EFFECT OF CONSTRUCTIVIST BASED TEACHING STRATEGY ON JUNIOR SECONDARY SCHOOL STUDENTS` ACADEMIC PERFORMANCE IN MATHEMATICS IN OGUN STATE

By

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Abstract

The study investigated the effect of the Constructivist Based Teaching Strategy on junior secondary school students` performance in Mathematics in Ijebu-East Local Government Area of Ogun State. The study employed a pre-test, post-test, and non-random control group quasi-experimental research design. 100 (46 male and 54 female) junior secondary school students with two hypotheses were generated. A 20-item Mathematics Performance Test (MPT) was used to gather data. A reliability coefficient of 0.82 was obtained using split-half coefficients *Data collected were analyzed using descriptive statistics such as mean, and standard deviation while inferential analysis was t-test and Analysis of Covariance (ANCOVA). The results revealed that there is no significant difference in the mean performance of the students before the treatment was applied, and also significant mean difference existed between the two groups after the treatment was introduced. Based on these findings, the study recommended among others that there is a need for mathematics teachers to approach the teaching of mathematics with more innovative approaches such as a Constructivist Based Teaching Strategy to develop students' performance in the subject.*

Keywords: Constructivist-Based Strategy, Mathematics, Performance, Secondary School

Introduction

The hunt for scientific knowledge has led to science education. Science education according to Aina (2013), is the transferring of science content and processes to individuals who are not conventionally considered to be members of the scientific community. Holbrook (2011) described science education as what is to do with science education in schools for students to become scientists, acquire factual knowledge and skills, and also be able to manipulate scientific knowledge, methods and skills for the benefit of the learners. This quest for scientific knowledge has produced many discoveries and innovations such as advanced means of communication, means of transportation and many other things that have made the world a global village (Mobolaji, 2017).

However, scientific literacy without mathematics or its knowledge could be a mirage, as mathematics unlock the door to technological breakthroughs and developments. Therefore, any purposeful and productive development anywhere in the world must has a solid scientific and mathematical background. Today, there are different definitions by scientists

of what mathematics is about. According to Oyedeji (2000), mathematics is the expression of what lies in the subconscious and mental activity of man. It was further explained that it is the branch of knowledge that seeks to enhance human perception and its immediate surroundings using a clear, logical, precise, and exact thought process. Ifamuyiwa (2019) defined mathematics as a creative language, tool, art and process. Davis, Maher, and Noddings (2011) held that mathematics is the study of patterns and relationships expressed in numbers or symbols. Akanni (2015) also described mathematics as a field of symbolic representation of ideas and relationships, and a tool for conducting logical investigations to implement different ideas.

In general, mathematics is a subject that acts as a bridge to all knowledge, be it mathematical or non-mathematical. The relevance of the subject has established its compulsory status in primary and secondary school curricula, and also a record of achievement being passed as a prerequisite before students could be considered for admission to any course or program in higher education institutions in Nigeria (Aminu, 2018).

Despite the relevance of mathematics to individuals and the nation at large, students learning outcomes (cognitive, affective, and psychomotor domains) at all levels of education in Nigeria continued to vary, leading to poor performance (Bature, 2020). This can be attested to in Table 1.1

Table 1.1 Students' Performance in Senior Secondary School Certificate Examination in Mathematics between 2012 and 2021

Years	Total entry	Total Obtained Credits & Above (A1-C6)	% Obtained Credits & Above (A1-C6)	Total Obtained (D7-F9)	% Obtained (D7-F9)
2012	1,675,224	819,390	49.00	852,834	51.00
2013	1,543,683	555,726	36.00	987,957	64.00
2014	1,692,435	529,732	31.30	1,162,703	68.70
2015	1,593,442	544,638	34.18	1,048,804	65.82
2016	1,544,234	597,310	38.68	946,924	61.32
2017	1,559,162	666,074	42.72	893088	57.28
2018	1,572,196	785,883	49.98	786,513	50.02
2019	1590173	1020519	64.18	669,654	35.82
2020	1,538,445	1,003,668	65.24	569,654	34.76

2021	1,560261	1,274,733	81.70	285,528	18.30

Source: *Test Development Division WAEC Office, Lagos. (Downloaded 08/02/2022).*

Table 1.1 shows the summary of students' performance in mathematics between 2012 and 2021 in the West African Senior Secondary School Examinations Certificate (WASSCE). Column 4 shows the summary Percentage of students' grades from grades A1-C6, that is, those who passed with credit, while column 6 shows the number and percentage of students who had F_9 throughout the federation. Summarily, it is realized that throughout the ten years under review, the percentage of students who scored at least a credit pass is less than 45.0% while the failure rate is 55.5%. this indicates that the failure rate is still higher than the pass rate.

The appalling performance implies that in ten years less than 50% who made a credit pass in Mathematics are qualified to seek admission into the university and other allied tertiary institutions. This is worrisome, for it has very strong implications for the study of science subjects/courses at institutions of higher learning. To improve mastery of Mathematics, there is a need to find methods and techniques to make learning more meaningful. It is in this light the study focuses on the effect of the constructivist-ased teaching strategy on students' performance in Mathematics.

Constructivism is a learning strategy that emphasizes the active role of learners in building their knowledge. Constructivism is a learning approach in which students learn by interpreting a message in an immediate environment. According to Schunk (2000), constructivism is a doctrine that holds that learning and understanding take place in context and learners shape or construct most of what they learn and understand as a function of their experience in a learning situation. The fundamental problem with constructivist learning is that individuals construct their concepts in a particular environment.

Given the compelling nature of the constructivist approach to learning, researchers in the science field have advocated the application of constructivism in a science classroom, particularly in math classrooms. Mathematics didactic researchers are therefore faced with the challenge of examining and certifying the actual constructivist-oriented teaching strategy for the mathematical performance of students

Statement of the Problem

The persistent failure in mathematics such as WASSCE, SSCE and other examination bodies over the years has caused mathematics teachers to worry about how to improve the teaching and learning of the subject. Previous researchers have identified the problems of teaching/learning mathematics, particularly at the junior secondary level, as well as the difficulties teachers face when choosing teaching/learning strategies in other subjects. In the case of mathematics, little has been done, particularly at junior secondary level. Hence the need for this study. This study was therefore designed to examine the effect of

constructivism-based teaching strategies on students` performance in mathematics in Ijebu-Ode local government Area of Ogun State.

Purpose of the study

The main purpose of the study is to effect of constructivist-based teaching strategy on junior secondary school students` academic performance in mathematics in Ogun State. Specifically, the study intends to find out:

i. If there is significant mean difference in the academic performance of the students` before the treatment was given
ii. If there is significant effect of treatment on students` achievement in Mathematics

Hypotheses

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

Ho1: There is no significant mean difference in the academic performance of the students` before the treatment was given

Ho2: There is no significant effect of treatment on students` achievement in Mathematics.

Methodology

This study adopted the quasi-experimental design. Specifically, the study was a non – equivalent control group design. The design is presented diagrammatically as shown below.

N O_1 X O_2
N O_1 O_2

Where O_1 means before treatment
O_2 means after treatment
X means treatment

A sample of 100 JSS 2 students 46 male and 54 female participated in the study. A purposeful sampling technique was employed to sample two (2) co-educational schools from the Ijebu-Ode local government Area in Ogun State. Out of the two schools selected, one school was randomly assigned to the experimental group, and the other was assigned to the control group. In each school, A purposeful sampling techniques was used to select fifty students each. The experimental group was exposed to a constructivist-based teaching strategy, while the control group was taught the conventional method.

The instrument used for data collection was Mathematics Performance Test (MPT). The MPT consists of two sections, section A sought demographic data of the respondents which include the name of schools, Age, Gender, etc. Section B is a four-option multiple-choice item. An initial pool of forty (40) questions was drawn to cover JSS II topics taught in mathematics. The items were from the past questions of the Junior School Certificate Examination that corresponded with the topics covered by the researcher.

To determine the content and face validity of the instrument, the test items were given to two other experts in the field of study to ensure that the questions were error-free and

measured what it is supposed to measure before final administration. Their suggestions were used to correct the test items which were then trial-tested on JSS II students from another school not taking part in the study. From the responses collected, discriminating and difficulty indices were calculated and used to remove items adjudged inadequate resulting in 20 items. Split-Half coefficients were calculated and reliability coefficients of 0.82 were realized.

Data Analysis

Data analysis in this study involved the use of both descriptive and inferential statistics. Mean and standard deviation scores are the descriptive statistics used to show estimates of the pre-test and post-test scores in Mathematics. The two hypotheses formulated were tested using the t-test and Analysis of covariance at a 0.05 level of significance.

Experiment

The constructivist-based teaching strategy was used in teaching the participants in the experimental group while the conventional approach (Chalk and Talk strategy) was used in the control group. Mathematics teachers were used as research assistants in experimenting. At the onset of the experiment, a pre-test was administered to both the experimental and control groups. The experiment was carried out during normal school hours using the school timetable. At the end of the experiment which lasted for three weeks, a post-test was administered to the students in both the experiment and control groups. The results collated were used in answering the tested hypotheses.

Result

Ho1: There is no significant mean difference in the academic performance of the students` before the treatment was given

Table 2: T-test summary of pretest scores

	N	Mean	Std. Deviation	Std. Error Mean	df	Sig, level
Experimental Group	46	9.83	2.559	.377	98	0.519
Control Group	54	9.50	2.471	.336		

Significant at 0.05

To establish the achievement level of the students before the treatment, the two groups were pre-tested. Table 2 shows a mean value of 9.83 and a standard deviation of 2.559 for experimental group, while the control group has a mean value of 9.50 and a standard deviation of 2.471. However, the significant value of 0.519 which is greater than .05 indicates that no significant difference in the mean academic performance of the students before the treatment was given. It shows the homogeneity of the groups.

Ho2: There is no significant effect of treatment on students` achievement in Mathematics.

Table 3: Summary of Analysis of Covariance of Students' Performance in Mathematics According to Treatment.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	930.465[a]	2	465.233	172.128	.000	.780
Intercept	930.673	1	930.673	344.332	.000	.780
Pre-Test	.575	1	.575	.213	.646	.002
Treatment	930.431	1	930.431	344.243	.000	.780
Error	262.175	97	2.703			
Total	16668.000	100				
Corrected Total	1192.640	99				

a. R Squared = .780 (Adjusted R Squared = .776)

Table 3 presents the summary of the Analysis of Covariance (ANCOVA) test on the effect of treatment on the students' scores in Mathematics. Table 3 shows the outcome of the main effects of the two levels of the treatment used in the study. The result shows significant main effect of treatment ($F_{(1, 97)} = 344{,}243$ $P < 0.05$). This implies that there is a significant difference in the mean post-test achievement scores of the students after exposure to the two levels of treatment. As a result, null hypothesis two is rejected. This is graphically expressed in figure 1

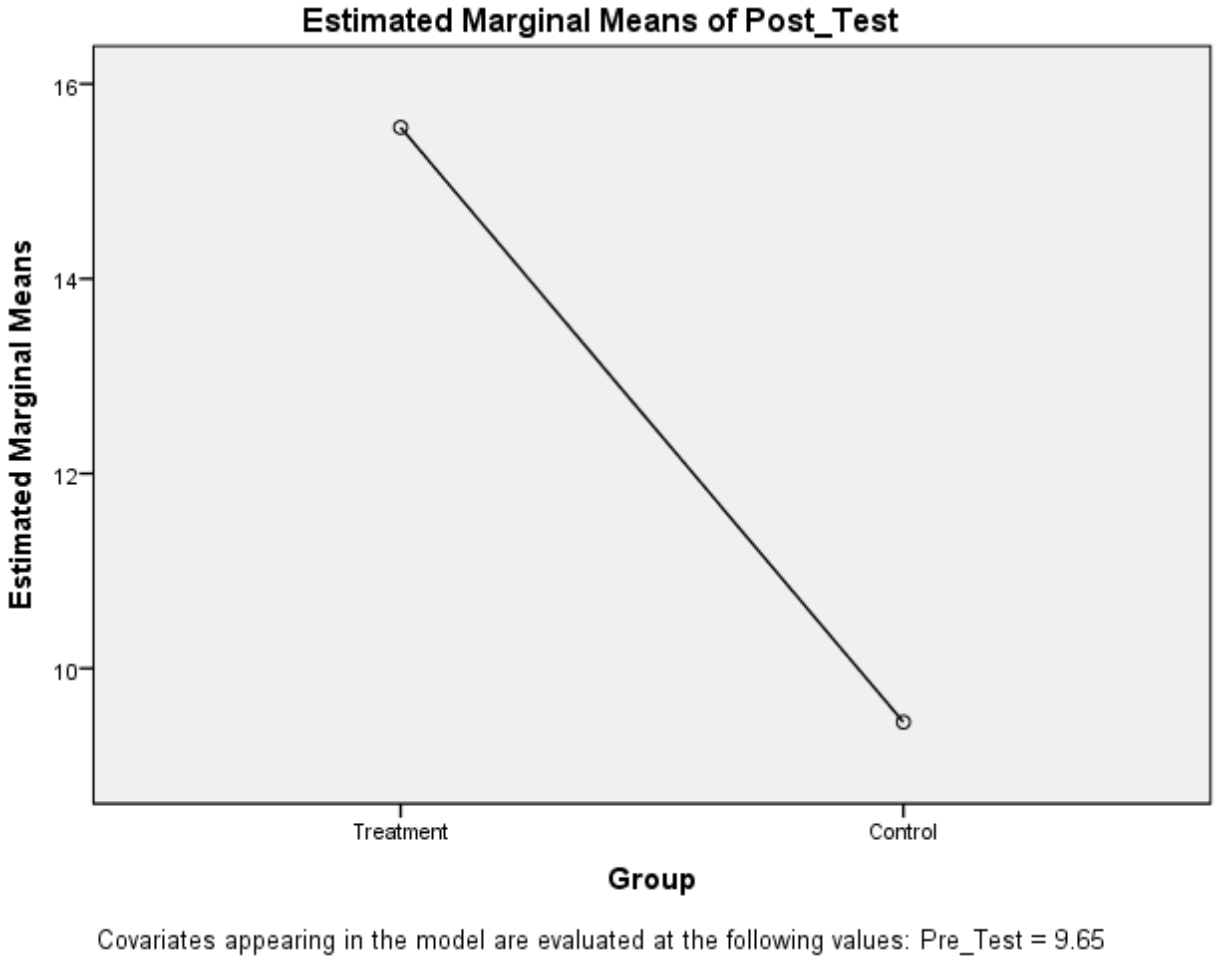

Figure 1 revealed a mean of 15.55 for treatment and a mean value of 9.45 for the control group

Discussion

The result of hypothesis 1 shows that there was no significant mean difference in the academic performance of the two groups of students before the commencement of the treatment. It reveals the homogeneity of the groups. The implication is that given the same academic environment, treatment and exposure, they are likely to perform at the same level.

Hypothesis 2 shows a significant difference between the mean academic performance of students who are exposed to a constructivist-based teaching strategy. This confirms that the treatment given had some effect on their performance. The outcomes of the findings provided a clear-cut endorsement for the treatment group. The outcome of the study is in line with the study of Nwafor and Aja (2017); Oludipe and Oludipe (2010), who reported that the constructivist instructed students had higher scores compared to those exposed to conventional strategy.

Conclusion

Research has shown that many students struggle with some mathematics concepts, as demonstrated in the pre-test. This low conceptual understanding was due to the traditional methods of teaching mathematics, as the method does not encourage creativity and critical thinking in mathematics teaching. The subject of mathematics is not static, so the teaching method should also be dynamic. Mathematics teachers need to be familiar with the tendencies of events as knowledge is passed on to learners in order to bring about a desirable change. Therefore, for math learning to be meaningful and enduring, math teachers need a very solid understanding of different methods to ensure learning takes place.

Recommendations

Given the result of the study, the following recommendations are made

i. There is a need for Mathematics teachers to approach the teaching of Mathematics with more innovative approaches such as constructivist-based teaching strategies to develop students' interest in the subject.
ii. Mathematics teachers should design a diverse range of teaching, learning, and assessment approaches that recognize and support the needs of students both as individuals and as members of a learning community
iii. Seminars, Workshops, and conferences should be organized more frequently for Mathematics teachers, to update their knowledge on the use of students-centred learning strategies as demonstrated by the present study

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