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Effect of Team Teaching Method on Students' Achievement in Mathematics in Mumi as Sub-County Kenya

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Abstract

The study investigated the effect of Team Teaching Method on students' achievement in mathematics in Mumias Sub-County, Kakamega County, Kenya. Achievement in mathematics has been discouraging over the years. The conventional wayof teaching mathematics has not been able to solve the problem of poor performance in mathematics, hence the purpose of this study. The designused was pre-test, post-test non-equivalent control group design. The research was guided by one objective and one hypothesis. The sample of the study comprised two hundred and seventy two (272) students in 6 public secondary schools in Mumias Sub-County selected randomly from 39 schools. Students in 3 schools (132) were taught using the traditional method (one teacher in class) while students in the remaining 3 schools (140) were taught using Team Teaching Method. Descriptive statistics used were mean and standard deviation, while inferential statistics used were t-test, Sheffe Post Hoc Analysis and ANOVA. The findings of this study show that there is significant difference in the mean achievement scores of students taught mathematics using Team Teaching Method and those taught with conventional method. Basing on the findings of this study, recommendations were made for teachers to adopt Team Teaching Method in teaching mathematics.

Keywords: Achievement Team; Teaching method.

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1. Introduction

Mathematics is at the heart of many successful careers and therefore a gate to brighter future [1]. Despite the effort of researchers suggesting different ways of teaching mathematics, the performance is still wanting. In the words of [2], mathematics is a precursor of scientific discoveries and inventions.The mathematical performance of students has recently been described as "wanting" and well below the level expected of an international leader [3]. However, mathematical proficiency is crucial not only to remain internationally competitive, but also to ensure the "eminence, safe and well-being" [3] of a nation. To ensure a citizenry equipped with the knowledge and tools needed to become mathematically proficient, the nation is in dire need of well-prepared and effective mathematics teachers (Conference Board of the Mathematical Sciences [5,6].

There is need for teachers to transform mathematics lessons into an environment rich of activities that promote effective learning of mathematics. In Kenya, education in secondary schools could benefit from Team Teaching Method of instruction, specifically in mathematics. Team Teaching Method is perceived to provide students with the needed attention since a group of teachers are in control of the class [7]. This method of teaching afford the teachers new ways of teaching the topic and meets the needs of the students even those ones that have been passive in class for a long time [8]. Teachers who engage in Team Teaching do not require much since they are using the skills they already have for teaching; they only organize themselves to observe each other or teach as a group. Researches show that, this type of teaching caters for individual differences, and therefore ensures that all students are on board [9].

When learning is passive, the products of the schools are rated low in critical thinking, problem solving and creativity. This is because the teachers have not engaged interactive methods of teaching like Team Teaching Method [10]There are a number of teaching approaches which are considered valuable because if used appropriately, it is believed that they can boost students' performance in mathematics. They include team teaching, peer teaching, set induction, problem solving, and group discussion among others. This study looked at Team Teaching Method where two or more teachers engage one class of students. The paper address the hypothesis which stated that there is no significant different in achievement scores between students who were taught mathematics using Team Teaching Method (TTM) and those who were taught using the conventional way. This study reports the results of two groups of students; Experimental and Control. The Experimental group used Team Teaching after the pre-test such that two teachers engaged one class of students. The Control group used the conventional way, where only one teacher engages the class.

2. The purpose of the study

The purpose of this study was to investigate the effect of Team Teaching Method on secondary school students' achievement in mathematics.

3. Objective of the study

This study was guided by the following objective;

To find out the influence of TeamTeaching Method on students' achievement in mathematics.

4. Hypothesis of the study

The study was guided by the following hypothesis;

There is no significant difference in achievement scores between students who were taught using Team Teaching Method and those who were taught using the conventional way.

5. Materials and Method

This study adopted pre-test post-test non-equivalent control group design. The design involved a random assignment of intact classes of students to two groups; one group being Experimental and another one being control.Intact classes were preferred in this study because it is not possible to randomly assign subjects to both Experimental and Control groups. Selected classes were put into two groups namely Experimental and Control. Students from3 schools comprised Experimental category (E_1, E_2 and E_3). Students from other 3 schools comprised Control category (C_1, C_2 and C_3). The students in the Experimental category were taught mathematics by use of Team Teaching while those in the Control category used the conventional method. Table1 illustrates this study design.

Table 1: Pre-test Post-test non-equivalent Control group design

GROUP	Pre-test	Treatment	Post-test
C_1	O_1		O_7
C_2	O_2		O_8
C_3	O_3		O_9
E_1	O_4	X	O_{10}
E_2	O_5	X	O_{11}
E_3	O_6	X	O_{12}

Source: [11]

Both the two categories received the pre-test (O_1, O_2, O_3, O_4, O_5, O_5, O_6) to ascertain whether they differ significantly before learning the topic of Algebraic expressions. The Experimental category was treated while the Control category was denied the treatment. Specifically the Experimental category was taught by use of Team Teaching Method while the Control category was taught using the conventional way (one teacher handled the course). Both the groups then received a post test on both dependent measures.The scores for the pre-test and post-test formed the data that were analyzed using both descriptive and inferential statistics.

6. Results

The students' mathematics Achievement test (MAT) which had 20 items totaling to 100% was used. Arithmetic

mean and standard deviation of the pre-test scores on MAT were calculated for both Experimental and Control groups and results were as shown in Table 2.

Table 2: Arithmetic mean and SD on MAT Pre-test Scores

SCALE MAT	Experimental (E)		Control (C)	
	Mean	S.D	Mean	S.D
	32.84	16.30	33.78	15.92

Table 2 reveals that the pre-test mean-score of the Experimental group was 32.84 and that of the Control group was 33.78. These results suggest that before the exposure of students to the lessons on algebraic expressions learners had similar achievement. To establish whether there was any difference between the mean scores of the groups, an ANOVA of the pre-test results was calculated at x = 0.05 and results recorded in table.3.

Table 3: One way ANOVA on MAT pre-test results

SOURCE	**DF**	**S.S**	**M.S**	**F. Ratio**	**C-Value**
Between groups	2 – 1 = 1	4882.71	4882.71		
Within groups	272-2=270	453546.62	1679.80	2.907	3.84
TOTAL	**271**	**458429.32**	**6562.51**		

From Table 3, the calculated F-ratio (2.907) was lower than the critical value (3.84). This implies that the difference in achievement does not exist among the groups under study. This indicates that the entry behaviour of both groups was the same before exposure to lessons on algebraic expressions. Moreso, a further analysis of the difference using Scheffe post hoc analysis procedure yielded the trend $C_1 = C_2 = C_3 = E_1 = E_2$ implying C=E at $P<0.05$. It was concluded that there is no significant difference in the achievement capability between the Experimental and Control groups. After the implementation of use of Team Teaching Method (TTM), it can be argued that the mathematics course benefited all the students in both groups since the scores of the students on the MAT had improved. Arithmetic mean and standard deviation of post-test scores on MAT were calculated for both groups, and results compared with pre-test scores and recorded in table 4.

Table 4: Comparison of mean scores and mean gains on MAT

Group	**No. of students**	**Pre-test**	**Post-test**	**Mean gain**
E	140	32.84	61.15	28.31
C	132	33.78	40.08	6.30

It can be seen from Table 4 that the post-test mean score for the Experimental group was 61.15 which was much higher than that of the Control group (40.08). The mean gain for the Experimental group was 28.31 while that for the Control group was 6.30. This indicate that students who were taught using Team Teaching Method achieved more than those who were taught using the conventional method. The higher mean score of the experimental group was attributed to the use of Team Teaching Method.

An ANOVA was calculated to show if there is any significant difference between the mean scores of the groups under investigation. This was to provide a clear picture about effectiveness or otherwise of Team Teaching Method (TTM) over conventional method. The results were recorded in Table 5.

Table 5: One way ANOVA on MAT post-test

SOURCE	**D.F**	**S.S**	**M.S**	**F. Ratio**	**C-Value**
Between groups	2 – 1 = 1	8385.1	8385.1		
Within groups	272-2=270	57946.59	1214.617	39.07	3.84
TOTAL	**271**	**66331.69**	**8599.72**		

It can observed from Table 5 that the calculate F-ratio (39.07) is greater than critical value (3.84) indicating significant difference in achievement between groups under the study. However these results do not show the direction of the difference. As such an independent samples t-test was calculated and results summarized in table 6.

Table 6: An independent samples t-test on MAT post-test results

Group	**N**	**Mean**	**DF**	**Calculated value**	**Critical value**	**Remark**
E	140	61.15	270	17.11	1.658	Significant difference
C	132	40.08				

The results in Table 6 reveal that the t-value for group E and C ($t_{1,\ 270}$) = 17.11 implying that the means were statistically different in the post-test examination in favor of the Experimental group. This is a clear indication that the scores obtained by students who were taught using (TTM) had a higher mean score and therefore outperformed those ones who use conventional method.

It was therefore concluded that there was a significant difference between the achievement of students who were taught in the Experimental group (E) and those in the Control group (C). The Scheffe post hoc analysis procedure was further carried out in order to find out where the significant difference lies. The results yielded the trend E>C.

7. Conclusion

The study entailed the use of Team Teaching Methodin the teaching of mathematics in comparison with the conventional teaching. The topic used for the study was algebraic expressions and the teaching went on for three weeks. The study sample was 272 form one students from 6 public secondary schools selected randomly. 3 schools provided students for Experimental group while the three others provided students for the Control group. The purpose of the study was to investigate the influence of Team Teaching Methodon secondary school students' achievement in mathematics. It was established that Team Teaching Method has a positive influence on students' performance in mathematics. These results were supported by [12] who said that many schools have implemented co-teaching as a means of promoting effective instruction in inclusive classrooms.The results were also supported by [13] who said that the primary goal of shifting from individual instruction to a team is to improve the quality of teaching and learning. He added that team teaching is a very important step along the road of constantly adjusting the educational system to the changing needs of students and abilities of teachers. The research findings by [14] showed the average final exam scores of students receiving team teaching were higher than those of students receiving traditional teaching in respect of students' achievement. In linewith the results of the study, the researcher recommended that **t**eachers should embrace the use of Team Teaching Method whenever teaching mathematics since it boosts students' achievement. Also teachers should be in-serviced on the Team Teaching Method of delivery to enable better performance of students in mathematics.Seminars and workshops should be held frequently to educate teachers on the use of Team Teaching Method so that teachers adopt it for effective classroom interaction and students' academic achievement.

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