

Relationship Between Teaching Method And Students' Performance In Mathematics In Public Secondary Schools In Dadaab Sub County, Garissa County; Kenya

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Abstract: *The teaching method used by teachers largely determines student' performance in mathematics. Secondary school students have in the past years continued to performdismally in mathematics and therefore the study aimed examining the influence of teaching methods on students' academic achievement in mathematics in Dadaab sub county, Garissa County. The study was based on a conceptual model developed by Shavelson; McDonwell and Oakes (1987). The study adopted quasi experimental research design but with mixed approaches of data collection and analysis. Target population comprised of all head teachers, all mathematics teachers and form two students in ten secondary schools in Dadaab Sub County. A total of 155 respondents were selected.Five school principals,all mathematics teachers and 30% of the students' constituted the study sample. Purposive sampling was used for the principals and mathematics teachers.Stratified random sampling and simple random sampling were used to determine student sample and subsequently place them into the research groups. All mathematics teachers and principals in each of the sampled schools were purposively included in the study. Achievement tests, structured questionnaires, and interview guides were used to collect both qualitative and quantitative data from respondents. Qualitative data was thematically coded and quantized then entered in statistical package for social science (SPSS) alongside the quantitative data then was analyzed descriptively and inferentially and presented using statistical tables, charts and graphs. The study established that there is a positive correlation between teaching methods and students' achievement in mathematics.Teaching using ICT's was strongly correlated to students' achievement than traditional methods of teaching.This indicated that teaching using ICT's can improve learners' performance. The study recommends thatthe government through the ministry of education should ensure that ICT resources in schools should be adequate enough in order for teachers and students to utilize them in the teaching learning process. The ministry of education to organize forums and create platforms that can be used to sensitize teachers on the importance of ICT in teaching. This will ensure teachers embrace ICT's and use them appropriately and frequently in their schools.*

Key words: *CommunicationTechnology, teaching methods, academic performance, teaching learning process.*

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I. Introduction

The main purpose of teaching at any level is to bring out a significant change in the learner (Tebabal & Kahssay, 2011). Transferring knowledge requires teachers to use the appropriately method and pedagogy that best suits the learner and suit the objectives and desired outcomes. Most of the traditional methods were teacher- centered with no activity for the learners making them passive and therefore obtaining knowledge from the teacher without building their engagement level with the subject matter, the approach is least practical, more theoretical and memorizing (Tebabal & Kahssay ,2011). Student-centered approaches which are more effective aremore encouraged because they embrace the concept of discovery learning (Brindley, 2015). Most teachers today apply the student-centered approach to promote interest, analytical research, critical thinking and enjoyment among students (Hesson & Shad, 2007).The effectiveness of teaching methods on students learning have consistently raised considerable interest on the thematic field of education research (Hightower, 2011). Most of the teaching methods today have embraced modern technology and this has brought tremendous changes in the field of learning.

The poor academic performance by majority of the students in various subject areas is basically linked to the application of ineffective teaching methods by teachers to impact knowledge to learners and therefore teachers need to be conversant with numerous teaching strategies (Adunola, 2011). ICT's have been proven to play an important role in the teaching-learning process as it provides learners with the understanding, skills and knowledge necessary for scientific research, thus improving their standards of living (Munishi, 2004). They also enable learners to acquire problem-solving and decision-making skills, which provide ways of thinking and inquiry. With the rapid usage of Information and Communication Technology resources (e.g. internet), ICT based teaching-learning applications are considered an effective alternative to traditional teaching methods because it presents students with unlimited opportunities to demonstrate the mastery of contents taught (Lei & Zhao, 2007).

Meta-analytic studies about the relationship between ICT and pupils' achievement in comparison with traditional instruction have shown that ICT have a positive impact on pupils' achievement level (Lei, 2007). A Meta-analysis study revealed that on average, students who used ICT-based instruction scored higher than students without computers. The students also learn more in less time and like their classes more when ICT-based instruction was included (Song & Kang, 2012). The findings may also be clouded by the influence of teachers' perception towards use of ICT and whether or not teachers were ICT compliant or trained. In addition, one roadblock that relates to teachers' attitude and perceptions towards ICT's affects the integration of ICT in learning. Some teachers prefer old traditional method for the fear of technology and lack of adequate skills. They may feel inadequate to use ICT's and if they try and fail they get embarrassed and would shy away from them hence apply old traditional teaching methods they are familiar with. These were the research gaps which this study sought to address.

1.2 Objective

To establish the influence of teaching methods on students' academic achievement in mathematics in public secondary schools in Dadaab sub county, Garissa County.

1.3 Research Hypothesis

The method of teaching does not significantly influence students' achievement in mathematics in public secondary schools in Dadaab sub county, Garissa County.

II. Literature Review

The primary purpose of teaching at any level of education is to bring a fundamental change in the learner (Tebabal & Kahssay, 2011). The poor academic performance by the majority students is fundamentally linked to application of ineffective teaching methods by teachers to impact knowledge to learners (Adunola, 2011). Substantial research on the effectiveness of teaching methods indicates that the quality of teaching is often reflected by the achievements of learners. Adunola (2011) indicated that in order to bring desirable changes in students, teaching methods used by educators should be best for the subject matter. Furthermore, Bharadwaj and Pal (2011) opined that teaching methods work effectively mainly if they suit learners' needs since every learner interprets and responds to questions in a unique way. As such, alignment of teaching methods with students' needs and preferred learning influence students' academic attainments. ICT's have been proven to play an important role in the teaching-learning process as it provides learners with the understanding, skills and knowledge necessary for scientific research, thus improving their standards of living (Munishi, 2004). They also enable learners to acquire problem-solving and decision-making skills, which provide ways of thinking and inquiry. With the rapid usage of Information and Communication Technology resources (e.g. internet), ICT based teaching-learning applications are considered an effective alternative to traditional teaching methods because it presents students with unlimited opportunities to demonstrate the mastery of contents taught (Lei & Zhao, 2007).

III. Research Methodology

The study adopted an experimental design because of its ability to provide better understanding of the research problem and detailed data which well analyzed clearly depicted the extent of the problem. The researcher collected data from the respondents by use of questionnaires, interview guides and achievement tests from the learners. In this case, the researcher divided the learners into two groups: experimental and control group. Treatment (teaching using ICT tools) was given to the experimental group while the control group received no treatment. Achievement tests were used to measure students' achievement in mathematics through pre-test and post-test. The results each were analyzed descriptively and inferentially. For the inferential statistics, The Pearson Chi-Square test for independence was determined to show the relationship between the variables. T-test for independent groups was determined to assess whether a significant difference existed in the mean achievement of the two study groups. Qualitative data was analyzed through categorization of the data into themes then coded and entered into a computer program for analysis. The collection and analysis of quantitative

and qualitative data was done concurrently though separately so that the researcher could understand the research problem properly.

4. Findings and Discussion

4.1 Findings on the Influence of teaching method on students' academic achievement in mathematics

The study sought to establish the methodologies adopted by teachers in the teaching of mathematics. The teachers were therefore asked to indicate the frequency with which they used the particular methodologies. This was based on a likert scale where Very Often-rated 1; Often – rated 2, Sometimes – rated 3; Rarely – rated 4, and Never, rated 5. Table 4.1 presents the findings

Table 4.1: Descriptive statistics on teaching methodologies used by teachers

Methodology	N	Minimum	Maximum	Mean	Std. Dev
Pure traditional methods	30	1.00	3.00	1.9000	.80301
ICT integrated methods	27	1.00	5.00	3.0741	.95780

From table, it is evident that majority of the teachers often applied traditional methods as opposed to the use of ICT resources. This is according to the means of 1.90 and 3.07 respectively. This implied that teachers were yet to fully embrace the integration of ICT's in the teaching of mathematics in public secondary schools in Dadaab sub-county. When the teachers were asked to draw a comparison between traditional and ICT methods in as far as the contribution to better student achievement was concerned, 21 (70%) of them responded in favor of ICT while nine (30%) cited traditional methods. Similarly, 87.5% of the principals favored the use of ICT and the rest (12.5%) teamed up for traditional methods. This is consistent with Munishi, (2004) who maintained that ICT's play an important role in the teaching-learning process as it provides learners with the understanding, skills and knowledge necessary for scientific research, thus improving their standards of living

The teachers were also required to rate the achievement of their students in mathematics. The results are as presented in Table 4.2

Table 4.2: Teachers' ratings of student performance in mathematics

Rating	Teachers		Principals	
	Frequency	Percent	Frequency	Percent
Excellent	1	3.3	-	-
Good	10	33.3	1	12.5
Average	16	53.3	5	62.5
Below Average	3	10.0	2	25.0
Total	30	100.0	100.0	100.0

From above results in tabular form, 33.3% and 53.3% had rated student achievement in mathematics as good and average respectively. Only 3.3% rated student achievement as excellent while 10% indicated a below average achievement. For the principals, 12.5% rated the achievement as good, 62.5% as average and 25% as below average. This meant that students' achievement in the sampled schools was far from impressing. From the raw scores of the pre-test and the post-test, descriptive analysis was done to obtain minimum and maximum scores in each test, the means of each test and the standard deviations. Tables 4.2 below summarizes the analyses of control and experimental groups respectively

4.3: Descriptive analysis of test scores of control group

Group	N	Minimum	Maximum	Mean	Std. Deviation
Control (pre-test)	60	14.00	60.00	35.0500	12.66173
Control (post-test)	60	15.00	64.00	37.8000	12.70500

Descriptive analysis of test scores of experimental group

Group	N	Min	Max	Mean	Std. Deviation
Experimental (pre-test)	60	11.00	62.00	35.5000	12.78969
Experimental (post-test)	60	22.00	78.00	40.8833	12.59821

From the table, the means of the pre-test for both the control and the experimental group are almost the same. However, the post-test analysis shows variation in means but to different magnitudes. The control group registered a small positive deviation in mean score of +2.75 while the experimental group registered an appreciable deviation of +5.3833. With regards to the individual scores, the control group realized a marginal improvement from a maximum of 60 in the pretest to 64 on the post test. On the other hand, the experimental group recorded a maximum score of 62 in the pretest but managed a maximum of 78 in the post test. The slight

improvement in achievement for the control group could be attributed to the fact that the learners were being taught and assessed on the topics for a second time. However, for the experimental group, the noticeable improvement could be as a result of the intervention that was made in the teaching approach by integrating the use of ICT in teaching.

4.2 Inferential Analysis

Based on these findings, the researcher was interested in establishing whether student achievement in mathematics was related to the teaching methodology used. To do so, bivariate correlation analysis was done and the results presented in table 4.3

4.3: Correlations between student achievement and teaching methods in mathematics

Method		Traditional methods	ICT integrated methods	student achievement in math
Pure traditional methods	Pearson Correlation	1		
	Sig. (2-tailed)			
ICT integrated methods	Pearson Correlation	.715**	1	
	Sig. (2-tailed)	.000		
student achievement in math	Pearson Correlation	.505	.585	1
	Sig. (2-tailed)	.126	.104	

Correlation is significant at the 0.01 level (2-tailed); n=30

This results indicates strong positive correlations between teaching methods and student achievement in mathematics. The use of ICT is correlated to student achievement at $r=0.585$ but the finding is not significant as $p>0.05$. On the other hand, traditional methods of teaching are correlated to student achievement and the finding is not significant ($r=0.505$, $p>0.05$). The findings show that ICT is a better correlate of student achievement compared to traditional methods. It is however of importance to note the strong and significant relationship between ICT and traditional methods ($r=.715$, $p<0.001$) which means the two methods are inseparable in the teaching learning process and for a teacher to optimize student achievement in mathematics; he/she should use both methods concurrently. The findings share similarity with that of a study by Song and Kang, (2012) who found significant but positive impact on students' performance due to ICT use. Similarly, Meta-analytic studies by Lei, (2007) about the relationship between ICT and pupils' achievement in comparison with traditional instruction showed that ICT have a more positive impact on pupils' achievement than traditional methods. This difference in achievement could be attributed to the fact that ICT based teaching-learning applications are considered an effective alternative to traditional teaching methods because it presents students with unlimited opportunities to demonstrate the mastery of contents taught

The study went ahead to establish whether differences existed in the mean performance of students taught using ICT (experimental group) and those taught using traditional methods (control group). This was done by conducting t-tests of independent samples and the results are summarized by Table 4.4

Table 4.4: T-test for Independent Samples

	t-test for Equality of Means				
	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	8.292	58	.000	21.35556	2.57550
Equal variances not assumed	8.207	23.630	.000	21.35556	2.60198

n=60

The analysis in the table above, depict a significant difference in the mean achievement between students taught using ICT and those taught using traditional methods (for equal assumed variance, $t=8.292$, $p<0.001$). This means that the use of ICT in the teaching of mathematics significantly and positively influence students' achievement in mathematics. Based on this finding, the null hypothesis that the teaching methodology does not significantly influence student achievement was rejected. This implies that, in order to bring desirable changes in students, teaching methods used by educators should be best for the subject matter and should suit learners' needs since every learner interprets and responds to questions in a unique way as such, alignment of teaching methods with students' needs and preferred learning influence students' academic attainments.

IV. Conclusion

The study established that use of ICT's in the teaching and learning of mathematics can cause an improvement in mathematics. ICT's are able to enhance learning and make even the learning process interesting and captivating to the learners. These findings indicate that not many schools have integrated teaching using ICT's in their classes and therefore ends up using the old methods to teach learners and these has led to dismal performance in mathematics. ICT's are powerful tools for improvement of teaching methodology and improvement in performance. It is also evident that most school mathematics teachers do not like using the ICT tools in their classes because they are used to the old traditional methods of teaching which are teacher-centered.

Recommendations

Teachers need to understand they should embrace the use of ICT's as a way of improving the performance in mathematics. Traditional methods of teaching mathematics which are not learner-centered do not bore any good results and therefore integration of ICT in the teaching learning process aims at helping learners to improve their academic performance. There is need for training teachers on the new methods of teaching for effectiveness of the content delivery, this will help the students to improve in performance. The Ministry of Education and Policymakers should ensure that school teachers adopt new methods and strategies which are learner-centered to improve basic performance of mathematics in the learners. Policies should be formulated to ensure that schools are equipped with ICT tools to make teachers more interactive to deliver quality teaching.

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