lecture method. Based on the results obtained, it could be concluded that inquiry teaching method can enable students see in their mind's eye abstract concepts, establish their thinking about the given topics, and learn the topics, concept and skills meaningfully.

The finding reveals that gender has no effect on the students' performance in bricklaying, blocklaying and concreting. This finding agrees with Natalie (2006) who noted that the gender psychological difference at birth for males and females are the same and

that it is the way they are treated that gives them what we consider as typical male and female characteristics. The result however contrasted with the finding of Ibrahim, Adisa, Abdulkadir, and Nene, (2013) who found that the male students performed better in bonding task (Flemish bond,) arch construction and construction of fire place and chimney stack task than the female students stereotyping roles.

The finding also shows that there is no interaction effect of teaching methods and gender on students' performance in brick/blocklaying concreting. The finding agrees with the finding of Olatoye, Aderogba and Aenu (2012) who found that the interaction effect of treatment, gender and self-concept on students' achievement in organic chemistry is not significant.

## CONCLUSION

Based on the findings of this study, it is therefore, concluded that the use of inquiry teaching method will highly improve students' performance in BBC trade. Nevertheless, demonstration teaching method also enhanced students' performance in bricklaying, blocklaying and concreting trade. The gender barriers of the students do not influence their performance in bricklaying, blocklaying and concreting. Students taught concepts and skills of foundation and bonding using inquiry and project teaching methods attained higher than those taught same concepts and skills did using demonstration teaching method. Therefore, technical teachers, bricklaying, blocklaying, and concreting teachers in particular if use inquiry teaching methods, the students' performance would be at the greatest high.

## RECOMMENDATIONS

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

1. The practice of inquiry teaching method, which is amongst the activity-based teaching methods, and students-centered method of teaching and learning bricklaying, blocklaying and concreting should be given consideration. Based on the results of this study it has clearly shown that inquiry teaching method improved students' performance drastically.
2. If demonstration method of teaching is combined with inquiry teaching method, there will be a great improvement on students' performance in bricklaying, blocklaying and concreting trade.
3. On-the-job training for technical teachers in form of workshops, seminars and conferences should be organized, on how to use inquiry-teaching method for better teaching of bricklaying, blocklaying and concreting skills and concepts.
4. There should be proper provisions of facilities, tools and equipment, which are necessary for teaching concept and skills in bricklaying, blocklaying and concreting trade effectively.

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