

## PEER LEARNING: AN ALTERNATIVE TEACHING MODEL FOR GARISSA COUNTY PUBLIC SECONDARY SCHOOLS

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### ABSTRACT

*Performance in Mathematics by public secondary school students in Garissa County was studied using peer learning and the conventional teaching methodologies. Schools were grouped based on the gender of their students into boys only, girls only and mixed-sex. Using simple random sampling technique, Form Two students in all the single-sexed schools were divided into Control and Experimental groups. The Control groups were taught by the conventional methods while the Experimental, and the students in the Mixed-sex schools which were being studied for effect(s) of interaction, were taught by peer learning methodology under single-blinded setup. Post-test and pre-test Mathematics scores were collected from all the groups. Scores were letter-graded A to E and entered in Microsoft Excel Software. Students who obtained C+ and above, the cut off point for university admission in Kenya were summarized. Statistics such pretest and posttest Means, Standard Deviations and Coefficient of Variation as well as Pearson' Correlation of the Experiment and the Control groups were calculated using Microsoft Excel Software. Using Chi-square test, the influence of peer learning on the exposed groups was tested for significance at 5% confidence level and while confounding factors such as gender of students, text book student ratio, and teacher student ratio were also tested at the same confidence level. The findings suggested that peer learning is a better teaching methodology than the conventional ones for Garissa County public secondary schools. The study also found out that there were significant differences between the Means of the Control and the Experiment groups. There were significant differences between the Mean scores of boys' and that of the girls' schools. The mixed-sex schools did show main significant effects of interaction. Girls gained more than the boys. However, there were high Coefficient of variation within same term than between the two terms. The confounding effects were found to be significant on their own and on peer learning.*

**Keywords:** Peer learning, Conventional, Mixed-sex, Confounding effects

### INTRODUCTION

Garissa County is in the Northern region of Kenya. The region is pre-dominated by a community with low literacy level. Because of its nomadic lifestyle, opportunities for proper education are hard to come by. Insecurity is one of the major challenges facing the people of Garissa County. This saw majority of non-local teachers leaving en mass after the massacre of over 148 students and staff by adherents of Al-Shabab at Garissa University College. The few teachers who risked remaining behind are living under constant fear for their lives. As a result, ninety-five public schools in the County and the only university in the entire region were closed down. Twelve of these schools were secondary while the rest were primary.

Intertribal conflicts over scarce natural resources are rampant though some are political instigated. They have predictable trends and commonly occur in the eve of national or by-elections events. Nationally, teachers' strikes are more frequent and take longer time to

resolve now than before. The combination of these two factors – longstanding insecurity and frequent teachers’ strikes- makes it difficult for the county schools to utilize their academic learning time (ALT) and achieve their objectives. Consequently, the entire teaching/learning processes of the schools were irreversibly disrupted.

For many years, C+ [C plus] has been the minimum mean grade for university admission in Kenya. Majority of students in Garissa County public secondary schools fail to attain this grade. Failing in the context of, their inability to attain this grade in order to undertake courses of their choice in local or international universities.

The table below shows the number of students who got Mean Grades of C+ [C Plus and above] in the Kenya Certificate of Secondary Education (KCSE) from 2010 to 2014 in Garissa County.

**Table 1. Garissa County KCSE Analysis: 2010-2014**

<i>Year</i>	<i>Entry</i>	<i>A</i>	<i>A-</i>	<i>B+</i>	<i>B</i>	<i>B-</i>	<i>C+</i>	<i>Total</i>	<i>% Change</i>
2010	1185	0	5	9	36	56	102	208	+17.55274
2011	1407	0	4	14	31	63	66	178	-12.65103
2012	2881	0	5	14	38	48	89	194	+6.73377
2013	1199	0	1	2	5	9	25	42	-3.50292
2014	1689	0	17	35	40	75	105	272	+16.10420
<i>Total</i>	<i>8361</i>	<i>0</i>	<i>32</i>	<i>74</i>	<i>150</i>	<i>251</i>	<i>387</i>	<i>894</i>	<i>+10.69</i>

**LITERATURE REVIEW**

Peer learning involves students working together and developing skills of mutual collaboration. It involves students of the same age and status taking collective responsibility for, and identifying their own learning needs and addressing them.

In early learning institutions, the effectiveness- if not the widespread use – of peer teaching is equally apparent. In one study conducted in the Ohio school in 2011, four six grade students of the same reading level engaged in reading passages from the Quality Reading Inventory (QRI).

The QRI is an informal assessment instrument containing graded word list and numerous passages designed to assess a student’s oral reading, silent reading and comprehension abilities (Leslie & Caldwell, 2006).

The students who had engaged in peer learning scored significantly higher on the QRI test than the students who had not, indicating the effects peer tutoring can have on academic achievements. Peer learning can be described as way of moving beyond independent to interdependent or mutual learning, (David Boud 1988).

Peer learning encompasses a broad sweep of activities. It is not single undifferentiated educational strategy. For example, researchers from the University of Ulster identified 10 different models of peer learning. These ranged from the traditional proctor model in which senior students tutor junior students, to the more innovative learning cells in which students

in the same year form partnerships to assist each other with course content and personal concerns, (Griffiths et al., 1995).

However as a survival necessity, most of the schools in the County secondary schools were found teaching mathematics and some other subjects by peer learning methodology since the non-local teachers left the county en masse as a result of the rampant insecurity. Former students, who were either awaiting for their Kenya certificate of secondary education examination (KCSE) results, and others on holiday from institutions of higher learning were employed by the school boards, and became lifeline for a good number of schools in the county.

The process of peer learning takes place in two formats. In one, the teacher is the main source of information and guidance on what to learn based on the content of the school curriculum and thus helps in improving the objectivity of the lessons.

In the second, the students are the main source of information and knowledge for his/her peers and the knowledge-sharing process takes place both within and outside the classroom. This may take place among a large group of students or between two individual students. The main advantage of this format is that students understand the colleague's level of thinking better than the teacher does. This will prompt the more-skilled peer to continue explaining the point repeatedly until the learner gets the concept. Confounded effects are factors that influence the performance outcomes of students who are learning from peers, but are not controlled for in the study.

However, despite its popularity peer learning has come under considerable scrutiny in recent years especially in the K-12 community. Some students may feel that being taught by another makes them feel inferior to that student, setting up an adversarial relationship from the start (2008 National Mathematics Advisory Panel).

It is one of the greatest mysteries of our times, how; private schools in the most vulnerable regions of the county that are making a booming business out of the created gap are retaining their non-local teachers.

The study was carried out to investigate whether peer learning has better performance outcomes than the conventional teaching methodology for Garissa County public secondary schools students.

## **MATERIALS AND METHODS**

Based on the gender of their students, all the public secondary schools in the county were grouped into three strata as boys only, girls only and mixed-sex schools.

Using simple random sampling technique, Form Two students in all the single-sexed schools were divided into Control and Experimental groups.

The Control groups were taught by conventional methods.

The Experimental, and the Mixed-sex schools which were studied for effect of interaction, were also taught by peer learning methodology only.

After six months of study, term one and term three Mathematics scores obtained by Form Two students of all the schools were collected, letter-graded from A to E and entered in Microsoft Excel Software.

All students who obtained scores equivalent to C+ and above were summarized.

## STATISTICAL ANALYSES

Using R Statistical Software (Version 3.1.1) statistics such as pretest and posttest Means, Standard Deviations and Coefficient of variation as well as Pearson's Correlation of the Experiment and the Control groups were calculated. Using Chi-square test, the influence of peer learning on the Experiment groups was tested for significance at 5% confidence level and while confounding factors such as gender of students, text book student ratio, and teacher student ratio were also tested at the same confidence level.

The Means of the three strata were calculated and tested for significant differences. Means of term one and term three were also tested for significant differences.

## RESULTS AND DISCUSSION

**Table 2. Summary of Statistics**

BOYS	CONTROL SCHOOLS			GIRLS	CONTROL SCHOOL	
STATISTIC	TERM I	TERM III		STATISTIC	TERM I	TERM III
MEAN	15.61	15.28		MEAN	12.81	10.41
SD	13.66	14.41		SD	12.48	12.07
SE	0.7758			SE	1.128	
CV	87.51%	94.31%		CV	97.42%	115.95%
N	655			N	237	
PEARSON	51.06%			PEARSON	58.77%	
Z	-0.589			Z	-3.06	
SIGNIFICANT	Yes, (P<0.05), SE*3(2.327)			SIGNIFICANT	Yes, (P<0.05), SE*3(3.384)	
BOYS	EXPERIMENT SCHOOLS			GIRLS	EXPERIMENT SCHOOLS	
STATISTIC	TERM I	TERM III		STATISTIC	TERM I	TERM III
MEAN	26.23	27.42		MEAN	14.53	19.48
SD	22.9	19.26		SD	16.43	14.34
SE	1.353			SE	1.401	
CV	87.30%	70.24%		CV	113.10%	73.61%
N	489			N	240	
PEARSON	70.74%			PEARSON	64.22%	
Z	1.1366			Z	5.35	
SIGNIFICANT	Yes, (P< 0.05), SE*3(3.105)			SIGNIFICANT	No, (P>0.05), SE*3(4.203)	
BOYS	MIXED-SEX SCHOOLS			GIRLS	MIXED-SEX SCHOOLS	
STATISTIC	TERM I	TERM III		STATISTIC	TERM I	TERM III
MEAN	20.82	17.81		MEAN	19.82	14.19
SD	20.11	19.23		SD	19.93	13.58
SE	2.06			SE	2.904	
CV	96.58%	107.97%		CV	100.56%	95.70%
N	183			N	69	
PEARSON	49.78%			PEARSON	73.49%	
Z	-2.112			Z	-3.45	
SIGNIFICANT	Yes, (P<0.05), SE*3(6.18)			SIGNIFICANT	Yes, (P<0.05), SE*3(8.712)	

**Table 3. Influence of Peer Learning on Student’s Performance in Mathematics**

Factor	Grades						Total	Chi-Square Value
	C+	B-	B	B+	A-	A		
Teaching Methodology								
Conventional	9	11	7	9	4	14	54	
Peer Learning	25	22	11	11	6	17	92	
Total	34	33	18	20	10	31	146	3.309

The outcome of this analysis had showed that the observed chi-squared value of 3.309 was much lower than that of the critical chi-square value of 21.03 at a 5% significant level under 12 degrees of freedom ( $P < \alpha$ ). There is sufficient evidence to suggest that peer learning has better performance outcomes when used to teach Mathematics to students than the conventional methodologies used in the various schools studied.

There were significant differences between Means of Term one and Term two in all the groups except in those of the girls in the Experiment group. The more skillful peer in this group of the girls may not have been up to the task and failed to meet the threshold of a peer teacher though essentially better than her peers. There were high coefficients of variations, more in the scores of the same term than between scores of the two terms. There were both main effect and significant effects of interaction between the two genders in the Mixed-sex schools. Girls in the Mixed-sex schools lost an average of 5.64 marks while the boys lost 2.10. This was compared with the girls and the boys in the Experiment groups who gained 4.89 and 1.19 respectively. The Teachers College Record published a study in 2009 that showed that in majority of cases, the effect of the interaction between boys and girls has resulted in less homework done, less enjoyment of school, lower reading and math scores. Recently, however, there has been a resurgence of interest in single sex schools in modern societies across the globe, both in the public and private sector due to educational research (Riordan, 2002).

However, 63.1% of all students who got a Mean Grade of C+ and above were taught by peer learning methodology compared with the 36.9% of those taught by the conventional method who managed to get C+ and above making peer learning look the better of the two. This outcome of the study supports the popular belief that peer learning has better performance outcomes.

**Table 4. Influence of Teacher-Student Ratio on Students’ Performance in Mathematics**

Factor	Grades						Total	Chi-Square Value
	C+	B-	B	B+	A-	A		
Teacher/Students Ratio								
1:40	10	12	8	12	5	14	61	
1:80	5	7	0	2	1	2	17	
>1:80	19	14	10	6	4	14	67	
Total	34	33	18	20	10	30	145	11.3888

The above results indicate that the observed chi-square value of 11.3888 is less than the critical chi-square value of 28.87 obtained at a confidence level of 5% under 18 degrees of freedom ( $P < \alpha$ ). There was enough evidence to suggest that students' performance in mathematics was influenced by the number of students in a class for a teacher. Students get adequate attention from their teaching when they are few than when many.

Nye et al (2001) explored the relationship between the numbers of years that students participated in Project STAR small classes and their level of achievement. After one year, the students in smaller classes had significantly higher achievement scores on the Stanford Achievement Test reading and mathematics subtests than students in larger classes.

The gap in scores widened after two years, indicating that the effects of small classes are cumulative. However, a state-mandated, four-year evaluation of California's class size reduction (CSR) program ultimately described its assessment of the program's relationship to improved academic achievement as "inconclusive" (Bohrstedt and Stecher, 2002). Statewide, average test scores in California improved as CSR reached more students, but the researchers could not determine whether the gains in test scores were attributable to CSR or to one or more of the other major initiatives under way in California at the same time.

**Table 5. Influence of Text Book Sharing on Students' Performance in Mathematics**

<i>Factor</i>	<i>Grades</i>						<i>Total</i>	<i>Chi-Square Value</i>
	<i>C+</i>	<i>B-</i>	<i>B</i>	<i>B+</i>	<i>A-</i>	<i>A</i>		
Text book students ratio								
1:1	2	2	0	1	1	0	6	
1:2	10	6	7	4	2	5	34	
1:3	7	13	7	4	1	3	35	
1:4	1	3	2	0	0	0	6	
>1:4	14	9	2	11	6	2	44	
Total	34	33	18	20	10	10	125	24.5089

The results in Table 5 indicated that the observed chi-square value of 24.5089 was less than the critical chi-square value of 43.77 at confidence level of 5% within 30 degrees of freedom ( $P < \alpha$ ). There was sufficient evidence to suggest that the performance of a student in mathematics was influenced by the number of other students with whom he/she was sharing mathematics text book. However, the main benefit of sharing a text book is in the discussion of, and the contribution from the group members and not the sharing per se. This is more so to the below-average-student who cannot benefit much even with adequate amount of text books of his/her own without the assistance of a peer.

The findings of Table 6 indicated that the observed chi-square value of 8.3859 was less than the critical chi-square value of 28.87 at the 95% significant level and degree of freedom of 18 ( $P < \alpha$ ). This meant that there were sufficient evidences to suggest that the performance of students in mathematics was influenced by their gender among other factors that were not controlled for in the study. Based on the findings, 64% of students who got a Mean grade of C+ and above were boys and 18.7% were girls. The remaining 16.4% of the students who got a Mean grade of C+ and above were from the mixed-sex schools. The data fails to support the

null hypothesis of no-difference and shows boys and girls perform differently in mathematics when they go to different schools.

**Table 6. Influence of Gender of Students on Their Performance in Mathematics.**

<i>Factor</i>	<i>Grades</i>						<i>Total</i>	<i>Chi-Square Value</i>
	<i>C+</i>	<i>B-</i>	<i>B</i>	<i>B+</i>	<i>A-</i>	<i>A</i>		
Gender								
Boys Only	21	21	10	13	6	23	94	
Girls Only	8	9	2	3	2	4	28	
Mixed-Sex	5	3	6	4	2	4	24	
Total	34	33	18	20	10	31	146	8.3859

The Teachers College Record published a study in 2009 that showed that in majority of cases, the effect of the interaction between boys and girls has resulted in less homework done, less enjoyment of school, lower reading and math scores. Recently, however, there has been a resurgence of interest in single sex schools in modern societies across the globe, both in the public and private sector due to educational research (Riordan, 2002).

**CONCLUSION**

Peer learning is a better teaching methodology than the conventional methodology for Garissa County public secondary schools.

Confounding effects such as gender of the student, teacher student ratio and student text book ratio have significant influence on student’s performance in mathematics.

The Mean scores between the two terms were not significantly different in all the schools except in that of the girls in the Experiment group which showed significant difference.

There were interaction effects that lead to generally low performance by students in the Mixed-sex schools. While girls in the Experimental group gain an average score of 4.89, girls in the Mixed-sex schools lost 5.64. Boys in the Experimental group gained average of 1.19 while their colleagues in the Mixed-sex schools lost 2.10.

**REFERENCES**

- [1] Anderson, G., & Boud, D. (1996) *Extending the Role of Peer Learning in University Courses. Research and Development in Higher Education: 19*, pp. 15-19.
- [2] Barbara, G. Davis. (2009). *Tools for Teaching: San Francisco: John Willey and Sons Inc.*
- [3] Bernd, H.(1997). *The Trees in My Forest: New York: Harper Collins Publishers.* pp. 141-151.
- [4] Glass, G.V., & Smith, M.L. (1978) *Meta-Analysis of Research on the Relationship of Class Size and Achievement.* San Francisco: Far West Laboratory of Educational Research and Development.
- [5] John, I. G.(2004). *A Place Called School Prospect for the Future: New York: McGraw- Hill.*

- [6] Johnson, K.A. (2000). *Do Small Classes Influence Academic Achievement? What the National Assessment of Educational Progress shows: A report of the Heritage Center for Data Analysis*. Washington, DC: Heritage Foundation.
- [7] Kurecka, P., & Claus, R.N. (2000). *A Study of a Reduced Class Size Program, Grades 1 & 2 1999/2000. Evaluation Report*. Saginaw, MI: Saginaw Public Schools, Department of Evaluation Services.
- [8] Long Walk to Freedom. *Autobiography of Nelson Mandela* (1994, p. 144) Martin's Press.
- [9] Mitchell, D. E., & Mitchell, R. E. (1999). *The Impact of California's Class Size Reduction Initiative on student achievement: Detailed findings from eight school districts*. Riverside, CA: University of California, California Educational Research Cooperative.
- [10] Molnar, A., Smith, P., & Zahorik, J. (1999). *Evaluation results of the Student Achievement Guarantee in Education (SAGE) Program, 1998-99*. Madison, WI: University of Wisconsin Madison, School of Education.
- [11] Munoz, M. A. (2001). *Class Size Reduction in a Large Urban School District: A Mixed Methodology Evaluation Research Study*. Louisville, KY: Jefferson County Public Schools.
- [12] Nachmias, D. (1992). *Research Methods in the Social Sciences, Volume 1*: New York: Saint Martin.
- [13] Norland-Tilburg, E. V. (1990). Controlling Error in Evaluation Instruments. *Journal of Extension*, [On-line], 28(2). Available at <http://www.joe.org/joe/1990summer/tt2.html>
- [14] Nye, B. A. (2000). Do the disadvantaged benefit more from small classes? Evidence from the Tennessee Class Size Experiment. *American Journal of Education*, 109, 1-25.
- [15] Nye, B., Hedges, L. V., & Konstantopoulos, S. (2001). Are effects of small classes cumulative? Evidence from a Tennessee Experiment. *Journal of Educational Research*, 94, 336-345.
- [16] Nye, B., Hedges, L. V., & Konstantopoulos, S. (2001). The Long-Term Effects of Small Classes in Early Grades: Lasting Benefits in Mathematics Achievement at Grade 9. *Journal of Experimental Education*, 69, 245-257.
- [17] Nye, B., Hedges, L. V., & Konstantopoulos, S. (2004). Do Minorities Experience Larger Lasting Benefits from Small Classes? *Journal of Educational Research*, 98, 94-100.
- [18] Pollard, J. P., & Yap, K. O. (1995). *The Nevada Class size Reduction Evaluation Study 1995*. Carson City, NV: Nevada Department of Education, Planning, Research, and Evaluation.
- [19] Speas, C. (2003). *Class-Size Reduction Program Evaluation, 2001-2002: A report to the North Carolina Department of Public Instruction*. Raleigh, NC: Wake County Public School System, Department of Evaluation and Research.