Observable Effects of Developing Mathematical Skills of Students through Team- Based Learning and Laboratory Learning Approaches

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Abstract
This study investigated the effect of teaching Mathematics through the use of Team- Based Learning against the Laboratory Learning Method of teaching and learning of Mathematics. The population of the study covered all the SS III students of Government College Funtua and the sample is 60 students chosen from the six classes of the SS III. Two Hypotheses were formulated for the study and t-test statistical method was used for the analysis.
Keywords: Mathematical Skills, Observable Effects, Poor Performance, Team Based Learning,
          Laboratory Learning Method

Introduction
There have been much concerns and outcry from many quarters about poor performance of students in mathematics. Hardly there is any day when issues relating to education are not reported in our daily papers and journals. In most cases, the issues discussed relate to the general performance of students in English and Mathematics or how to arrest the dwindling performance of students in the two subjects.

Calls for reform in the ways we teach Mathematics at all levels, and in all areas, are widely spread. The effectiveness of changes being called for, employment of student-centered, active learning pedagogy, are now well supported by evidence. But the objective look at the attainment of aims (quality and achievements) of educational products, particularly in the field of Mathematics, does not justify all the concerted efforts of educators, researchers and the expenditure. Even though there is the opinion that these funds or expenditure are grossly insufficient and inadequate, especially looking at the diverse nature of the area (Mathematics) and it's importance to the nation.

Statement of the Problem
This study arose as a result of some salient problem observed, such as the continuous poor performance of students in mathematics in the country- Katsina state in particular. As seen from 1987 to 1999 when the state was created, there was not up to 9% pass in Mathematics at Senior Secondary School Certificate Examination (SSCE) and from 2000 to 2012 not up to 12%. (Research and Statistics Department, MOE Katsina 2013).

It is the desire of this study to find out how and teaching and learning of mathematics can be developed or enhanced. This study is therefore designed to address and simplify the choice method(s) or approaches of teaching and learning of Mathematics.

Objective of the Study
 The major objective of the study is to develop and enhance teaching and learning of Mathematics to the students and to test the suitability or other wise of using Team-Based Learning in teaching Mathematics against Laboratory approach. Specifically, the study will endeavour to:
   a) establish the suitability of team-based
   b) determine the best approach of the two
   c) test the students after exposure to the two methods so as to establish or observe the variation in achievements

Research Question
The study will endeavour to answer the following questions :
   (i)   Which of the two approaches (Team- Based or Laboratory) bring about more understanding of
Mathematics activity?
   (ii)   Is there any difference in students' performance in Mathematics test using the two approaches?
   (iii)   What factors are responsible for the greater understanding in either of the two approaches?

Research Hypotheses:

The Two hypotheses that were formulated for the study are:

H_1: There is no significant difference between performance of students taught by Team – Based and those taught by Laboratory approaches

H_2: There is no significance difference in students understanding when taught using either of the two approaches.

Literature Review

Today, Mathematics is the major requirement for any significant technological advancement hence, the first and foremost requirement in the study of Sciences, Technology and Engineering. According to Gnedako and Khalid (2005), Mathematics has turned into something more than a calculating tool; it has become a powerful and flexible method of penetrating into the nature of Science, Engineering and Industry". Lawal (2011) stated that "apart from being the mother and bed rock of all Sciences, Mathematics is also useful in all spheres of life. Ahmad (2009) opined that neglect of Mathematics is an injury to all knowledge since ignorance of it connotes ignorance in a scientific world.

Many researchers have dwelt widely on the problems militating against the improvement teaching and learning of Mathematics. Many came up with a lot of suggestions. Shaw (1992) carried out an experiment to investigate whether individual learning or group learning is better. She employed six problems of same difficulty. One half of which were to be solved by individuals working in groups of four members, and the other half were to be solved by individuals working alone. She analyzed her data in terms of total number of correct solutions attained and found a strong advantage for group over individuals. Similarly, Abdulraheem (2008) conducted a research on factors responsible for better performance of students in schools where the analysis factors ranged from educational attainment, occupation and income of parents of students to teachers' qualification to facilities available in the school. On facilities available in the school, he tested the hypothesis " there is a correlation between the facilities available in the school and their academic performance" and found that it was true as the research showed that the school that performed better have better facilities than the school that performed poorly.

Methodology

The data collection method utilized was the use of primary sources and achievement test is used. The techniques adopted for the analysis was descriptive approach and the use of related t-test. The decision criterion is the computed value compared with the critical (tabulated) value at 5% level of significance. If the computed value is greater than the critical value, the alternative hypothesis is accepted and the null rejected.

The population of the study was all SS III students of Government College Funtua which are in six classes that contained between 115 to 125 each with a total of 708 students. For the purpose of this study, 60 students are chosen, that is 10 students from each class, using purposive sampling. (Roger 1998) further explained that "selection of specific number for inclusion in this type of sample is based on the judgment of those taking the sample, that those selected are typical or that they have particular characteristics which are of interest or perhaps they are selected for inclusion simply because of conveniences."

Also, the sample is further divided into two groups. Each group consists of 5 students from each class making a total of 30 students for each group. The first group of 30 students was taught and the selected topics were: Algebra, Mensuration, Longitude and Latitude using the Team-Based approach .The second group were taught the same topics using the laboratory approach and thereafter, the test was administered to both groups.

Result and Discussion

As earlier stated, two hypotheses were tested by using t-test and the summary of the outcome for the test is shown:

	Group A (Team-Based)	Group B (Lab.)
Mean Mark	$X_1 = 10.88$	$X_2 = 7.32$
No. of Students	$n_1 = 30$	$n_2 = 30$
Standard Deviation	$S_1 = 2.78$	$S_2 = 3.868$

Standard Error Difference $= \sqrt{\dfrac{\left(n_{1}s_{1}^{2}+n_{1}s_{2}^{2}\right)(n_{1}+n_{2})}{(n_{1}+n_{2}-2)(n_{1}n_{2})}}$

$$= \sqrt{\frac{681 \times 60}{58 \times 900}} = 0.78$$

Diff in Mean $\left(x_{1-x_{2}}\right)$ = 10.88 – 7.32

$\qquad\qquad$ = 3.56

Calculation of t ratio $= \dfrac{x_{1-x_{2}}}{S.E} = \dfrac{3.56}{0.78}$

$\qquad\qquad$ = 4.54

Results of Analysis
The calculated value of 't' is far greater than the tabulated value of 't'. Thus, the null hypothesis is rejected. This means that the difference between the mean is significant at 0.05, hence there is significant difference between the performance of students by Team-Based approach and those taught by Laboratory approach. On the other hand, the second hypothesis can also be rejected as it can be clearly seen from the average score of students taught by Team-Based approach (10.88), while those taught with Laboratory approach is 7.32. This clearly illustrates a high level of understanding of the students.

Conclusion and Recommendations
Empirical findings from the study suggest that there is significant difference between students taught by Team Based Learning (TBL) and those taught by Laboratory approach (LAB). It is therefore recommended that the TBL be streamlined and standardized particularly large classes, so as to derive maximum benefit for the students

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