

Effects of Greeno Problem Solving Instructional Approach on Students' Academic Achievement in Blocklaying and Concreting in Technical Colleges in Rivers State

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Abstract

The study was carried out to examine the effects of Greeno Problem Solving Instructional Approach on students' academic achievement and interest in Blocklaying and Concreting in technical colleges in Rivers State. The study employed quasi-experimental design. The population for the study consisted of all 2015/2016 National Technical Certificate Class Two (NTC II) students from the four Technical Colleges in Rivers State, numbering 214; (150 males and 64 females). A sample of 124 was drawn from two technical colleges offering Blocklaying and Concreting using purposive sampling techniques. Two instruments were used for data collection in this study. They were the Blocklaying and Concreting Achievement Test" (BCAT) and "Blocklaying and Concreting Interest Inventory" (BCII) which were developed by the researchers. Three experts validated the instruments; one drawn from the Department of Industrial Technical Education, University of Nigeria, Nsukka and two from Department of Technical Education Ignatius Ajuru University of Education, Port Harcourt. Kuder Richardson formula 20 (K – R20) technique was used to estimate the internal consistency of Blocklaying and Concreting Achievement Test (BCAT) which yielded 0.80, while Cronbach Alpha was used to estimate the internal consistency of Blocklaying and Concreting Interest Inventory" (BCII) and it yielded 0.94. The research questions were answered using mean and standard deviation. The hypotheses were tested at 0.05 level of significance, using analysis of covariance (ANCOVA). The findings of the study revealed that students taught with Greeno problem solving instructional approach had higher mean achievement score than those students taught using the conventional lecture method in the achievement test and likewise the interest inventory test. The study recommended amongst others that Blocklaying and Concreting teachers should be encouraged to employ GPSIA in the teaching of the subject in all classes in technical colleges.

Keywords: *Greeno Problem Solving, Instructional Approach, Blocklaying and Concreting, Academic Achievement*

Introduction

Teachers continually face the difficult challenges of teaching that produces successful students. Education continues to be the driving force for change in the world. For a nation like Nigeria that is making serious strides towards scientific and technological advancement, it is essential that teaching and learning must first and foremost be put into consideration (Caine and Caine, 2010). In the same vein, Okafor (2011) stated that to achieve scientific and technological advancement, the role of education sector must be considered. Federal Government of Nigeria, (2013), spelt it out that the greatest instrument that Nigeria can make for quick development of its economic, political, social and human resources is through technical education.

Blocklaying and Concreting is one of the trades taught in Technical Education in Technical Colleges. Blocklaying and Concreting deals with the study and application, design as well as the construction of buildings for human habitation and comfort (Ezeji, 2010). Despite the good intent of Blocklaying and Concreting trade programme, the number of students who passed below credit level in Blocklaying and Concreting in the various Technical Colleges was far above those who passed at credit level and above (NABTEB, 2010). This is informed by the fact that academic achievement rests more on the type of instructional technique adopted by the teacher.

Academic achievement of students in Blocklaying and Concreting in National Technical Certificate (NTC) examinations has not been very good. NABTEB (2014), summarized NTC May/June results for the past 4 years stands thus: in 2010, the rate of failure of students that sat for Blocklaying and Concreting in Rivers state was 56%, in 2011, the rate of failure was 50%; in the year 2012, the rate of failure was 42.72% and the year 2013, the rate of failure was 47.25%. Academic achievement is the performance level of students in test or examinations administered in a school or college setting in a given subject or course. According to Akinson and Feather (2012), student's academic achievement is conceived as a latent disposition which is manifested in overt striving only when the individual perceives performance as instrumental to a sense of personal accomplishment. Furthermore, Krebs (2010) stated that one of the techniques used in evaluating the academic performance of learners is the achievement test and that the scores students obtained in an achievement test are supposed to be representative of the extent to which the characteristics being measured by the test are present in the test instruments. It is therefore, relevant that the test items, also emphasize the high cognitive levels of application, synthesis and evaluation, hence these will expose the students to critical thinking.

Interest is a persisting tendency to pay attention and enjoy some activities. Interest is viewed as an emotionally oriented behavioural trait which determines a student's vim and vigour in tackling educational programmes or other activities (Chukwu, 2010). Ogbonna (2009) opined that interest as a social construction developing within the dynamic relationship between the individual and the situation. Student's interest in any learning activity is sustained by the active involvement of the learner in all aspects of the learning process.

Conventional lecture method of teaching (CLM) is a common strategy teachers adopt in teaching Blocklaying and Concreting in Technical Colleges these days. Gbamaja (1991) referred to conventional lecture method of teaching as the "talk and chalk" or "textbook method". Gbamaja, further said that conventional lecture method allows the teacher to dominate the teaching with little participation on the part of the learners. Nandi, Chan, Chan & Chan (2011), saw conventional lecture method of teaching as teacher-centered method and comprises large group lectures, tutorials, structured laboratory experience and periodic tests of achievement. In conventional lecture method, the teacher does whatever the learners are

expected to do at the end of the lesson and showing them how to do it and explaining the step by step process to them (Ameh, Daniel and Akus, 2011).

Therefore, in order to improve academic achievement of the students when teaching Blocklaying and Concreting, it is imperative for the teacher to give proper and adequate attention especially in the choice of method(s) appropriate to facilitate a better understanding of the subject matter (Adah and Ameh, 2010). Hence the use of Greeno problem solving instructional approach.

Greeno problem solving instructional approach has been defined by many educationists in various ways with regard to its philosophical and psychological backgrounds. Flowers (2010), defined Greeno problem solving instructional approach as an insightful or initiative process involving the perceptual processes of the solver. Omalle (2011) maintained that Greeno problem solving instructional approach is more effective in the sciences like physics and mathematics and may likely be used in vocational and technical subjects. Mundi (2011) emphasized that in Greeno problem solving instructional method, the students are instructed and provided with questions from the teacher to discover Blocklaying and Concreting concepts. Studies carried out tend to indicate that Greeno problem solving instructional approach has the potential for helping students to achieve and to gain interest in a lot of subjects. It may have the same potential on students' interest in the study of Blocklaying and Concreting. The schools in the study are made up of either males or female, hence, the need to see what effect gender has on students' achievement in Blocklaying and Concreting using Greeno problem-solving instructional approach. Gender refers to a term, which describes behaviours and attributes expected of individuals on the basis of being a male or a female (Okeke, 2009). Colman (2010), defined gender as a behavioural pattern and attitude perceived as masculine and feminine within a culture. There is a general belief that boys are superior to girls in terms of cognition and logical reasoning and even superior in academic reasoning (Anigbogu, 2011).

Statement of Problem

Learning is the primary purpose of teaching. The teaching of Blocklaying and Concreting requires appropriate instructional methods, as their proper application is essential for facilitating the achievement of the set objectives. The experience of the teacher and adoption of appropriate methodology in teaching greatly help in promoting effectiveness and consequently students' academic achievement, interest and retention. In order to improve the academic achievement, interest and retention of students in Blocklaying and Concreting there is the need to turn from the conventional lecture method to the modern teaching method like Greeno Problem-Solving Instructional Approach (GPSIA) which is sparingly used by teachers of applied sciences in the teaching of basic knowledge in schools which has not been used in teaching Blocklaying and Concreting in Rivers State.

Based on the foregoing, the question that this study intends to answer is: could the Greeno Problem-Solving Instructional Approach enhance students' achievement, interest and retention in Blocklaying and Concreting in Technical Colleges in Rivers State?

Purpose of the Study

The purpose of the study was to determine the effects of Greeno problem-solving instructional approach on students' academic achievement and interest in Blocklaying and Concreting in Technical Colleges in Rivers State. Specifically, the study sought to determine the:

1. Effect of Greeno problem solving instructional approach on students achievement in Blocklaying and Concreting.

2. Effect of Greeno problem solving instructional approach on students interest in Blocklaying and Concreting.

Research Questions

The following research questions were posed to guide the study:

1. What is the effect of Greeno problem solving instructional approach on students' achievement in Blocklaying and Concreting?
2. What is the effect of Greeno problem solving instructional approach on students' interest in Blocklaying and Concreting?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance

H₀₁: There is no significant difference between the mean achievement scores of students taught with Greeno problem solving instructional approach and those taught with conventional lecture method in Blocklaying and Concreting.

H₀₂: There is no significant difference between the mean interest scores of students taught Blocklaying and Concreting with Greeno problem solving instructional approach and conventional lecture method.

Methods

The study employed a quasi-experimental research design. The population for the study consisted of all 2015/2016 National Technical Certificate Class Two (NTC II) students from the four Technical Colleges in Rivers State, numbering 214: The 214 is made up of 150 males and 64 females (Planning, Research and statistics (PRS) Department, Post Primary schools Management Board, Rivers State Ministry of Education, 2015). The sample for this study was 124 National Technical Certificate Two (NTC II) students drawn from two Technical Colleges offering Blocklaying and Concreting using purposive sampling techniques. Two instruments were used for data collection in this study. They were the Blocklaying and Concreting Achievement Test" (BCAT) and "Blocklaying and Concreting Interest Inventory" (BCII) which were developed by the researcher. Blocklaying and Concreting Achievement Test (BCAT) was developed by the researcher to assess students' achievements in the experimental and control groups (GPSIA and CLM) respectively. BCAT consisted of 40 multiple choice questions based on Technical College, Blocklaying and Concreting curriculum content for National Technical Certificate Two (NTC II) students. Each item has five alternative answers. Each correct answer has one point while each incorrect answer is zero point. The instruments were validated by three experts; one from the Department of Industrial Technical Education, University of Nigeria, Nsukka and two from Department of Technical Education Ignatius Ajuru University of Education, Port Harcourt. Reliability coefficient of Blocklaying and Concreting Achievement Test (BCAT) was carried out to estimate the internal consistency using Kuder Richardson formula 20 (K – R 20) technique.

The instrument was pilot-tested on 40 NTC II Blocklaying and Concreting Students of Government Technical College, Ahoada, Rivers State. These students' scores were used to compute the coefficient of internal consistency of the BCAT which was found to be 0.80. The reliability of BCII was determined by computing the Cronbach Alpha internal consistency coefficient of the pilot scores of the items. The test was carried out on the same students used in BCAT. Cronbach Alpha is used here because the homogeneity of items is determined and is reliable. The internal consistency estimate of BCII using Cronbach Alpha technique was found

to be 0.94. The research questions were answered using mean and standard deviation. The hypotheses were tested at 0.05 level of significance, using analysis of covariance (ANCOVA).

Results

Research Question 1

What is the mean achievement score of students taught using Greeno problem solving instructional approach and those taught using conventional lecture method in Blocklaying and Concreting?

Table 1

Mean of Pretest and Posttest Scores of Treatment and Control Groups Taught Blocklaying and Concreting using Greeno Problem Solving Instructional Approach and Conventional Lecture Method

Group		N	Pretest \bar{X}	S.D	Posttest \bar{X}	S.D	Mean Difference	Mean Gain
Greeno Solving Approach (Experimental)	Problem Solving Instrumental Approach	62	45.15	3.16	73.08	2.97	27.93	10.47
Conventional Lecture Method (Control)	Conventional Lecture Method (Control)	62	44.15	3.06	61.61	2.68	17.46	

Source: *Authors (2020)*

The results in Table 1 show that the experimental group taught Blocklaying and Concreting with Greeno Problem Solving Instructional Approach had a mean score of 45.15 in the pre-test and a mean score of 73.08 in the post-test, making a pretest, posttest mean gain of 27.93. The control group taught Blocklaying and Concreting with conventional lecture method had a mean score of 44.15 in the Pretest and a posttest mean of 61.61 with a pretest, posttest mean gain of 17.46. With these results, students taught Blocklaying and Concreting with Greeno Problem Solving Instructional Approach had a higher mean achievement score than those taught with conventional lecture method in the Blocklaying and Concreting achievement test.

Research Question 2

What is the effect of Greeno Problem Solving Instructional Approach on students' interest in Blocklaying and Concreting?

Table 2

Mean of Pretest and Posttest Scores of Experimental and Control Groups Taught Blocklaying and Concreting with Greeno Problem Solving Instructional Approach and Conventional Lecture Method in the Achievement Interest Inventory

Methods		N	Pretest \bar{X}	S.D	Posttest \bar{X}	S.D	Mean Difference	Mean Gain
Greeno Solving Approach (GRSIA)	Problem Solving Instrumental Approach (GRSIA)	62	17.09	2.95	42.21	7.40	25.12	8.31
Conventional Lecture Method (CLM)	Conventional Lecture Method (CLM)	62	11.59	2.19	28.40	4.63	16.81	

Source: *Authors (2020)*

The results in Table 2 show that the experimental group had a mean score of 17.09 in the pretest and a mean interest score of 42.21 in the posttest, making a pretest, posttest mean interest gain of 25.12. The control group taught Blocklaying and Concreting with conventional lecture method had a mean interest score of 11.59 in the Pretest and a posttest interest mean of 28.40 with a pretest, posttest mean interest gain of 16.81. With these results, students taught Blocklaying and Concreting with Greeno Problem Solving Instructional Approach had a higher mean interest score than those taught with conventional lecture method in the Blocklaying and Concreting interest inventory.

Hypotheses

H0₁: There is no significant difference in the mean achievement scores of students taught with Greeno problem solving instructional approach and those taught with conventional lecture method in Blocklaying and Concreting.

Table 3

Summary of Analysis of Covariance for Test of Significance of Three Effects: Treatment, Gender and Interaction Effect of Treatments and Gender on Students Achievement in Blocklaying and Concreting

Source	Sum of Squares	Df	Mean square	F	Sig.
Corrected Model	433L354a	4	1082.8385	17.137	.000
Intercept	2101259	1	2101.259	266.043	.000
PRE	1.228	1	1.228	.155	.694
Group	287.776	1	287.776	36.436*	.000
Error	718.735	98	7.898		
Total	567463.000	124			
Corrected Total	5050.089	123			

Source: *Authors (2020)*

Significant at sig of 11 < .05

The data in Table 3 show the F-calculated values for group and interaction effect of treatments on students' achievement in Blocklaying and Concreting. The F-calculated value for group is 36.436 with a significance of F at .000 which is less than .05. The null hypothesis is therefore rejected at .05 level of significance. With this result, there was a significant difference between mean achievement scores of students taught Blocklaying and Concreting with Greeno problem solving instructional approach and those taught with conventional lecture method.

H0₂: There is no significant difference in the mean interest scores of students taught Blocklaying and Concreting with Greeno problem solving instructional approach and those taught with conventional lecture method in building construction.

Table 4

Summary of Analysis of Covariance for Test of Significance of Three Effects: Treatment Gender and Interaction of Treatment and Gender on Students' Interest in Blocklaying and Concreting

Source	Sum of Squares	Df	Mean square	F	Sig.
Corrected Model	7432.558 ^a	4	1858.1395	9.327	.000
Intercept	2582.420	1	2582.420	81.016	.000

PRE	21.146	1	21.146	.663	.417
Group	8.538	1	8.538	.575*	.010
Error	3123.797	98	31.875		
Total	165128.000	124			
Corrected Total	10556.355	123			

Source: *Authors (2020)*

Significant at sig of $F < .05$

Table 4 shows F-calculated for group, gender and interaction of treatment and gender on students' interest in Blocklaying and Concreting. The F-calculated for group is .575 with a significance of F at 0.010 which is less than 0.05. Hence, the hypothesis of no significant difference between mean interest scores of students taught Blocklaying and Concreting with Greeno problem solving instructional approach and conventional lecture method was rejected at 0.05 level of significance.

Discussion of Findings

The data presented in table 1 provided answer to research question one. Finding reveals that students taught with Greeno problem solving instructional approach had higher mean achievement score than those students taught using the conventional lecture method in the achievement test. In the same vein, analysis of covariance was used to test the first hypothesis, Table 3, at the calculated F-value (36.436), significance of F (0.000) and confidence level of .05 there as a statistically significant difference between the mean scores of the group taught with Greeno problem solving instructional approach and those students taught using the conventional lecture method in the achievement test. The implies that Greeno problem solving instructional approach is more effective than conventional lecture method in enhancing students' achievement in Blocklaying and Concreting. The finding agreed with the finding of Igwe (2011) who found that students taught basic electronics with tutorial, drill and practice methods of computer assisted instruction had a higher mean achievement scores than those students taught using the conventional teaching method in the achievement test Greeno problem solving instructional approach has been found effective in subjects such as foreign languages, psychology education among others.

Table 4 revealed that students taught Blocklaying and Concreting with Greeno problem solving instructional approach had higher mean interest scores than those students using the conventional lecture method in the interest inventory items. Analysis of covariance was used to test the hypothesis on interest, Table 4 at the calculated F-value (.575), significance of F (.010) and significance level of .05 there was a statistically significant difference between the mean scores of the group taught with Greeno problem solving instructional approach and those students taught using the conventional lecture method in the interest inventory. The finding indicates that Greeno problem solving instructional approach is more effective in stimulating students' interest in Blocklaying and Concreting than the conventional lecture method. The finding agreed with the finding of Adebayo (2014) who conducted a study on comparative effects of computer simulation and tutorial techniques on achievement, interest and retention of automechanics students in technical colleges in Lagos State where it was found out that students taught automechanics with computer simulation had higher mean interest scores than other control group.

Conclusion

From the findings, the researcher made the following conclusions:

1. This study indicated that the use of Greeno problem solving instructional approach did produce a higher level of academic achievement in Blocklaying and Concreting by NTC II students in the schools used for the study than the conventional lecture method.
2. There was a statically significant difference between the experimental group and the control group.
3. The students' achievement indicated high level of confidence that the treatment in the study was responsible for any gain made by the experimental group.

Recommendations

The following recommendations were made based on the findings of this study:

- (1) Since the use of GPSIA has been found to enhance the quality of achievement and interest in Blocklaying and Concreting, Blocklaying and Concreting teachers should be encouraged to employ it more in the teaching of the subject in all classes in technical colleges.
- (2) There should be seminars, conferences and workshops organized by government and professional bodies like the Nigeria Association of Teachers' of Technology (NATT) on the use of GPSIA.

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