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Research Article

ANALYZING LEARNING OUTCOMES AND STUDENTS PERFORMANCE IN GEOMETRY AMONG SENIOR SECONDARY SCHOOLS FOR SCIENCE, TECHNOLOGY, EDUCATION AND MATHEMATICS (STEM) COMMUNITY DEVELOPMENT

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ABSTRACT

Most of the twentieth century mathematical literature has been predominantly on algebraic processes. These indicate that they were rather relegation of the explanations of the deep processes of understanding and learning mathematics especially geometry. Therefore, the study was designed to examined and braked information into parts by identifying motives of analyzing learning outcomes on students' performance in geometry among Senior Secondary Schools students in Maiduguri Metropolis, Borno State. The objective was to determined effect of analyzing learning outcomes and the null hypothesis was analyzing learning outcomes does not have significant effect on student performance in geometry among Senior Secondary Schools in Maiduguri Metropolis, Borno State. A comparison group before-after quasi-experimental design was adopted and a sampled of 180 students' were selected using stratified random -sampling techniques from three selected senior secondary school in Maiduguri Metropolis. Pre-test and post-test with alpha calculated of 0.675 were derived from Mathematics Performance Test (MPT) using the test retest as an instrument for data collection. Mean, standard deviation and Analysis of Covariate (ANCOVA were used in analyzing the data. The paper found that analyzing learning outcomes has significant effect on students' performance in geometry education curriculum issue among senior secondary schools. Therefore, students' who sued analyzing learning outcomes is likely to be related to higher quality of learning and performance in solving geometry problems. the study therefore, recommended that an index of solution to the poor geometry performance in Nigeria is suggested as the adoption of analyzing learning outcomes when teaching geometry among senior secondary schools.

INTRODUCTION

These indicate that the explanations of the deep processes of understanding and learning mathematics were rather the twentieth century mathematical literature depicts that mathematics education concerned on mathematics curriculum, predominantly on algebraic processes etc. It indicates that the explanations of the deep processes includes the frameworks which define specific mathematical activity, the cognitive functions of thought in mathematical thinking, mathematical learning, mathematical understanding, mathematical connections between reference domains and symbols systems; connection between the deductive mathematics of theorem proving, the inductive mathematics of doing constructions, mathematical structures and symbol structures; empirical mathematics proofs. The cognitive architecture connections between deductive and empirical mathematics such as, vision and visualization, how visualization works toward understanding, how can the relevant visual features be discriminated? Visualization and figural processing, transitional visualization and development of the coronation of registers of representation of understanding and learning mathematics were rather neglected. These processes include geometry topics tend to be best developed in context of high interaction, collaboration with analyzing learning outcomes. Furthermore, analyzing learning outcomes allows students learn or construct their own ideas based on Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations on their own perceptions (Confrey & Kazak 2005; Quale 2002; von Glasersfeld).

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In appreciation of the role of geometry education to the development of Science, Technology, Education and Mathematics (STEM), researches in developmental psychology, new technologies and new requirements in assessment have been very sensitive to needs of changes over the last fifty years in Mathematics education. To them mathematics education for the past decades were more concerned on mathematics curriculum and concept acquiring at each level of the curriculum; have mere reference to general theories of learning, descriptions of student's activity in classroom and on means of teaching; and most of the twentieth century mathematical literature has been predominantly on algebraic (Jones, 1998; Duval 2006; Deliyianni, Elia Gagatsis, Monoyiou and Panaoura, 2009; Kaur, 2015). These indicate that the explanations of the deep processes of understanding and learning mathematics were rather neglected. These processes include the frameworks which define specific mathematical activity and the cognitive functions of thought that play role in mathematical thinking, learning and a way of understanding of mathematics (Schoenfeld, 1986; Duval, 1995b; Duval and alii, 1999; French National Assessment, 1992 and 1996; Duval, 1995a; Pavlopoulou, 1993; and Damm, 1992).

Others were virtual connections between reference domains and symbols systems, any connection between the deductive mathematics of theorem proving and the inductive mathematics of doing constructions, the kind of operative connections between deductive and empirical mathematics, proofs and constructions, between mathematical structures and symbol structures, the cognitive architecture by which the students can make objective connections between deductive and empirical mathematics. For instance, vision and visualization, how visualization works toward understanding, how can the relevant visual features be discriminated? visualization and figural processing, transitional visualization and development of the coronation of registers of representation (Duval, 1995b; Dupuis, 1995a; Pluvinage, 1990; Duval, 1999; Duval, 1998c; Anderson and alii, 1987; Duval, 1989, 1991; Luengo, 1997)
Therefore, the study was designed to examined and braked information into parts by identifying motives of analyzing learning outcomes on students' performance in geometry among Senior Secondary Schools students in Maiduguri Metropolis, Borno State.

Objective of the Study

The objective of this study was to determine effect of analyzing learning outcomes on students' performance in geometry among Senior Secondary Schools students in Maiduguri Metropolis, Borno State.

Hypothesis

The null hypothesis was analyzing learning outcomes does not have significant effect on student performance in geometry among Senior Secondary Schools students in Maiduguri Metropolis, Borno State.

METHOD

The research design used for this study was comparison group before-after quasi-experimental. One hundred and eighty senior secondary school II (SSSII) students were sampled using stratified random sampling technique. The research instrument for this study was Mathematics Performance Test (MPT) that contained 4 multiple choices and 2 written questions in geometry of senior Secondary two (SSII). The instrument was pilot tested and the instrument was validated as well reliability was obtained by using test-retest to be 0.675. The experiment was done for a total of ten lessons spread over six weeks. The data were obtained from the scores of the pre-test and post test scores.

Before the commencement of the treatments, the pre-test was administered to the participants of both the control and treatment (experimental) groups. The researchers recorded the scores of the participants. After the pre-test, the experimental groups were taught prior knowledge of basic geometric and mensuration concepts and the geometry topics of senior secondary II. While the control groups were taught some brief histories of some prominent Mathematicians in Nigeria as placebos and the geometry topics of senior secondary II. This involves answering some questions such as: a) construct a quadrilateral ABCD in which AB is parallel to DC , AB = 5cm, BC = 7cm, DC = 9cm and $\angle ADC = 120^0$.

Measure the diagonal BD and calculate the area of the quadrilateral ABCD. b) Construct triangle ABC such that $\angle BAC = 45^0$, $\angle ABC = 75^0$ and AB =10.5cm. Measure AC, BC and calculate $\angle ACB$. Here the method of analyzing learning outcomes and the geometry topics of senior secondary should include construct DC parallel to AB, infer that AB=5cm, BC=7cm and DC=9cm by measuring them. Bisect or construct AB at angles of 30^0, 45^0, 60^0 and 90^0 respectively by drawing a straight line where arcs meet. Expected responses are analyze, assume, categorize, classify, compare, conclusion, contrast, discover, dissect, distinguish, divide, examine, function, inference, inspect, list, motive, relationships, simplify, survey, take part in, test for and theme by using ruler, compasses and set square.

After the treatments, the data collected on pre-test and post-test scores was tested based on the hypothesis of the study. ANCOVA with pre-test as covariate, status as fixed factors, and post test as dependent variable was used to test the hypothesis. The ANCOVA was carried out using SPSS 16.0. Mean and Standard Deviation of variables analysis was obtained as part of the output of the analysis.

RESULTS

Table 1 Mean and Standard Deviation of Effect of analyzing learning outcomes on students' performance in geometry

	Pre-Test		Post Test	
Group	Mean	Std.Dev.	Mean	Std.Dev.
Experimental	6.61	2.00	9.79	1.38
control	6.31	2.16	7.66	2.08
Total	6.31	1.90	8.72	2.06

To acknowledge the issue of analyzing learning outcomes in geometry education curriculum, the result of ANCOVA in table 2 pinpointed that there was significance difference between the experimental and control groups in pre-test in analyzing learning outcomes. It also shows that there was significant difference in status as 0.00< 0.05 which is there, was significant difference between mean of experimental and mean of control groups in post-test.

Table 2 Result of ANCOVA on effect of analyzing learning outcomes on students' performance in geometry

Source	SS	Df	MS	F	Sig.	PES
Preana	3.67	1	3.67	1.23	0.27	0.01
Status	199.77	1	199.77	66.80	0.00	0.28
Gender	14.70	1	14.70	4.91	0.03	0.03
Status * Gender	11.468	1	11.49	3.84	0.05	0.02
Error	523.366	175	2.99			
Total	14452.500	180				
Corrected Total	758.611	179				

Key: Preana = Pre-test of analyzing learning outcomes

The difference 2.13 was in favour of experimental groups.This means there was significance difference between the experimental and control groups post-test on effect of analyzing learning outcomes on student performance in geometry among senior secondary school. Since the mean of post test of the experimental group was 9.79 higher than mean of post test of the control 7.66. The difference was in favour of the experimental group. Thus, the analyzing learning outcomes has improved the performance relative to teaching of biography.

The results of this study show that teaching analyzing learning outcomes has significant effect on students' in geometry performance relative to teaching of biography. In other words, students who were exposed to analyzing learning outcomes perform more than those who were not on analyzing learning outcomes in geometry. Male students outperformed female students as a result of the effect of analyzing learning outcomes in geometry among senior secondary school students.

Thus, the results of analysis in this study showed that analyzing learning outcomes has significant effect on students' performance in geometry, which are students who were exposed to analyzing learning outcomes outperformed than those who were not on analyzing learning outcomes in geometry. Hence, teaching of analyzing learning outcomes therefore did improve the students analyzing learning outcomes in geometry. Also there was significant gender difference in favour of females. In other words, female student do performed higher than male when students were exposed to analyzing learning outcomes on students' performance in geometry.

DISCUSSION

This study investigated effect of teaching analyzing learning outcomes on students' performance in geometry of senior secondary schools. The study was consistent with the constructivism theory advocated by Bruner (1966) which emphasized that students should actively construct their individual mathematical worlds by reorganizing their experiences in an attempt to resolve their problems (Cobb, Yackel & Wood, 1992). The study had established whether teaching analyzing learning outcomes as well as gender differences have significant effect on student's performance in geometry of senior secondary school. Quasi-experimental design and Analysis of covariance were used for this study. The study found that teaching analyzing learning outcomes as well as gender difference have significant effect students' performance in geometry among senior secondary school students as total difference between means of experimental and control groups, male and female students, pre test and post test results were not static.

The study corroborate with the findings of De Corte (1992) that difference in performance between boys and girls are attributed to the possession of masculine and feminine genotype known as logos and eros in males and females respectively. Also the key to developing an integrated and generative knowledge base is to build upon the learners' prior knowledge. This statement clearly implied that individual differences in the prior knowledge base are a primary source of differences in student's achievement (Dorchy, 1996). Piaget (1969, 1971) pinpointed that the way children think and reasons are qualitatively different from older children and adults. Their responses to questions are usually different from older peers because they think differently. The quality of answers and the way they tackle problems become more and more refined with increase in age. Piaget (1971) also describes human behaviour as ability to use past experience in order to solve the present and future problems.

Specifically, the null hypotheses (H_{o1} and H_{o2}) were tested; the study revealed that teaching analyzing learning outcomes have significant effect on students' performance in geometry as the means of post test for the experimental group was 9.79, while that of control group was 7.66. The difference between experimental and control groups was therefore 2.13 in favour of experimental group. Also there was significant difference between experimental and control groups in post-test as partial eta squared in respect of status was 0.28> 0.005 level. On the issue of gender difference the results revealed that there was no significant gender difference, as there is significant interaction between status and gender as the partial eta squared in respect of status and gender was 0.02<0.005. Also there is no significant interaction between male and female as there was partial eta squared in respect of gender was 0.02<0.05. Also the study indicates that there was significance difference between the male and female as the mean of post-test scores of male was 8.43 and female were 9.01. The difference 0.58 was therefore in favour of female.

CONCLUSIONS

Based on the findings of this study, it was concluded that teaching analyzing learning outcomes significantly have effect on students' performance in geometry among senior secondary schools. This implies that where analyzing learning outcomes were adequately taught learners performance in geometry will be high among senior secondary schools. The findings also revealed that gender difference have significant effect on students' performance when analyzing learning outcomes in geometry among senior secondary schools. In other means the findings shows that female students performance in geometry will be high than male student performance when teachers use analyzing learning outcomes among senior secondary schools.

Recommendations

Based on the findings, the study recommends that Students should be exposed to analyzing learning outcomes in order to improve their performance in geometry. Gender difference in

teaching analyzing learning outcomes of any aspect of other subject using students performance among senior secondary schools should not be a matter of concern when teach. Further studies should be conducted on effect of teaching analyzing learning outcomes on students' performance in other aspects of mathematics of Federal or States senior secondary school students. The study should be replicated in other states of the Federation to enable comparative analysis. Studies on some topics using their prior knowledge of concepts on general cognitive performance, remembering, understanding, applying, analyzing, evaluating and creating learning outcomes in other aspects of mathematics of Federal or States senior secondary school students should be conducting. Some topics using gender difference to teach analyzing learning outcomes on students' performance in other aspects of mathematics (algebraic processes, statistics, number and numeration) of Federal or States senior secondary school students should be studies.

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