

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

YUSSUF ALI HASSAN

**MASTER OF SCIENCE
(RESEARCH METHODS)**

**JOMO KENYATTA UNIVERSITY OF
AGRICULTURE AND TECHNOLOGY**

2016

**Peer learning: An alternative teaching model for Garissa county
public secondary schools**

Yussuf Ali Hassan

**A thesis submitted in partial fulfillment for the degree of Master of
Science in Research Methods in the Jomo Kenyatta University of
Agriculture and Technology.**

2016

DECLARATION

This thesis is my original work and has not been presented for award of a degree in any other university.

Signature: _____ Date: _____

(Yussuf Ali Hassan)

This thesis has been submitted for examination with our approval as university supervisors:

Signature: _____ Date: _____

(Dr. Aggrey O. Adimo)

JKUAT, Kenya

Signature: _____ Date: _____

(Prof. Edward George Mamati)

JKUAT, Kenya

DEDICATION

I dedicate this work to my late Mama, Hawa, who gave me the first opportunity for education. May ALLAH forgive her and raised her among the Honourables.

And, to all students of Garissa University College who lost their lives in the hands of the cowards; And to the former and current pupils and students of the various primary and secondary schools in North Eastern Province, who were let down by our government;

And finally, to my beloved daughters; Sa'adow, Fatush and Lutu who kept me going.

ACKNOWLEDGEMENTS

I am heavily indebted to my supervisors; Dr. Aggrey O. Adimo and Prof. Edward George Mamati and for their invaluable guidance and contributions towards this work. I would like to thank the Garissa County Chief Officer of Health Dr. Sophia Mohammed Ahmed for approving my request for study leave under difficult circumstances. May Allah bless her. Special thanks go to all the school heads and in a particular way to the Deputy Principal of Modogashe secondary school for his exemplary co-operation and encouragement during the data collection.

My sincerest appreciation goes to all the lecturers of the MSc Research Methods course and in a particular way to Prof. Kavoi whose method of lecturing fits my research topic of peer learning so well.

Finally, in a way that I have no words to describe I would like to thank JKUAT for giving me the opportunity to pursue Master's degree in Research Methods.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF APPENDICES	xi
LIST OF ABBREVIATIONS	xii
ABSTRACT.....	xiii
CHAPTER ONE	1
1.0 INTRODUCTION.....	1
1.1 Background	1
1.2 Insecurity.....	1
1.3 Kenyan System of Education	2
1.4 Teaching Methods	3
1.4.1 Sample Teaching Models proposed by the University of Ulster	3
1.4.2 Teacher-Centered Approach to Learning.....	4
1.4.3 Student-Cantered Approach to Learning	5
1.5 Statement of the Problem	7
1.6 Broad objective	7
1.6.1 Specific Objectives of the Study	7

1.7 Hypotheses	8
1.8 Research Questions	8
1.9 Justifications.....	8
1.9.1 The Purpose of the Study	9
1.9.2 Significance of the study	10
1.9.3 Scope of the study	10
1.9.4 Delimitation of the Study	12
1.9.5 Limitation of the Study	12
1.9.6 Basic Assumptions of the Study	12
CHAPTER TWO	13
2.0 LITERATURE REVIEW.....	13
2.1 Introduction	13
2.1.1 Content Overlap	14
2.1.2 Involvement.....	14
2.1.3 Success	14
2.2 Teaching Methodology and Students’ Performances in Mathematics.....	15
2.3 Gender and Students’ Performances in Mathematics.	20
2.4 Student-Teacher Ratio and Student’s Performance in Mathematics.....	24
2.5 Gender of Students and their performances in Mathematics.	27
2.6 Text Book Student Ratio and their performance in Mathematics.....	30
2.7 Theoretical Framework	31
2.8 Conceptual Framework	32
2.8.1 Moderating Variables.....	33
2.8.2 Intervening Variables	33

CHAPTER THREE	35
3.0 RESEARCH METHODOLOGY	35
3.1 Research Design.....	35
3.2 Target Population	36
3.3 Sample Size.....	36
3.4 Inclusion Criteria.....	36
3.5 Sampling Procedure	36
3.6 Distribution of Boys’ Secondary Schools by Sub-County.....	38
3.7 Distribution of Girls Secondary School by Sub-County.....	40
3.8 Distribution of Mixed-sex Secondary Schools by Sub-County.....	41
3.9 Data Sources.....	43
3.9.1 Data Collection Instruments.....	43
3.9.2 Data Collection Techniques.....	43
3.9.3 Collection of Pretest Data.....	43
3.9.4 Introduction of the Model.....	44
3.9.5 Validity.....	44
3.9.6 Reliability of the Research Instruments.....	44
3.9.7 Piloting Study.....	45
3.9.8 Post Test Data Collection.....	45
CHAPTER FOUR.....	47
4.0 DATA ANALYSIS	47
4.1 Response Rate	47
4.2 Demographic Data.....	47
4.3 Age Groups of Form Two Students in Sampled Schools.....	47

4.4 Distribution of Students by their Gender.	48
4.5 Teaching Methodology and student’s performance in Mathematics.	49
4.6 Gender of Student’s and their performance in Mathematics.	50
4.7 Teacher student ratio and their performance in Mathematics.....	56
4.8 Text Book Student Ratio and their performance in Mathematics.....	59
CHAPTER FIVE.....	62
5.0 SUMMARY, DISCUSSION, CONCLUSION AND RECOMMENDATIONS	62
5.1 Introduction.....	62
5.2 Summary	62
5.3 Discussion	63
5.4 Conclusion	67
5.5 Recommendations	67
5.6 Recommendations for Further Studies.....	68
REFERENCES.....	69
APPENDICES	74

LIST OF TABLES

Table 1.0 Garissa County KCSE Analysis: 2010- 2015.	11
Table 3.0 Strata and Sample Size Generation	38
Table 3.1 Boys’-Only Secondary Schools and Enrolment by Sub-County.	40
Table 3.2 Girls’-Only Secondary Schools and their Enrolment by Sub-County.	41
Table 3.3 Number of County Mixed-sex Secondary Schools and their Enrolment. .	42
Table 4.0 Distribution of Students by Their Age Groups.	48
Table 4.1 Distribution of Form Two Students based on Their Gender.	49
Table 4.2 Teaching Methodology on Students’ Performance in.....	50
Table 4.3 Descriptive Statistics of the Different Strata.	52
Table 4.4 Gender of Students and their performance in Mathematics.....	56
Table 4.5 Teacher-Student Ratio and their performance in Mathematics.....	58
Table 4.6 Text Book Student Ratio and their performance in Mathematics	59

LIST OF FIGURES

Figure 1.0 Map of Garissa County	2
Figure 1.1 Blame Game Pentagrams.....	9
Figure 2.0 Global Gender Disparities in Secondary Enrolments.....	21
Figure 2.1 Countries with High Female Gross Enrolment Ratio.....	22
Figure 2.2 Countries with Largest Gender Disparities in the World.....	23
Figure 2.3 Class size and reading performance in 2005 in USA.....	26
Figure 2.4 Countries with the Highest Secondary Pupil-Teacher Ratio	27
Figure 2.5 Conceptual Framework.....	35
Figure 4.0 Number of students who scored C+ and above in Garissa County.....	61
Figure 5.0 Average Class Size in Education Institutions by Level of Education	66

LIST OF APPENDICES

APPENDIX ONE: CONSENT FORM 74

APPENDIX TWO: LETTER OF INTRODUCTION..... 82

APPENDIX THREE: COUNTY RESEARCH PERMIT 83

APPENDIX FOUR: THEORETICAL SAMPLE SIZE GENERATION 84

LIST OF ABBREVIATIONS

ALT	- Academic Learning Time
CDF	- Constituency Development Funds
CSR	- Class Size Reduction
FBO	- Faith Based Organization
GPA	- Grade Point Average
ICS	- Internationaal Christelijk Steunfonds
KCPE	- Kenya Certificate of Primary Education
KCSE	- Kenya Certificate of Secondary Education
KEEP	- Kenya Equity in Education Project
KMO	- Kayser-Meyer-Olkin
MKO	- More Knowledgeable Other
NGO	- Non-Governmental Organization
PISA	- Program for International Students Assessment
QRI	- Quality Reading Inventory
STAR	- Student Teacher Adjustment Ratio
TE	- Teacher Efficacy
TSC	- Teachers Service Commission
UNHCR	- United Nations High Commission for Refugees
ZPD	- Zone of Proximal Development

ABSTRACT

To pass knowledge from one generation to another requires proven method that stands the test of time. Teachers struggle to ensure their students grasp facts and concepts of a topic at hand in real time. The methodology of teaching influences the learning process. Like professional story-teller, a teacher must make his/her students see the mental pictures of the story. He/ she must leave more questions than answers in the heads of his/her students for contemplation. This study investigates whether students can learn better from colleagues (peers) than from their professional teachers. Performance outcomes of Garissa County public secondary school students in Mathematics was studied using peer learning and other conventional teaching methodologies as treatments. Based on the gender of their students, schools were grouped 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. All the Mixed-sex schools were treated as a stratum. Post-test Mathematics scores were collected from all the three groups. The Control groups were taught using the conventional methodologies while the Experimental group from single-sex schools and those from the Mixed-sex schools that were being studied for effects of interaction were taught by peer learning methodology, all under double-blinded setup. Pretest Mathematics scores were collected from the groups. They were letter-graded A to E and entered in Microsoft Excel Software. The number of students who obtained C+ and above, the cut off point for university admission in Kenya was summarized. Statistics such pretest and posttest Means, SDs and CV as well as Pearson' Correlation of the Experimental and the Control groups were calculated using R Statistical Software. Paired and unpaired t-test was also calculated. Using Chi-squared test, the influence of peer learning on the exposed groups was tested for significance at 5% confidence level while the confounding factors such as gender of students, text book student ratio, and teacher student ratio were also calculated at the same confidence level. The study 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 those of girls' schools. The Mixed-sex schools showed significant effects

of interaction. There was high coefficient of variations within scores of the same term than between the two terms. The confounding effects were found to be significant on their own and on peer learning. The findings suggested that peer learning was a superior teaching methodology compared to the conventional ones for Garissa County public secondary schools.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Garissa County is in Northern region of Kenya. It covers an area of 44,174.5 km² with an estimated population of 623, 0604 (Garissa county 2014- 2018 Strategic Policy). The region is pre-dominated by a community with low literacy level. The harsh climatic conditions and the poor soils make farming impossible in many parts of the region. The communities are majorly pastoralist (90%), agro-pastoralist (7%) and others rely on formal employment and petty trade at 3% (Kenya Census; 2009). Long and porous border with Somalia make efforts by the central government to curtail insecurity futile. Inter-tribal conflicts over scarce natural resources, some of which are politically instigated reached normalcy levels. Corrupt leadership and undefined resource ownership drains the economy.

Due to its nomadic lifestyle, opportunities for quality education are hard to come by for majority of the community. The county has six sub-counties.

1.2 Insecurity

The county has been hosting the biggest refugee camp in the world –Dadaab since 1991. The camp is home to Somali, Ethiopian and Eritrean refugees. It also hosts South Sudanese and Congolese refugees. The county has paid a heavy price for its generosity in terms of environmental destruction, smuggling of small arms, abductions of foreign aid workers for ransom and killing of the country's security personnel for revenge. Such killing increased the vulnerability of the common man.

The massacre of 148 students and staff of Garissa University College was the straw that broke the camel's back and the non-local teachers in the county public schools left en mass.

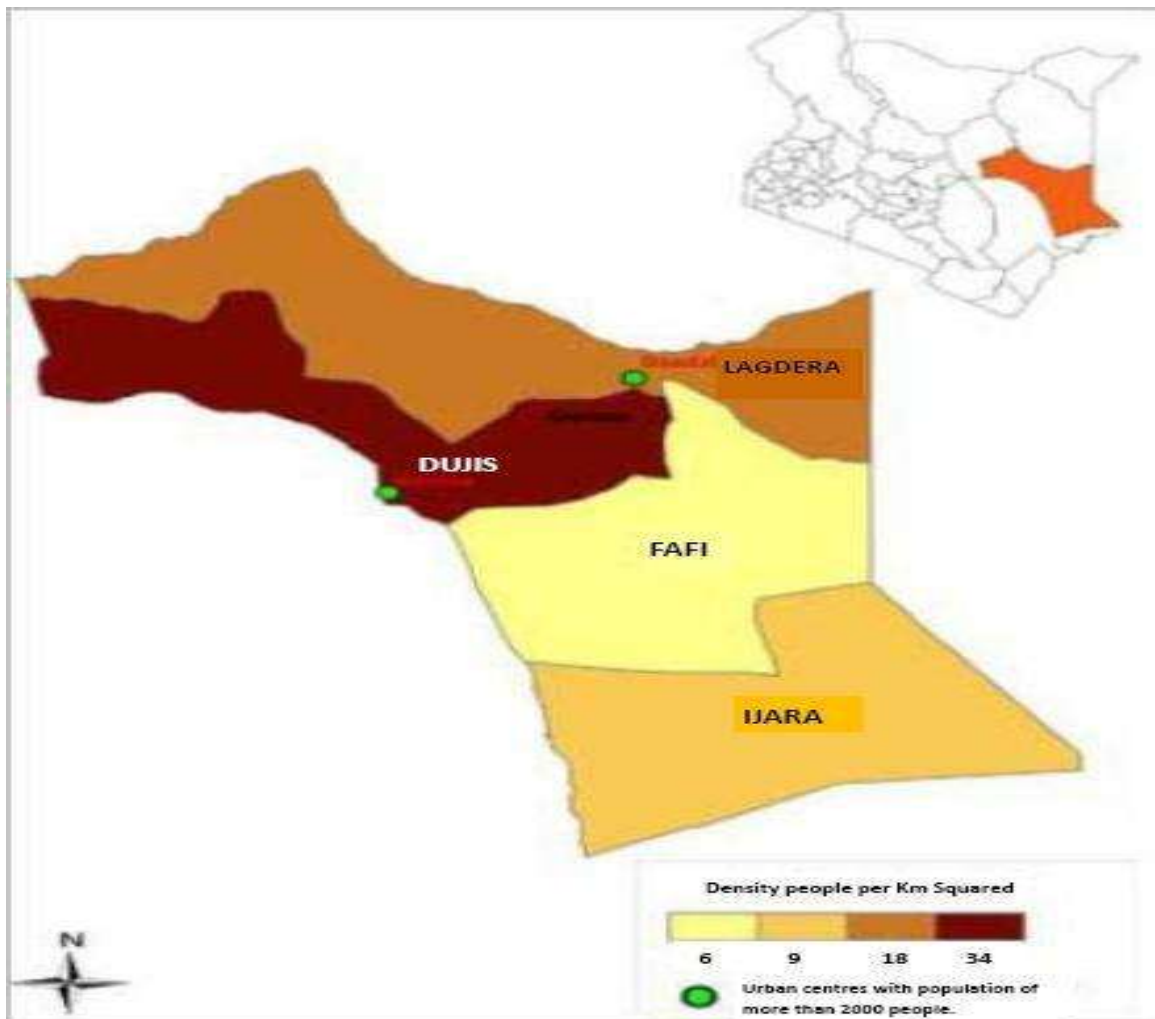


Figure 1.0 Map of Garissa County

1.3 Kenyan System of Education

Kenya upholds education as a fundamental human right and recognizes it as pivotal for the attainment of self-fulfillment and national development (GoK 2007; MoE 2006; Children Act Cap 586 2001). Consistent efforts have been made to address issues of access, equity, quality and relevance of education. At the national level, commissions of education have periodically been set up to review educational provision. Government propelled interventions such as the free primary education and tuition waiver for secondary schools have been introduced to enhance access. Curriculum reviews have been undertaken to address relevance and ease overload on the learners. Public-private partnerships in education have been encouraged leading to increased individual and community participation in the education sector. The

ministry of education continues to receive the highest allotment of the recurrent expenditure. Despite all these efforts, the education sector is still beset with challenges.

Education is the greatest engine of personal development. It is through education that a daughter of a peasant can become a doctor... and that, a child of farm workers can become the president of a great nation. It is what we make out of what we have and not what we are given that separates one person from another, Mandela, (1994).

Historically, for Northern districts like Wajir, Garissa, Isiolo, Marsabit, and Mandera that are largely Muslim, formal education was generally shunned, not because the concept was alien to those communities, but more so due to its association with Christianity. The relative success of alternative provisions of education like the Dugsi and Madrassa in Northern Kenya lend credence to the argument that formal education provision can succeed if enshrined within the religious and cultural conceptions of a people, Sara (2009).

1.4 Teaching Methods

The term teaching method refers to the general principles, pedagogy and management strategies used for classroom and fieldwork instructions. The choice of teaching method depends on the prevailing circumstances — the educational philosophy, classroom demographic, subject area(s) and school mission statement. Regardless of the available resources and the prevailing circumstances, the role of teachers is to ensure their students grasp new content and concepts. There are several teaching methodologies in use over the world. Teaching theories primarily fall into two categories or “approaches” — teacher-centered and student-centered:

1.4.1 Sample Teaching Models proposed by the University of Ulster

Buzz Groups: A large group of students subdivided into smaller groups of 4–5 students to consider the issues surrounding a problem. After about 20 minutes of discussion, one member of each sub-group presents the findings of the sub-group to the whole group.

Affinity Groups: Groups of 4–5 students are each assigned particular tasks to work on outside of formal contact time. At the next formal meeting with the teacher, the sub-group, or a group representative, presents the sub-group’s findings to the tutorial group.

Solution and Critic Groups: One sub-group assigned a discussion topic for a tutorial and the other groups constitute ‘critics’ who observe, offer comments and evaluate the sub-group’s presentation.

1.4.2 Teacher-Centered Approach to Learning

Teachers are the main authority figure in this model. Students are viewed as “empty vessels” whose primary role is to passively receive information (via lectures and direct instruction) with an end goal of testing and assessment. It is the primary role of teachers to pass knowledge and information onto their students. In this model, teaching and assessment are viewed as two separate entities. Student learning is measured through objectively scored tests and assessments.

When a teacher begins a new unit of study or project with students, she clarifies the purpose and learning goals, and provides explicit criteria on how students can be successful. It is ideal to also present models or examples to students so they can see what the end product looks like.

How do learners know they are moving forward without steady, consistent feedback? They often won't. Along with individual feedback (written or verbal), teachers need to provide whole-group feedback on patterns they see in the collective class' growth and areas of need. Students also need to be given opportunities to provide feedback to the teacher so that he/she can adjust the learning process, materials, and instruction accordingly. These are the essence of anonymous teacher evaluations in various institutions of learning.

In order to provide students with effective and accurate feedback, teachers need to assess frequently and routinely where students are in relation to the unit of study's learning goals or end product (summative assessment). Hattie recommends that teachers spend the same amount of time on formative evaluation as they do on summative assessment.

1.4.3 Student-Centered Approach to Learning

While teachers are an authority figure in this model, teachers and students play an equally active role in the learning process. The teacher's primary role is to coach and facilitate student learning and overall comprehension of material. Student learning is measured through both formal and informal forms of assessment, including group projects, student portfolios, and class participation. Teaching and assessment are connected; student learning is continuously measured during teacher instruction.

Students are given opportunities to plan and organize, monitor their own work, direct their own learning, and to self-reflect along the way. When students were provided with time and space to be aware of their own knowledge and their own thinking, student ownership increases. And research shows that metacognition can be taught, John Hattie (2013).

Teachers need to frequently step offstage and facilitate entire class discussion. This allows students to learn from each other. It is also a great opportunity for teachers to formatively assess (through observation) how well students are grasping new content and concepts.

Students are given opportunities to plan and organize, monitor their own work, direct their own learning, and to self-reflect along the way. Peer learning, also known as cooperative learning is a comprehensive approach to teaching that derives from a theory of education and encompasses key assumptions about what students should learn and how they teach, Duke (1990). Lessons in the cooperative learning strategy are arranged so that each student, ranging from the fastest to the slowest learner, has a contribution to make, Sapon-Shevin and Schniedewind, (1990). Because the students, in this approach, tutor one another, they are likely to acquire greater mastery of the material than in the common individual study with recitation pattern. Furthermore, the shared responsibility and interaction are likely to generate better inter-group relations, and result in better self-images for students with histories of poor achievement, Joyce and Weil (1980).

The Kenya Education Commission popularly referred to as Ominde Commission (Republic of Kenya 1964) was mandated with charting a new education policy for the country. The commission was constituted against a backdrop of disproportionate educational opportunities across the races and the regions. Northern Kenya then

referred to as the northern frontier districts which had been ignored due to perceived lack of relevance to the colonial economy had an almost non-existent educational investment. In the early years of independence, it still remained a closed area under emergency rule, Ngome (2005) analyzed that there was apparent recognition that educational disparity would pose a problem to national integration.

Education is therefore typically viewed as a powerful factor in leveling the field of opportunity as it provides individuals with capacity to obtain a higher income and standard of living. It can, however, represent a medium through which the worst forms of social stratification and segmentation are created.

Inequalities in quality and access to education often translate into differentials in employment, occupation, income, residence and social class. Because such disparities are inherited from generation to generation, access to educational and employment opportunities are to a certain degree inherited while a segment of the population suffering systematic exclusion. The importance of equal access to a well-functioning education system, particularly in relation to reducing inequality cannot be over-emphasized". Anonymous, (2013).

For real or perceived insecurity reasons, the non-local teachers in Garissa County public schools left en mass. This was a stab in the back to the already substandard quality of education in the county. Students had to brave their way and strive harder than their counterparts in the other parts of the country. In this endeavor there was a need to find out an alternative way of ensuring learning continued in spite the absence of the teachers. Peer learning as a teaching model became more of a necessity than a choice to be used by students in the county public secondary schools to mitigate the feeling of helplessness and reduce their desperations. The study compared the performance of students in Mathematics between when they had teachers as in Term One (conventional methods) and, Terms Two and Term Three combined when the teachers were not there and the students learning from each other (peer learning) in the Experimental schools. Mathematics was chosen for the influence it has on the learning of other subjects such as Physics, Chemistry and in some way, Biology.

1.5 Statement of the Problem

Due to insecurity and frequent strikes by the teachers many public secondary schools in the county were closed down for good period of the school terms. These frequent and sometimes prolonged closures reduce the opportunities for the students and teachers to complete the course work on time. Uncompleted course work leads to reduced content overlap; a measure of the number of topics in national examination students may have actually managed to cover in a class within the set time frame and therefore be able to answer them satisfactorily. As a result, majority of students in Garissa County public secondary schools fail in the national examinations. Failing in the context of their inability to attain C+ (C Plus) grade, the minimum university admission requirements to undertake courses of their choices offered at the local or international universities. Therefore peer learning was expected to help students learn from one another and increase their possibilities of improving the content overlap and by extension increase chances of passing national examinations in the event that teachers fail to come back.

1.6 Broad Objective

To evaluate the influence of the teaching methodology, gender and the available resources on Garissa county public secondary school students' performance in Mathematics.

1.6 Broad objective

To evaluate the influence of the teaching methodology, gender and the available resources on Garissa county public secondary school students' performance in mathematics.

1.6.1 Specific Objectives of the Study

- 1) To determine whether the performance of Garissa County public secondary school students in Mathematics significantly varies with the teaching methodology used in their school.
- 2) To determine whether the performance of Garissa County public secondary school students in Mathematics significantly varies with their gender.

- 3) To determine whether the performance of Garissa County public secondary school students in Mathematics significantly varies with the student-teacher ratio in their schools?
- 4) To determine whether the performance of Garissa County public secondary schools students in Mathematics significantly varies with the student-text book ratio in their school?

1.7 Hypotheses

The following hypotheses were tested at 0.05 alpha-level.

H₀₁: There is no significant difference between peer learning and conventional teaching methodologies in the performance of Garissa County public secondary schools students in Mathematics.

H₀₂: There is no significant difference in the performance of Mathematics between boys and girls in Garissa County public secondary schools.

H₀₃: Student-teacher ratio has no influence in the performance of Mathematics in Garissa County public secondary schools.

H₀₄: Student-text book ratio has no influence in the performance of Mathematics in Garissa County public secondary schools.

1.8 Research Questions

- 1) Does the performance of Garissa County public secondary school students in Mathematics significantly vary with the teaching methodology used in their school?
- 2) Does the performance of Garissa County public secondary school students in Mathematics significantly vary with their gender?
- 3) Does the performance of Garissa County public secondary school students in Mathematics significantly vary with the student-teacher ratio in their schools?
- 4) Does the performance of Garissa County public secondary schools students in Mathematics significantly vary with the student-text book ratio in their school?

1.9 Justifications

Since 2010, a bare 1175 (11.8 percent) of a whopping 9960 students managed to obtain C+ (C Plus) grade and above- the current cutoff point required for university admission in Kenya.

In April 2015, ninety-five public schools and a university in Northeastern province were closed down for security reasons. Twelve of these schools were secondary while the rest were primary schools. Many others were just open but without teachers. The combination of the two factors -; strikes and insecurity made it difficult for the county schools to utilize their academic learning time (ALT) and achieve their objectives successfully. The trend was growing and getting worse by the year.

There was a high level of insecurity in the county that saw majority of non-resident teachers leave the county en mass while the few who risked remaining behind were living under constant fear for their lives. In addition, teachers' industrial strikes were more frequent and took longer time to resolve now than before. Consequently, majority of the public secondary school students in the county were faced with severe shortage of teachers and were just coping.

1.9.1 The Purpose of the Study

The purpose of the study was to establish whether Garissa County public secondary school students perform better in Mathematics when they were taught through the peer learning methodology as compared to the conventional didactic methods.

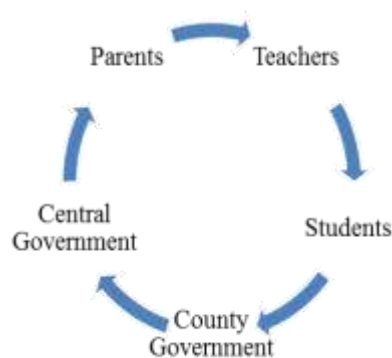


Figure 1.1 Blame Game Pentagrams

Source: Anonymous 2014.

1.9.2 Significance of the study

Some teachers in the county schools spend a good part of their time attending to personal errands. Others were either on strikes or have left schools altogether for insecurity reasons. It has showed that as much the teachers' role in teaching Mathematics was extremely necessary students can, in their absence, learn better from their peers.

There was no previous research carried out in this field in this county, therefore, this research was expected to assist in policy formulation that will enable the local adoption of an appropriate model for the county public secondary schools. The findings were also expected to act as source of reference for future researchers in the field.

1.9.3 Scope of the study

The study covered 20 of the 25 public secondary schools in Garissa County and excluded the private secondary school and those run by faith-based and those of non-governmental organizations.

Inasmuch as there were no adequate teachers both in the primary and secondary schools in the county, and none at all for some, the 2015 KCSE results of the county public secondary schools was found to be the most improved compared to those of the past five years.

Table 1.0 shows the performance of the county public secondary schools in the Kenya certificate of secondary education from 2010 to 2015.

Table 1.0 Garissa County KCSE Analysis: 2010- 2015.

YEAR	ENTRY	C+	B-	B	B+	A-	A	TOTAL	%Passed
2010	1185	0	5	9	36	56	102	208	17.5
2011	1407	0	4	14	31	63	66	178	12.6
2012	2881	0	5	14	38	48	89	194	6.7
2013	1199	0	1	2	5	9	25	42	3.5
2014	1689	0	17	35	40	75	105	272	16.1
2015	1599	0	8	26	47	78	122	281	17.6
TOTAL	9960	0	40	100	197	329	509	1,175	11.8

The data showed that when the students were deserted and left on their own by their teachers for security and other reasons, they coped and strove harder in their studies than before. They resorted to constant and continuous discussion among and between themselves. They did that to ensure that they compensated for the required input of the absent teachers. They also believed that, in an ideal situation, teachers do not have to teach but facilitate the learning process, hence, by simply and systematically role-playing that role, they, too, can achieve their goal of learning. As a result, 2015, the year in which teachers were away for the longest continuous period on record, produced the highest number of KCSE candidates qualifying for university admission compared to the previous five years.

That proves that peer learning as a model has greater performance outcome in a natural setting. This clears all doubt that the Experimental groups in the study were showing an improvement due to Pygmalion Effect since the 2015 candidates had no teachers for a good part of the year but practiced the peer learning technique by design. The work of Rosenthal and Jacobsen (1968), among others, showed that the teacher's expectations influenced student's performance. Positive expectations influenced positively, and negative expectations influenced performance negatively. They originally described the phenomenon as the Pygmalion Effect. "When we expect certain behaviors of others, we are likely to act in a way that makes the expected behavior more likely to occur", Rosenthal and Babad (1985).

1.9.4 Delimitation of the Study

The study was carried out in twenty public secondary schools in Garissa County. The data were collected between May 2015 to February 2016, across targeted 20 public secondary schools in Garissa County.

1.9.5 Limitation of the Study

During the research process, the following challenges were encountered:

Teachers' absence from some schools as result of insecurity caused the researcher to replace some schools with others without compromising on the principle of randomization.

Insecurity in many parts of the county especially where some control schools were, made visiting them impossible but the challenge was overcome by making use of teachers in the local private schools who provided the required data through email and some by courier services.

Difficult geographical terrain and the targeted schools were many and far between but the challenges were overcome through patience and commitment.

Demand for payment by some teachers in order to provide relevant data was experienced in some schools but the problem was overcome by explaining the importance of the study both for themselves, their students and the community at large.

1.9.6 Basic Assumptions of the Study

“Even carefully collected results can be misleading if the underlying context of the assumptions is wrong”. Bernd Heinrich,(1997). Based on this; the following assumptions were in play in the entire process of data collection; That, the pre-test scores provided by the schools were what the students actual score in the given examinations. That, all information provided in the questionnaires by the school heads was true to the best of their knowledge. That, any improvement in the post-test scores of students in the experiment schools was as a result of the treatment given (peer learning) and not due to any of the confounding factors. That, all the questionnaires will correctly and completely be filled and returned on time.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

In 2010, over 90 percent of primary school age children around the world were enrolled in primary and secondary education. But being in school does not guarantee that students are learning. (World Bank, The State of Education. (2014).

Peer learning involves students working together and developing skills of collaboration. Doing that trains them on the practice needed in planning and teamwork, and makes them be part of a learning community in which they have a stake. There are increased possibilities for students to engage in reflection and exploration of ideas when the authority of the teacher was not an immediate presence.

Peer learning involves a group of students taking collective responsibility for identifying their own learning needs and planning how to address that. Students learn a lot from their colleagues more than they learn from their teacher since the duration of contact among students is longer than between students and their teachers. This is a vital learning-how-to-learn skill as well as providing practice for the kinds of interaction needed in employment. Learning to cooperate with others to reach mutual goals seems prerequisite for operating in a complex society, Boud (1988).

The impact of the absent teachers from the county public schools was palpable and it adversely manifested itself more in the 2015 national primary schools examination results where majority of the public primary schools pupils performed dismally. These pupils had no teachers and were not competent enough to practice peer learning.

To realize the benefits of peer learning over the conventional teaching methodologies will, however, depend on the ways in which it was established and the context in which it was operated. Students gain more practice in communicating in the subject

area than was typically the case in learning activities when staff was present, David Boud (1995).

Because of insecurity and the attitude of teachers towards working in Garissa County, schools do not achieve their academic learning times very well. ALT is a combination of three separate variables: Content Overlap, Involvement and Success.

2.1.1 Content Overlap

This is defined as the percentage of the set questions in the national examination actually covered by students in the classroom and is sometimes referred to as "Time on Target." This was the most common challenge faced by the visited schools.

Schools do not evaluate their performance in reference to how much of the questions in a national examination paper were actually in the topics covered in the classroom during the course work. They emphasize much on the average performance of the students which will reflect that of the school in general. That was why many county schools have cut-off grade for admitting new students to lock out below average students who did not have learning opportunities in their primary education cycle. The trend increases dropout rates and repetitions while favoring only the bright ones. Setting and subjecting a blanket national examination to all candidates sitting for any national examination when the teaching/learning environment was not conducive both for teachers and their students to allow for full coverage of school syllabi was unfair and grave assumption that educational resources were equitably distributed.

2.1.2 Involvement

This is defined as the amount of time students actively take part in the learning process and is often referred to as "Time on Task". Time on task depends on the availability and the ability of the teacher to engage students to make them actively participate but that by itself remains mirage when security-the most important moderating factor for meaningful teaching/learning was lacking.

2.1.3 Success

This is defined as the extent to which students complete and submit on time assignments given to them by their teachers. On average, it was less than 25 percent of the county public secondary school students who completed and submitted their homework on time for marking. However, it was found out that most teachers in the

county do not give homework to students in order increase content coverage but do so to engage them so that they (teachers) get time to attend to their personal errands during scheduled school contact-hours.

2.2 Teaching Methodology and Students' Performances in Mathematics.

Teaching children according to their actual learning abilities was the most consistently effective at improving learning, and was also very cost-effective.

If a school has more than one class per grade, then reassigning students to classes by initial learning level—often known as streaming—costs very little, improves test scores, and was therefore extremely cost-effective. Even if it is necessary to hire a new contract teacher to allow the class to be divided, streaming is still cost-effective. Providing targeted help for students in the lower half of their class as well as computer programs that allow for self-paced learning, also appear to be quite cost-effective, Duflo, Dupas, and Kremer (2011; 2012).

Peer learning on its own will not bring much to the students without other necessary conditions and support. These include the number of students in a class; the number of trained and actively teaching staff. The availability of relevant reference materials for use and, to some extent, the amount of time a student spends on studying; task. The study also investigated the level of influence co-factors such as gender; student-teacher ratio and student text-book have on the broader concept of peer learning.

The process of learning/teaching takes place in two formats. In one format, the teacher was the main source of information and guidance on what to learn based on the content of the school syllabus and thus helps in increasing the objectivity of the lessons. The main disadvantage of the didactic methodology, particularly in the targeted schools was the fact that the teachers, when present, were do-it-all and as a result, were overwhelmed by the high number of students in their classrooms against the requirements of the bloated syllabus. This reduces opportunity for personalized contact between the teacher and the students. The method favors only the bright students who can grasp facts and concepts fast enough."Because teachers are granted longer blocks of instructional time, they are encouraged to break away from overreliance on lecture and discussions as the primary (often only) model of teaching", Canady and Rettig (1993).

In the other format, the students were the main source of information and knowledge for his/her peers in a give and take style. The process takes place both within and outside the classroom. It may involve a large group of students or two individuals only. The main advantage of this format was that, students (giver) understand the peer's level of thinking better than the teacher does, and if need be, can continue explaining the point repeatedly until the peer gets the concept. While by giving, the "teacher" gains confidence and understands the concept more. Depending on the number and nature of questions that will arise from the students the "teacher" was continuously being challenged the more. Therefore, peer learning was mutually beneficial and was a methodology with interdisciplinary applications. It offers students non-routine problems which encourage them to demonstrate learning in open-ended ways; to talk and write about what they were doing, looking to their peers for validation.

"We propose a curriculum that links knowledge with real life experiences and puts emphasis on collaborative rather than individual learning", Prof. Laban Ayiro (Moi University).

To arrange these longer time blocks, the high school schedule would need to reduce the number of classes students must attend each day.

Canady (1995) proposed a model lesson format for use in a block schedule based upon observation of the most successful teachers using such schedules. According to Canady, those teachers typically use 25-40 minutes of explanation (usually whole group with modeling and demonstration of the objective (s)) of the lesson, followed by 40-60 minutes of application (often using varied groupings and high levels of student activity in a 'hands-on' approach), and concluding with 15-30 minutes of synthesis (closure opportunity for students to connect the explanation to the application and then summarize with reflections and reviews.)

The importance of homework; to give students an opportunity to think and tackle assignments at personal level outside school hours was not emphasized to the students. Nonetheless, students from the county who attended public secondary

schools in other counties other than those in NEP do relatively better than their colleagues at home.

This could be due to combination of factors such as the high standard of discipline set and practiced in those schools, timely and complete coverage of the syllabus (good content overlap), involvement and success as well as the stiff competition they faced when in those schools induced them to work hard.

However, a popular belief was that, counties with schools that were doing relatively better have all that the schools in Garissa County lack. These included adequate, committed and experienced teaching staffs, well equipped laboratories as well as libraries stocked with relevant learning materials. And that, the devolution of the education ministry would not add them much, and that, it will, in fact, bring them some predictable disadvantages such as losing teachers to schools in under-staffed counties as soon as the need for equitable distribution of teachers becomes a reality and was enforced at the national level.

The most important concern for the modern era educationists was not only the learning process but also the learning technique. There was need to change with the prevailing circumstance and make learning adapted to the learners' immediate environment and prevailing conditions. The mobile schools and libraries of the early 90s where teachers would migrate with their pastoralist pupils were not invented for security reasons at the time but were ways of ensuring the continuity of the teaching process as families moved from one place to another in search of water and pasture for their animals. Therefore, waiting for a never-coming teacher will not yield much and it was upon the students to take up teaching roles among and between themselves.

In early institutions of learning, 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 and 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.

Research has demonstrated that, regardless of subject matter, students who engaged with course material by working in teams tend to learn more of what was taught, and to retain it longer than when the same content is presented in other instructional formats such as lectures, Davis (1993). There is also plentiful evidence that students who work together on teams outperform even the highest achieving individual students, Hsiung(2010); Johnson and Johnson(1999); Johnson (1998); Springer(1999), and are more likely to attain higher-order thinking skills such as analysis, synthesis, evaluation, and problem solving, Johnson and Johnson (2002); Springer et al., (1999); Wankat and Oreovicz (1993). For example, problem-solving teams comprised of diverse members consistently perform better than teams of members who approach problems in a similar way (p. 2007), and students' ability to engage in active thinking, their level of intellectual engagement, and their self-rated academic ability are all enhanced by experiences with diversity, Gurin et al., (2002); Watson et al., (2002). The characteristics of effective student teams have been widely studied, and there is ample research on what makes student teams succeed, Johnson et al., (2007), for example, definitive traits of effective student teams, and they noted that each one is critical for success. The first trait is positive interdependence: students work together to accomplish a shared learning goal, and each student can achieve his or her learning goal if and only if the other team members achieved theirs. The sense of accomplishment must come from the knowledge that every person on the team succeeded. Second is individual accountability which suggested that each member should be accountable for his or her learning, and every person must do a fair share of work. This can improve student motivation and the overall energy level of the team.

The third trait, face-to-face interaction, was crucial for building interpersonal skills, as teams work best when members were physically present to interact with the others on the team. Fourth, team members should learn interpersonal and small-group skills

and should use these skills as the team works together. Last, but not least, the team should periodically assess its performance as a team, reflecting on what has been useful or problematic in ensuring an effective working relationships and making decisions about what behaviors should continue and which ones should be changed.

Other models involved discussion seminars or counseling, peer-assessment schemes, collaborative project or laboratory work, projects in different sized (cascading) groups, work-place mentoring and community activities. Peer learning should be mutually beneficial and involve the sharing of knowledge, ideas and experience between the participants. 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 was 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).

At a time when resources are over-stretched and demands upon the teaching staffs are increasing, it offers students the opportunity to learn from each other. It gives them considerably more practice than traditional teaching and learning methods in taking responsibility for their own learning and, more so, learning how to learn. However, it was not a substitute for the teacher since the lessons have to be initially designed and moderated by the teacher.

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

2.3 Gender and Students' Performances in Mathematics.

In all Muslim communities around the world avoidable intermingling of the opposite sexes is strictly prohibited. At home, girls and boys sleep in different rooms. When at school, as much as possible, they stay separated and even sat at different locations of the same classroom.

In some institutions, they were taught by teachers of their own gender where the economy allowed. Unfortunately, this reduced the opportunity for the opposite sexes to learn from each other more so the girls whose time at home was predominated by domestic work.

Nevertheless, we cannot stress enough the importance of strong, sustained emphasis on the expansion of equitable, broad-based and quality basic education, especially for girls. The gap between rhetoric and reality remains large, though gender differentials in education have fallen in most countries, including North Africa, Middle East and South Asia during the 1990s. Many developing countries still spend more on defense than health and education combined. It will be vital for governments and the international community to prioritize education spending and better protect education budgets in periods of fiscal crises, Court and Cornia (2001).

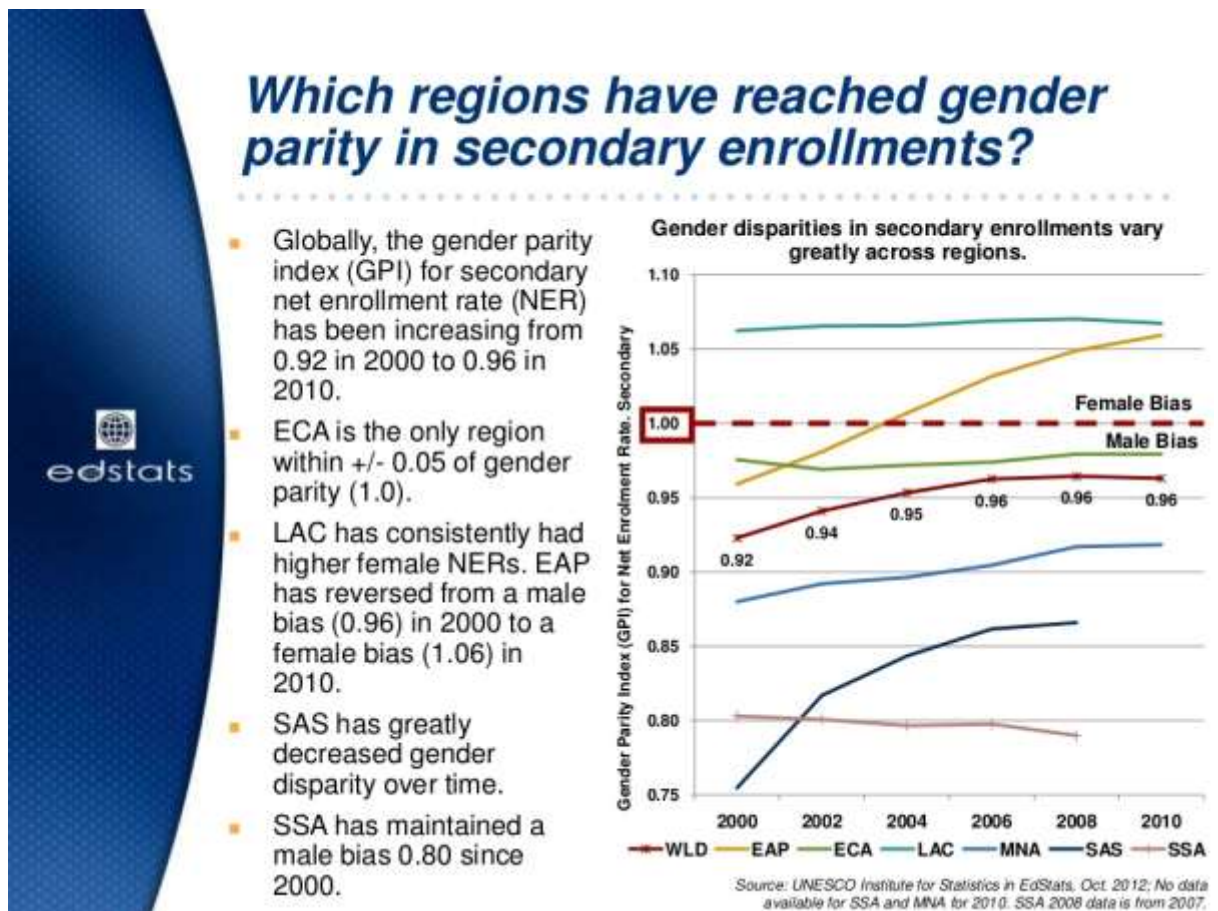


Figure 2.0 Global Gender Disparities in Secondary Enrolments.

Before the 19th century, single-sex schools were common. During the 19th century, more and more coeducational (schools attended by both boys and girls) were set up. Together with mass education, the practice of coeducation was universalized in many parts of the world.

In 1917 coeducation was mandatory in the Soviet Union. According to Cornelius Riordan, by the end of the nineteenth century, coeducation was all but universal in American elementary and secondary public schools, Kolesnick (1969); Bureau of Education (1883); Butler (1910); Riordan(1990). And by the end of the 20th century, this was largely true across the world. Wiseman (2008) showed that by 2003 only a few countries across the globe had greater than one or two percent single sex schools. But there were exceptions where the percentage of single sex schools exceeded 10 percent: Belgium, Chile, Singapore, Hong Kong, Israel, New Zealand, Australia,

South Korea, and most Muslim nations. 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).

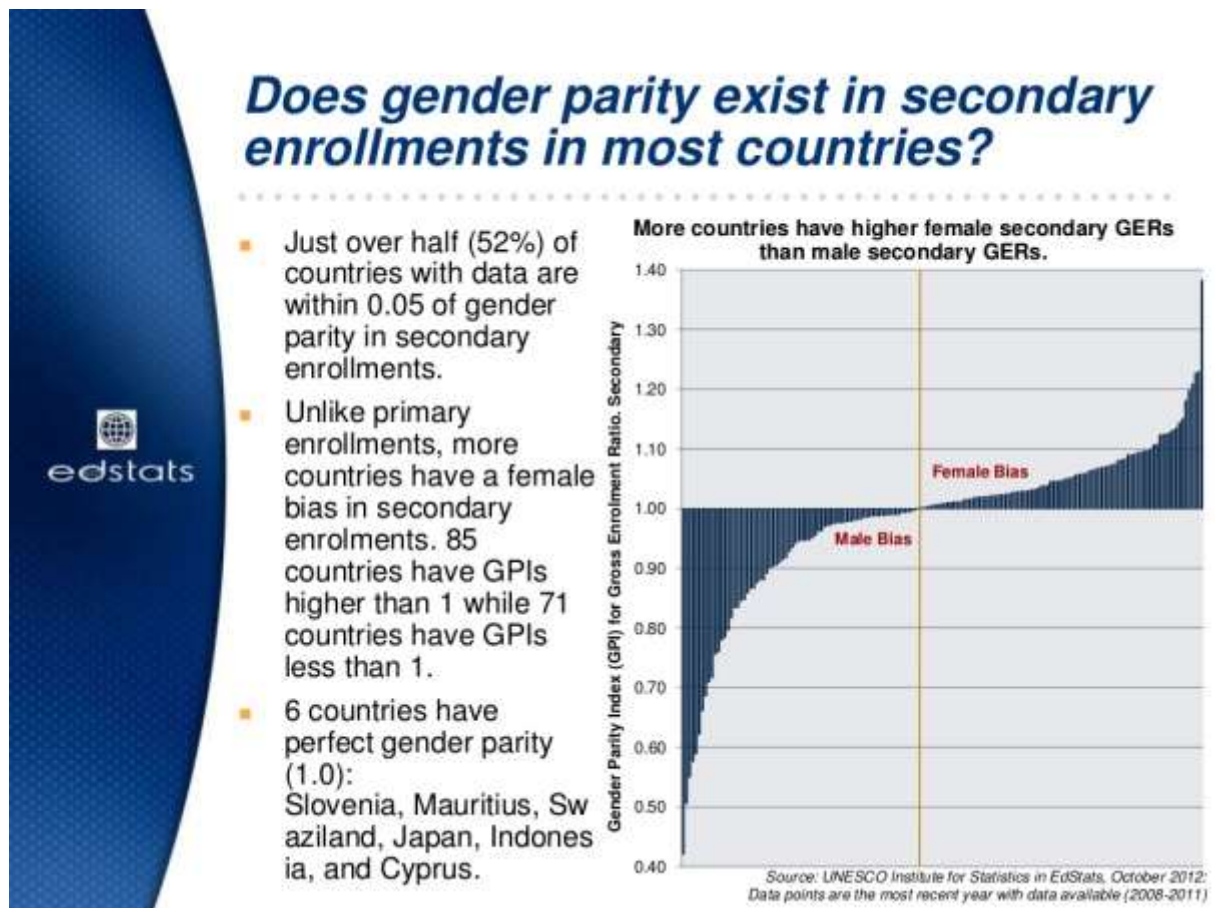


Figure 2.1 Countries with High Female Gross Enrolment Ratio.

According to Barbara Gross Davis (2009), the topic of single-sex education is controversial. Advocates argued that it aids student outcomes such as test scores, graduation rates and solutions to behavioral difficulties.

Opponents, however, argued that evidence for such effects was inflated or non-existent, and instead argued that such segregation can lead to increased prejudice and cost students social skills. Advocates of single-sex education believed that there were persistent gender differences in how boys and girls learn and behaved in educational settings and that, such differences merit educating them separately. One version of

this argument holds that brains of males and females develop differently. Proponents referenced these developmental differences to argue that by separating students according to sex, the educator is able to meet the needs according to the developmental trajectory of the different genders. In addition, supporters of single-sex education argued that by segregating the genders, students do not become distracted by the other gender's actions in the classrooms, therefore making them pay attention more to teacher than to their peers.

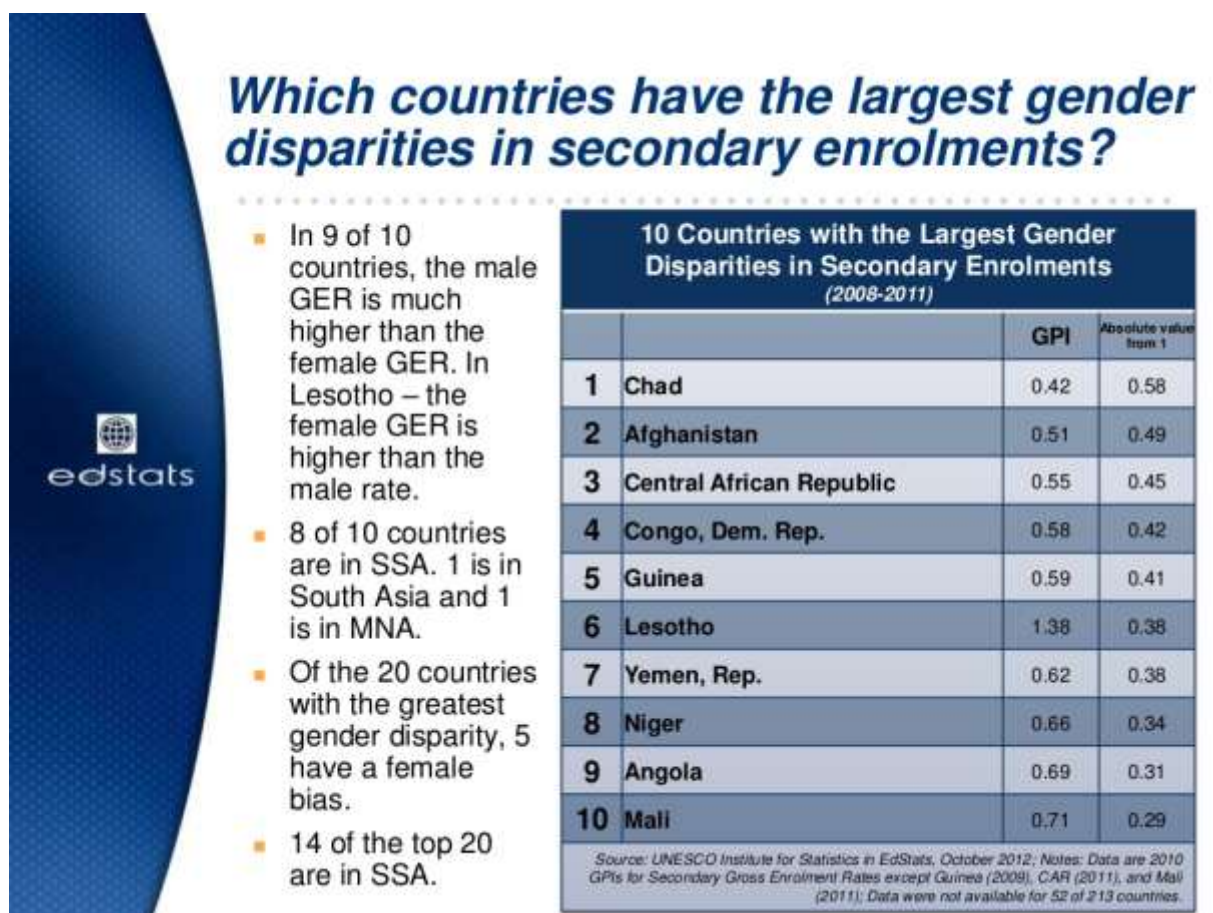


Figure 2.2 Countries with Largest Gender Disparities in the World.

The benefits of single-sex schools include; decrease in distractions in learning, reduction in students' behavior problems. It provides more leadership opportunities as well as promoting a sense of community among students and staff. It helps address unique learning styles and interests of boys or girls as well as reducing sexual harassment among students. 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.

“In September 2011, the journal science published a study deeply critical of the evidence behind positive effects of gender segregation in schooling, arguing that the movement towards single-sex education is deeply mis-guided, and often justified by weak, cherry-picked, or misconstrued scientific claims rather than by valid scientific evidence. The study goes on to conclude that there was no well-designed research showing that single-sex (SS) education improved students' academic performance, but there is evidence that it increases gender stereotyping and legitimized institutional sexism. Opponents of single-sex education, including the authors of The Science article referenced above, argue that it is not single-sex education that is producing positive results with students but rather it is the motivation of the teacher and the resources that were available. There was a lack of quality research in the field to attribute success to single-sex schooling rather than extraneous factors. They believed that by having a single-sex schools the children were not prepared for the real world where they would need to communicate with members of the opposite sex”, Molnar et al., (1999).

They argued that coeducational schools break down sexist attitudes through interaction with the opposite sex. Other opponents of single-sex education also argued that it was coeducational schools that created a feeling of safety and a sense of mutual respect.

2.4 Student-Teacher Ratio and Student's Performance in Mathematics.

A low student–teacher ratio is often used as a selling point to those choosing schools for tertiary education. On the other hand, high student–teacher ratio is often cited for criticizing proportionately underfunded schools or school systems, or as evidence of the need for legislative change or more funding for education. Globally, there were around 24 pupils per teacher in 2000 and 2004, Global Report, (2010) on State of Education.

Classes with too many students are often disrupting to education. Also, too many students in a class results in a diverse field of students with varying degrees of learning ability. Consequently, the class will spend more time for on less academically gifted students to assimilate the information, when that time could be better spent progressing through the curriculum. In this way, student–teacher ratios are compelling arguments for advanced or honors classes.

The student-teacher ratio, also known as class size, predicts the level of attention a student was likely to get from the available teacher. Reduced class size as a reform is likely to produce improvement in achievements. Class size is a hotly-debated topic and continues to be at the forefront of the educational and political agenda in many countries. Apart from optimizing public resources, reducing class size to increase student achievement is an approach that has been tried, debated, and analyzed for several decades. Some countries like Finland favor smaller class sizes (20 students or fewer) and are among the most successful countries in the PISA study. Studies set a ratio of 13:1 as their benchmark for “small” classes, which are compared to “large” classes with a ratio of 20:1 (or higher). Others considered classes with a ratio of 20:1 to be “small”. In other words, one program’s “small” class could be another program’s “large” class, making comparisons even more difficult. The most influential contemporary evidence that smaller classes lead to improved achievement is Tennessee’s Project STAR (Student Teacher Adjustment Ratio), Glass (1978).

Because this program set up randomly selected control and experimental groups of students, researchers could compare students who had four years of small class participation to students who had none. This meant that researchers could more reliably evaluate the impact of the class size reform Project STAR (Finn, 2002).

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 were cumulative. Because this program set up randomly selected control and experimental groups of students, researchers could compare students who had four years of small class participation to students who had none. This meant that researchers could more reliably evaluate the impact of the class size reform. Project STAR (Finn, 2002). 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", Bohrnstedt 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.

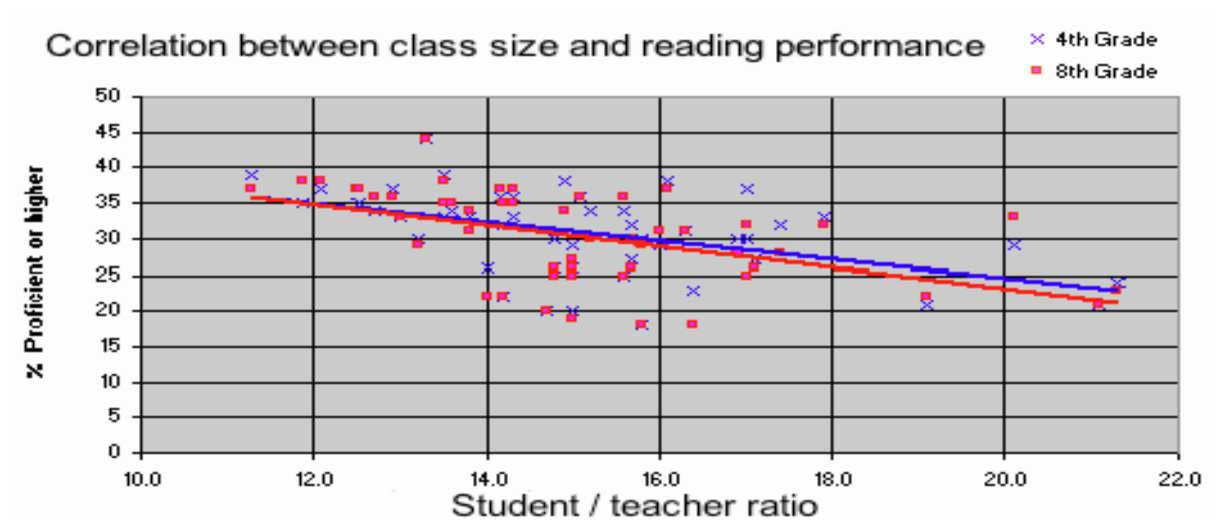


Figure 2.3 Correlation between class size and reading performance in 2005 in USA.

A point to note is that though the teacher student ratio of the targeted county public secondary schools was close to the national figure of 1:40, this should not be taken to mean that the local schools had more or less the same adequate number of teachers, but in fact, it meant that there was a very low enrollment of students either because local primary schools were not producing enough graduates who were qualified to start secondary school education or, the local secondary schools had history of

underperforming hence most of the admitted students moved away to other schools in other sub-counties in the county or counties in the country.

It worth mentioning that the bulk of teachers discussed above were not employees of Teachers Service Commission (TSC) – The national commission that regulates matters related to teachers in Kenya, but were employed by the local school Boards.

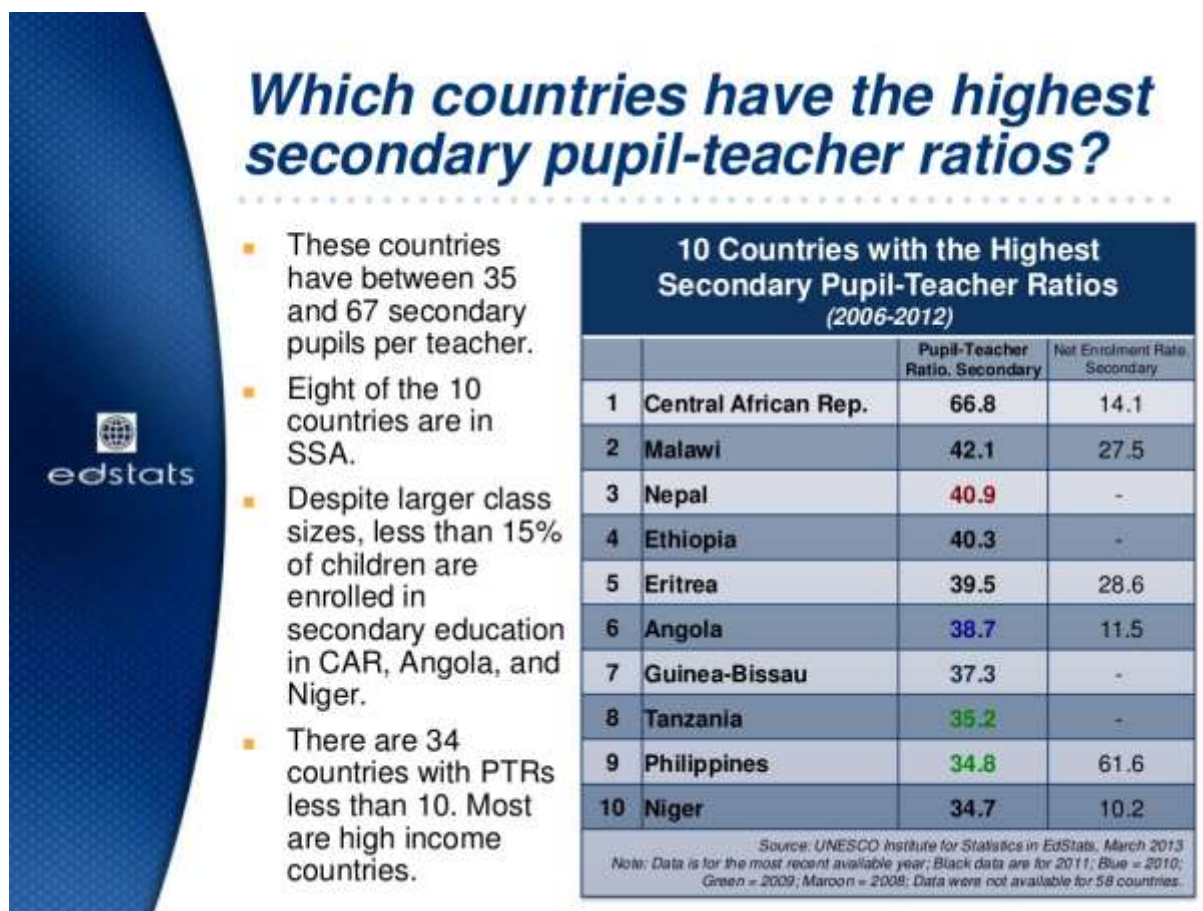


Figure 2.4 Countries with the Highest Secondary Pupil-Teacher Ratios (2006-2012).

2.5 Gender of Students and their performances in Mathematics.

In all Muslim communities around the world avoidable intermingling of the opposite sexes is strictly prohibited. At home, girls and boys sleep in different rooms. When at school, as much as possible, they stay separated and even sit at different locations of the same classroom.

In some institutions, they are taught by teachers of their own gender where the economy allows. Unfortunately, this reduces the opportunity for the opposite sexes to learn from each other more so the girls whose time at home is predominated by domestic work.

Nevertheless, we cannot stress enough the importance of strong, sustained emphasis on the expansion of equitable, broad-based and quality basic education, especially for girls. The gap between rhetoric and reality remains large, though gender differentials in education have fallen in most countries, including North Africa, Middle East and South Asia during the 1990s. Many developing countries still spend more on defense than health and education combined. It will be vital for governments and the international community to prioritize education spending and better protect education budgets in periods of fiscal crises, Court and Cornia (2001).

Before the 19th century, single-sex schools were common. During the 19th century, more and more coeducational (schools attended by both boys and girls) were set up. Together with mass education, the practice of coeducation was universalized in many parts. In 1917 coeducation was mandatory in the Soviet Union. According to Cornelius Riordan, by the end of the nineteenth century, coeducation was all but universal in American elementary and secondary public schools, Kolesnick (1969); Bureau of Education (1883); Butler (1910); Riordan (1990). And by the end of the 20th century, this was largely true across the world. Wiseman (2008) shows that by 2003 only a few countries across the globe had greater than one or two percent single sex schools. But there are exceptions where the percentage of single sex schools exceeds 10 percent: Belgium, Chile, Singapore, Hong Kong, Israel, New Zealand, Australia, South Korea, and most Muslim nations. 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).

According to Barbara Gross Davis (2009), the topic of single-sex education is controversial. Advocates argue that it aids student outcomes such as test scores, graduation rates and solutions to behavioral difficulties.

Opponents, however, argue that evidence for such effects is inflated or non-existent, and instead argue that such segregation can lead to increased prejudice and cost students social skills. Advocates of single-sex education believe that there are

persistent gender differences in how boys and girls learn and behave in educational settings and that, such differences merit educating them separately. One version of this argument holds that brains of males and females develop differently. Proponents reference these developmental differences to argue that by separating students according to sex, the educator is able to meet the needs according to the developmental trajectory of the different genders. In addition, supporters of single-sex education argue that by segregating the genders, students do not become distracted by the other gender's actions in the classrooms, therefore making them pay attention more to class than their peers.

The benefits of single-sex schools include; decrease in distractions in learning, reduction in students' behavior problems. It provides more leadership opportunities as well as promoting a sense of community among students and staff. It helps address unique learning styles and interests of boys or girls as well as reducing sexual harassment among students. 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.

“In September 2011, the journal science published a study deeply critical of the evidence behind positive effects of gender segregation in schooling, arguing that the movement towards single-sex education is deeply mis-guided, and often justified by weak, cherry-picked, or misconstrued scientific claims rather than by valid scientific evidence. The study

goes on to conclude that there is no well-designed research showing that single-sex (SS) education improves students' academic performance, but there is evidence that it increases gender stereotyping and legitimizes institutional sexism. Opponents of single-sex education,

including the authors of The Science article referenced above, argue that it is not single-sex education that is producing positive results with students but rather it is the motivation of the teacher and the resources that are available. There is a lack of quality research in the field to attribute success to single-sex schooling rather than extraneous factors. They believe that by having a single-sex schools the children are

not prepared for the real world, where they would need to communicate with members of the opposite sex”,Molnar et al., (1999).

They argue that coeducational schools break down sexist attitudes through interaction with the opposite sex. Other opponents of single-sex education also argue that it is coeducational schools create a feeling of safety and a sense of mutual respect.

2.6 Text Book Student Ratio and their performance in Mathematics.

The availability of adequate and appropriate learning resources such as reference books, greatly influence academic performances of students. However, studies showed that student-text book ratio of 1:1 does not necessarily lead to significantly better scores than in a ratio of 1:2.

Heyneman et al., (1983), examined a World Bank project in the Philippines which provided one textbook for every two students. For a group of randomly selected schools they provided textbooks at a one-to-one ratio. They found out little difference in test scores between these schools and those which received textbooks at a one-to-two ratio. In many of their comparisons, the schools that received one textbook for every two students actually performed better than the schools that received one textbook for every student.

Heyneman, Jamison, and Montenegro also compared test scores in schools receiving textbooks at a one-to-two ratio with test scores in the previous year. They found out that an average effect over two grades and three subjects of 0.40 standard deviations, with students from poor families benefitting the most. They concluded that textbook provision greatly improved test scores, but that there was no advantage of a one-to-one ratio over a one-to-two ratio.

Nevertheless, text book student ratio was dependent on the social backgrounds of the students as some rich parents were able to buy all the required text books and other learning materials while the poor were not. There is intense debate about the effects of education expenditure on test scores in developed countries, Hanushek et al., (1995), Hedges et al.,(1994).

However, even writers who are skeptical about the effects of educational inputs in developed countries are optimistic that provision of textbooks in developing countries can substantially increase test scores. Lockheed and Hanushek (1988), summarized studies of textbooks in developing countries; the four studies that they examined in detail reported that textbooks improved test scores by 0.34, 0.36, 0.30 and 0.06 standard deviations of individual test scores. “Although teacher-centered inputs may be ineffective, non-teacher inputs could be very effective”, Pritchett and Filmer, (1999).

“It is what we make out of what we have and not what we are given that separates one person from another”, Nelson Mandela (1994). It is not the number of books that matter most but it is the content of the books and quality of contact hours between the teacher and the student.

2.7 Theoretical Framework

The Lev Vygotsky (1978) Principle of More Knowledgeable Other (MKO) also known as Vygotsky Constructivism theory was adopted for this study for its appropriateness to the study design. Vygotsky's theories stress the fundamental role of social interaction in the development of cognition, Vygotsky (1978), as he believed strongly that community (living in the same place and doing things together) plays a central role in the process of "making meaning. MKO is someone who has better understanding or has a higher ability level than the learner, with respect to a particular task, process or concept. The zone of proximal development (ZPD) has been defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers", Vygotsky (p. 86, 1978).

Lev Vygotsky viewed interaction with peers is an effective way of developing skills and strategies. He suggested that teachers use cooperative learning exercises where less competent children develop with help from more skillful peers. He believed that when a student is in the ZPD for a particular task, providing the appropriate assistance will give the student enough of a "boost" to achieve the task.

Independent	ZPD	Support
-------------	-----	---------

In this condition, level- the distance between end of “Independent” and the beginning of “Support” regions of ZPD is largest and will therefore require the least amount of support and guidance from the MKO.

Independent	ZPD	Support
-------------	-----	---------

The level of ZPD is relatively larger and therefore the amount of support and guidance required by the peer is more than in that required by the previous case.

Independent	ZPD	Support
-------------	-----	---------

The level of ZPD is least in the above case. And because of that, the level of support and guidance required by the peer from the MKO is greatest.

Therefore, the amount of support needed by an individual was inversely proportional to the level of ZPD in which an individual was. The adoption of the theory was considered in this study for its conceptualization of the idea of learning from another person (the skillful peers).

The assumptions of the principle are that it does not explain who determines, and how the KMO was determined (prequalification). For example, it does not tell whether this “Other” was a student from the same class, or, from another of advanced grade. Secondly, different individuals will be at different levels of ZPD even when the task was brought to their attention at the same time. Thirdly, it does not tell how to detect the level of the ZPD for the individual so that the more skillful peer decides and determines how much effort was needed to make the learner understand. Finally it does not give a way of differentiating and measuring in order to determine the level of progress of an individual student per unit time.

2.8 Conceptual Framework

This study was guided by the following conceptual framework which was used to explain the relationships between the independent and the dependent variables.

2.8.1 Moderating Variables

Several factors determine the academic performances of students. They are classified into two major components. Those which are not under the control of the students like the government policies on education set and disseminated by the Education ministry are known as moderating variables. For example, Government policies determine the number of teachers a school should have based on its enrolment. The enrolment of students in a school in turn significantly influences the output of a teacher because teachers are able to manage small classes better than large ones. The output of a teacher can be measured in terms of curriculum and syllabus coverage. Government policies also determine the length of school term and amount of fee to charge. Government policies are the sources of the school guidelines.

2.8.2 Intervening Variables

Government policies are implemented through the application of, and adherence to school guidelines. These guidelines catalyze the implementation of the government policies. It constitutes the broader objective of the existence of Education as a ministry and are updated as need arises.

Intervening variables determine, for example, how many student in a class can efficiently share a text book. They also determine the teaching methodology to be used in a school.

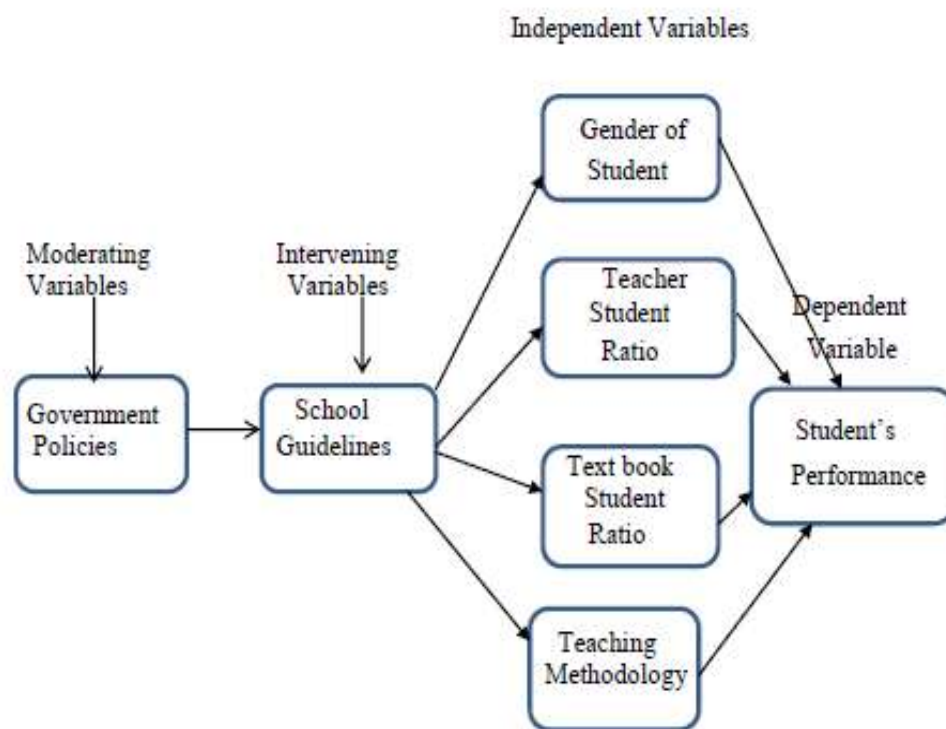


Figure 2.5 Conceptual Framework

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

Experimental design was used in the study. It involved the use of Experimental and Control groups that were obtained after a fair randomization process. Experimental design was used to explore the cause-and-effects relationship between independent and dependent variables. In experimental setups, the causes (independent variables) can be manipulated to produce different kinds of effects or outcomes (dependent variables). The design was chosen because the study required comparison of the performance outcomes in Mathematics between two groups of schools that were subjected to different teaching methodologies under the assumption that all other factors were constant. Schools were randomly assigned to Experimental and Control groups.

Because of the requirements for random assignment, the design is difficult to execute in real life situations. This was because of the various interactions that were usually take place between the Control and the Experimental groups outside the classroom environment which the researcher could not prevent but only reduce them. In this study, two-stage sampling technique was used to get the needed sample schools in the county.

Stage one (nonprobability technique) involved putting the schools into the three main strata based on the gender of the students they enrolled. The three strata consisted of; males-only schools, females-only schools and mixed-sex schools.

Stage two (probability technique) involved simple random sampling technique to identify schools for experiment and control categories or groups. Based on this, 20 of the 25 schools were selected for the study. The county had 25 public secondary schools that consisted of 10 boys' schools, 9 girls' schools and 6 mixed-sex schools.

This sampling method was chosen because the nature of the sampling units (gender) was categorical except in the mixed-sex schools where it was overlapping and was treated as single entity. Using simple random sampling technique, eight girls' schools, eight boys' schools and four mixed-sex schools from the total 25 public secondary schools in the county were included in the study.

Four from each of the single-sex schools, and four from the mixed-sex schools were randomly placed in the experimental group and therefore taught using the new teaching model while the rest acted as control and continued to be taught by conventional method. The four mixed-sex schools were treated the same way as the experiment schools and thus taught by the peer learning method. The findings from the sampled schools were used to generalize to the entire county public secondary schools.

3.2 Target Population

The population considered in the study consisted of all Form Two students in the 25 public secondary schools in Garissa County where 20 of such schools were randomly sampled. All Form Two students in the sampled 20 schools were considered in this study. Form Two students were chosen with the aim of timely identifying their strength and weaknesses in order to take corrective measures throughout their journey of secondary school education cycle. Form two levels is the actual beginning of real secondary school life since students spend their first year of their school life on adapting themselves to the new environment and getting accustomed to the realities of living away from home.

3.3 Sample Size

Since the target population (Form Two students) was estimated to be less than 3000 all the Form Two students in the sampled 20 public secondary schools in the county were included into the study. The decision to study 20 of the total 25 schools was meant to generate coverage of at least 80% of the targeted population of schools. However, using 2.5% as the Margin of error, a sample of 1335 was used.

3.4 Inclusion Criteria

The study targeted all public secondary schools in the county and excluded those managed by faith-based organizations (FBOs), the privately owned secondary schools and those ran by non-governmental organizations (NGO).

3.5 Sampling Procedure

There were 25 public secondary schools in the Garissa County. Ten were boys' schools; nine were girls' schools while six were of mixed-sex schools. To allow eighty percent coverage, 20 schools were randomly selected into the study. They

were put into three strata. These strata were those of boys' only; girl's only and that of the mixed-sex schools.

The following steps were used to sample the three strata of schools.

- (1) A list of all the 25 public secondary schools in the county was prepared.
- (2) Based on the gender of their students, the schools were grouped into three categories where separate lists of the boys-only, girls-only schools and one for mixed-sex schools were made.
- (3) Separately the names of every school in every stratum were written down on small pieces of papers.
- (4) All the papers were folded and placed in their respective containers accordingly labeled.
- (5) From the boys' list, eight papers were randomly picked and the names on those eight papers schools included into the study. The remaining 2 were excluded.
- (6) To identify the girls' schools to be included into the study, step (5) above was used. The remaining one was excluded.
- (7) In the same manner, four of the total six mixed-sex schools were randomly included to test the effect of interaction. The remaining two were excluded.
- (8) Four schools in every stratum from the single-sex schools were further randomly selected to act as experimental and therefore taught using the peer-learning model while the remaining four acted as control for that gender.
- (9) The four selected mixed-sex schools were treated as in the Experiment schools.

To ensure the Control and the Experiment groups were not aware that they were being examined; double-blind testing technique was used where it was only the researcher and not the 'teacher' nor his students who was aware that they were being examined.

The Experimental groups were taught by peer learning methodology while the Control groups were not in any way influenced by the researcher to do anything that would help them learn in the absence of their teachers. They were found to be in their respective schools for the entire duration of study with the hope that the government will make it good her threat of sacking the striking teachers and replace them. However, some individual students were found to be revising their notes and some attending evening tuitions in private schools.

Table 3.0 Strata and Sample Size Generation

Category	Enrolments	Sample (F 2)	Percentage
All Boys	3863	789	20.4
All Girls	2922	546	18.7
Girls Only	2717	477	17.6
Boys Only	3081	597	19.4
Mixed-Sex	987	252	25.5
Girls in Mixed-Sex	205	69	27.3
Boys in Mixed-Sex	782	183	23.4
Experimental Boys	1591	249	15.7
Experimental Girls	1335	240	17.9
Control Boys	1490	357	23.9
Control Girls	1382	237	17.1

There were a total of 6785 students enrolled in all the public secondary schools in Garissa County. Boys made up 3863 (56.9 percent) while girls were 2922 percent (43.1 percent). Of these were 1335 Form Two students consisting of (19.7 percent). 789 were boys and 546 were girls, 59.1 and 40.1 percent respectively. At a glance, it can be noted that the distribution of boys and girls in Form Two was closely proportional to the general distribution of the two genders in the county public secondary schools. This increased the reliability of the sampling technique employed.

The Experimental groups from the single-sex schools and, Mixed-sex schools made up 741 (63.4 percent) of the total Form Two students and the Control groups were 594 (36.6 percent). While the Experimental groups had 249 boys and 240 girls, the Control group had 357 boys and 237 girls.

3.6 Distribution of Boys' Secondary Schools by Sub-County.

Garissa Township had the highest number of boys enrolled for secondary school education in the county with a total of 1978 out of the total 3863 boys in the entire county, translating to 51.2 percent. Balambala sub-county had 591 male students in

its secondary schools (15.3percent). A point to note is that Balambala has one girl's school (Saka girls) and two male secondary schools one of which (Sankuri secondary school), was located about 10 kilometers North of Garissa town. Sankuri location was initially part of Garissa main town but was curved away and placed under Balambala sub-county for political reasons. Therefore, students in Sankuri secondary school enjoy all the privileges as that of their counterparts in Garissa Township. Ijara sub-county had 400 boys in its secondary schools (10.4percent) while Fafi had 112 boys in Bura Boys high school (2.9 percent).

Garissa Township had the highest number and among the oldest schools in the county. Garissa High School was the oldest boys' only secondary school. Established in 1969 followed by County High School which was established almost a decade later (1978). NEP Girls' secondary school and Yathrib girls' secondary schools were the oldest and the youngest girls' secondary schools in Garissa Township. They were established in 1974 and 2014 respectively. Nanighi girl secondary in Bura sub-county was newly established school and had been in operational for two years during the study period.

With a total enrollment 6785 students, more than a half of these schools were established after the year 2000. Security was leisure in the marginal sub-counties of Garissa. The number of students, both boys and girls, gets lesser as one moves away from Garissa town and because of that, the number of secondary school students in the marginal sub-counties was directly proportional to the level of insecurity in that sub-county.

Lagdera, one of the six sub-counties in Garissa County had no single boys-only secondary school hence; there were no data to be collected on that.

Table 3.1 summarizes the number of boys enrolled in the county secondary schools by sub-county.

Table 3.1 Boys'-Only Secondary Schools and Enrolment by Sub-County.

Sub-County	No. of Schools	Total Enrolment	Form Two
Township	4	1978	381
Balambala	2	591	151
Fafi	1	112	41
Ijara	1	400	33
Total	10	3081	656

3.7 Distribution of Girls Secondary School by Sub-County

Township sub-county had the highest number of girls' secondary schools and students in the county. Its four secondary schools had a total of 1785 girls

(60.1percent) out of the total 2922 girls in the entire county. Ijara had one secondary school for girls and the second highest number of girls enrolled for secondary education, 350 (11.9percent). Balambala sub-county had 232, (7.9percent) in Saaka girls' secondary school; the only girls' secondary school in the sub-county, enrolled for secondary education.

Fafi sub-county had an enrolment of 162 girls that make up about 5.5 percent of the total enrolment of girls in the county.

Lastly, Dertu, the only girls' school in Dadaab had an enrolment of 188 girls that made up a percentage of about 6.4 of the total girls enrolled in secondary schools in Garissa County.

Lagdera, one of the six sub-counties in Garissa County had no single girls-only secondary school hence there were no data to be collected on that. However, the sub-county had 205 girls in its four mixed-sex schools which made up 7.0 percent of the total girls in the county.

The data indicated that there were high numbers of girls attending public secondary schools in Garissa Township alone than all the other sub-counties combined (61.1 percent). There were several reasons for these:

Firstly, for security reasons, parents in Garissa Township whose daughters qualified for secondary school education do not allow them to attend schools in other sub-counties where security was comparatively poor. Secondly, Garissa, the headquarters

of the sub-county enjoys a modern public library and numerous private bookshops that are well equipped with essential and affordable reference materials which are all missing in the other sub-counties. Thirdly, the sub-county has the highest number of teachers who were concentrated in the main town reducing the teacher-students ratios. Teachers in the township enjoy numerous other privileges that were missing in rural secondary schools such as easy access to their bank accounts and working within the reach of communication networks that allows them easily and regularly be in touch with their relatives. Finally, there were also a number of private schools where students could attend over the school holidays and weekends for tuition to help them tackle some of the difficult tasks. These provide the local teachers with opportunities for earning extra income from teaching such tuition centers in the town. Table 3.2 summarizes enrolment of girls-only secondary schools in the county.

Table 3.2 Girls'-Only Secondary Schools and their Enrolment by Sub-County.

Township	No. of Schools	Total Enrolment	Form Two
Township	4	1785	315
Balambala	1	232	42
Fafi	2	162	35
Ijara	1	350	63
Dadaab	1	188	22
Lagdera	0	0	0
Total	9	2717	477

3.8 Distribution of Mixed-sex Secondary Schools by Sub-County.

Lagdera sub-counties (Dadaab and Lagdera) had 4 of the total 6 mixed-sex schools in the county while the remaining 2 were in Ijara. There were various reasons given for this: That, the number of pupils from the local primary schools who managed to obtain the required pass mark to join secondary schools was low. That, the amount of resources invested in educational infrastructure over the years had been low. Because of that, the current crop of the local elected leaders were faced with difficult dilemma on whether to invest in educational infrastructure and have separate schools for the two gender, or, to continue keeping them to study together in the same schools and divert funds earmark for building classrooms to other priority areas such as buying

school text books, paying part time teachers or, providing boarding facilities to the children of the nomads.

That, due to lack of sufficient and sometimes openly inefficient human resource in the schools led to the concentration of the boys and girls in the same schools to maximize on the use of the few available teachers and other resources.

That, the merits and the demerits of coeducation was not well understood by the local community which is preferentially pastoralist. Therefore, all that the parents want is to ensure their children complete the primary school education cycle without any regard for the quality of education their children were getting. Table 3.3 summarizes enrolment of mixed-sex secondary school students in Garissa County.

Table 3.3 Number of County Mixed-sex Secondary Schools and their Enrolment.

Sub-County	School	Current	Enrolment
		(2015)	Form Two
Dadaab	Dadaab	410 (67 girls/343 boys)	91
Lagdera	Shanta Abaq	142(26 girls/116 boys)	33
Lagdera	Modogashe	320(91girls/229 boys)	89
Lagdera	Benane Secondary	115(21 girls/94 boys)	39
Ijara	Ijara secondary	No data	
Ijara	County Council	No data	
TOTAL	6	>987	252

There were a total of 987 students enrolled in four of the six mixed-sex schools in the county. This amount was equivalent to 14.5 percent of the entire 6785 students enrolled in the targeted schools. The mixed-sex schools had 252 Form Two students out of the 1335 studied, for effect of interaction. They constituted about 18.9 percent of the entire Form Two students.

Ijara had two Mixed-sex secondary schools but there were no data available on the number of students enrolled in either of them. Fafi, Township and Balambala had no single Mixed-sex secondary schools.

3.9 Data Sources.

National examination analysis reports of the past five years starting from 2010 in the county education offices were the main source of primary data for the study. The Mathematics scores of pre- and post-implementation of the model to the experiment schools were collected from summary registers in Mathematics departments of the target schools. Qualitative data were also collected from all of the principals of the targeted schools in the county using semi-structured questionnaires. Verification of data was made through follow up phone calls made to the respective principal teachers of the school using the indicated mobile number on the questionnaire.

3.9.1 Data Collection Instruments.

Structured questionnaires (Appendix 1) were used to collect data from the schools that were visited. The questionnaires consisted of two parts which required two different categories of data. Part one was used to capture information on the particular school while the Part Two had both closed- and, open-ended questions. They were filled by the principal teachers of the schools and some by the respective heads of the Academic Studies departments.

3.9.2 Data Collection Techniques.

Permission to carry out the research was sought after presentation of the study proposal to the supervisors at Jomo Kenyatta University of Agriculture and Technology. The purpose and nature of the study was explained to the respondents by the researcher. After approval, the researcher submitted a soft copy of the approved proposal to the National Council of Research and Development for research permit. Questionnaires were coded to maintain confidentiality and stored in secure safes. Mathematics scores were obtained and entered in Microsoft Excel Software and saved and access denied except to authorized staff only.

3.9.3 Collection of Pretest Data.

Form Two students were the targeted cohort classes for the study while Mathematics as a subject was used to test the model. The end of term one examination scores from all Form Two students of the sampled schools were collected as pre-test. School codes and the admission numbers of the students were used for reference.

3.9.4 Introduction of the Model.

In the beginning of Term Two the new teaching methodology was introduced during the mathematics lessons of the class.

It was made sure that both the broad and the specific objectives of the lessons were introduced to the class by the peer teacher within its first 5 minutes.

Then the class was divided into a number of groups equivalent to the number of specific objectives on hand and each, with a leader chosen among them to present on behalf of the group.

Using appropriate reference materials, the groups were left to discuss their specific objective in the fifteen (15) minutes that followed.

After the 15 minutes, each group-leader presented the findings of the group to the whole class while the rest listened and used the opportunity to critique and ask questions for the next 15 minutes.

The “teacher”, who in this case was the best student in the subject highlighted the strength and weaknesses of every group and their leader in the remaining 5 minutes, for self-correction and later summarized the lesson.

Finally, the students were informed of the broad objective of the next lesson for prior familiarization and study. That continued for Term Two and Term Three of the year.

3.9.5 Validity

Validity appears to measure according to the researcher’s subjective assessment Nachmias, (1958). Validity is the amount of systematic or built-in error in measurement Norland, (1990). Valid and reliable questionnaire is a must to reduce measurement error. Groves defined measurement error as the "discrepancy between respondents' attributes and their survey responses". Validity testing includes whether the questions in the questionnaire were appropriate for the sample. Is it comprehensive enough to address the purpose and the goal of the study? Does it look like a questionnaire? The validity of the questionnaires was tested and improved before embarking on the actual data collection process by consulting principals of 5 schools.

3.9.6 Reliability of the Research Instruments.

Reliability of an instrument was its ability to reproduce consistent results when many of them are used in different times in some areas. The notion of reliability revolves

around whether one will get at least approximately the same results if something was measured several times with the same measurement instrument.

A common way to define reliability was the correlation between parallel forms of a test. This involved the administration of the same questionnaire to the same group of subjects after some time, Orodho (2009). In this study, the reliability of the questionnaires was not tested since the study took place as a single phase and not replicated in different places for lack of time and other resources. The timeframe was a period of 6 months (Between the beginning of Term Two and end of Term Three of the year 2015).

3.9.7 Piloting Study.

Piloting is the process of trying out research instruments on subjects or objects that are not part of the study sample but have similar characteristics as the population under study. It is important for pilot study to be carried out before embarking on the actual study. The aim of piloting is to check for any inconsistencies in the questionnaire before the actual event so as to correct it beforehand. 5 schools that were initially excluded from the study were used for piloting and the scores of first and the second groups taken two weeks apart were correlated using Pearson's product moment to test the internal consistency. The testing helped in elimination of some questions and reframing of others.

3.9.8 Post Test Data Collection.

After application of the model by the experiment schools, the end of Third Term mathematics scores of the Experiment-, Control- and the Mixed-sex schools were collected for analysis. The collection process involved visiting the schools after they opened for the Term One of 2016. It is a common trend for county schools to close and issue their students with examination results of a current term in the beginning of the term that follows. In some schools these data were not readily available at all, while some lacked photocopy machines forcing the researcher to hand copy them from the main books.

Objective	Variable	Indicators	Source	Scale of measurement
To investigate the better teaching methodology for the targeted schools.	No. of schools teaching mathematics by peer learning ,didactic Methodology.	End of term one and term three mathematics scores.	Mathematic scores registers of Form Two Students.	Nominal Ordinal
To investigate whether student teacher ratio influence performance in Mathematics.	No. of teaching staff and the No. of Form Two students in the school.	End of Term One and Three Mathematics scores.	Mathematic scores registers of Form Two Students.	Nominal Ordinal
To investigate whether gender influences performance in Mathematics.	Gender of students in a given school.	End of term one and term three Mathematics scores.	Mathematic scores registers of Form Two Students.	Nominal Binary
To investigate whether text books influence performance.	No. available mathematics text books for Form Two students.	End of term one and term three Mathematics scores.	Mathematic scores registers of Form Two Students.	Nominal Ordinal

Figure 3.0 Operational Definitions of Variables.

CHAPTER FOUR

4.0 DATA ANALYSIS

4.1 Response Rate

The numbers of schools out of the targeted 20 that completely filled and timely submitted the questionnaire were compared with those which did not, and findings presented in the form of percentage. It was found out that all of the targeted 20 schools filled and submitted the questionnaires on time for data entry resulting to a 100 percent response rate. A response rate of 10percent is sufficient to provide significant statistics that can be generalized to a population from which that sample was drawn. It worth mentioning that, in some schools where the researcher could not reach for security reasons, courier services were instead used to deliver and receive the questionnaires.

4.2 Demographic Data.

The most important demographic characteristics collected were the gender and ages of all the students of the cohort classes. The stratification of schools was based on the gender of their students. An exception to this rule was the 6 mixed-sex secondary schools in the county- two of which; Ijara-Mixed and County-Council mixed secondary schools were in Masalani sub-county while the rest were in the greater Lagdera region- (Dadaab and Modogashe). They were treated as a third identity besides the binary labeling of the boys' and the girls' schools.

4.3 Age Groups of Form Two Students in Sampled Schools.

There were 4 age brackets where the youngest group ranged between 15 and 17 years and the eldest were aged above 23. Majority of the students; 973 (72.88 percent) were between 18 and 20 years of age. About a fifth, 262 (19.63 percent) were aged between 21 and 23. The two extremes had 92 students whose age ranged between 15 and 17 years (6.89 percent) and there were 8 students who were older than 23 years (0.6 percent). The distribution of the age groups of the students was found to be normally distributed.

Table 4.0 Distribution of Students by Their Age Groups.

Age Brackets (Years)	Frequency	Percentage
15-17	92	6.9
18-20	973	72.9
21-23	262	19.6
>23	8	0.6
Total	1335	100

The Mean ages for the boys and the girls were 19.1 and 19.7 years respectively. The findings indicated that boys go to school earlier than girls, a trend which is common in the local community though the narrow margin is a big improvement by the efforts of girl-child supporting organizations. Dadaab in particular had Windle Trust, a non-governmental organization that supports girls through payment of their school fees and distributes sanitary towels. Kenya Equity in Education Project (KEEP), an NGO that also focuses on girls and has made some significant contribution in increasing the completion rate of secondary cycle for female students in Dadaab. It provides of scholarships to the bright but needy ones, distributes sanitary towels and school uniforms. It also provides solar lamps to schools where these girls attend. Boys benefit indirectly in the sense that they face less competition for other sources of funds that are meant for community support such as bursaries in the constituency development funds (CDF).

4.4 Distribution of Students by their Gender.

The strata of the students and the schools they go to was predetermined by their gender. However, the mixed-sex schools were exceptional since they had girls and boys studying together, who interacted and shared the available resources. The effect of this interaction was one of the specific objectives under study in this research. 45.39 percent of the total students were boys, 35.73 percent were girls while the remaining 18.87 percent were from mixed-sex schools. The Experimental group consisted of 55.5 percent while the remaining 44.5 percent were in the Control group.

Table 4.1 Distribution of Form Two Students based on Their Gender.

Gender	Experimental	Control	Total	%
Boys Only	249	357	606	45.4
Girls Only	240	237	477	35.7
Mixed-Sex	252	0	252	18.9
Total	741	594	1335	_____
%	55.5	44.5	100	100

4.5 Teaching Methodology and student's performance in Mathematics.

The teaching methodology used in many of the schools for purpose of this study was not under the control of the researcher except for a very few of them. Coincidentally, some schools that were assigned to the Experiment group of a stratum were found already using peer learning methodology to teach mathematics to Form Two students. This has been a great advantage to the study since those students were not aware that they were being studied and therefore could not behave in any way influenced the outcome of the study.

The teaching methodologies under study were peer learning and the conventional method commonly used in most of public schools. It was intended to find out in which teaching methodology do students do better in Mathematics. The table 4.4 summarizes the total number of students regardless of their sex, who got a Mean Grade of C+ and better grades and the teaching methodology used in their school.

Table 4.2 Teaching Methodology on Students' Performance in Mathematics.

Factor	Grades						Total	χ^2
	C+	B-	B	B+	A-	A		
Teaching Methodology								
Conventional	09	11	07	09	04	14	54	
Peer learning	25	22	11	11	06	17	92	
Total	34	33	18	20	10	31	146	3.309

The outcome of this analysis had showed that the observed chi-square value of 3.309 was much lower than that of the critical chi-square value of 21.03 at a 5% significant level and degrees of freedom of 12. There is sufficient evidence to suggest that the learning methodology (Peer learning and Conventional) influences the scores students obtained in Mathematics and therefore the null hypothesis was rejected. Based on the available data 63.1% of students got a Mean Grade of C+ and above when taught by Peer learning methodology while it was only 36.9% of students taught by the conventional method who managed to get the same grade making peer learning the better of the two. However, as a survival necessity most of the schools were found teaching Mathematics and some other subjects by peer learning methodology since the non-local teachers left.

Former students, who were either awaiting for their Kenya certificate of secondary education examination (KCSE) results and others on vacation from their institutions of higher learning who were employed by the school boards became lifeline for a good number of schools in the county. It is one of the mysteries of our time why, the local private schools that were making a booming business out of the gap created had a good number of non-local teachers who do not feel the threat of insecurity!

4.6 Gender of Student's and their performance in Mathematics.

The topic of single-sex education is controversial. Advocates argue that it aids student outcomes such as test scores, graduation rates, and solutions to behavioral difficulties. Opponents, however, argue that evidence for such effects is inflated or non-existent, and instead argue that such segregation can lead to increased prejudice and cost students social skills. Advocates of single-sex education believe that there are

persistent gender differences in how boys and girls learn and behave in educational settings, and that such differences merit educating them separately. One version of this argument holds that brains of males and females develop differently.

Proponents reference these developmental differences to argue that by separating students according to sex, the educator is able to meet the needs according to the developmental trajectory of the different genders. In addition, supporters of single-sex education argue that by segregating the genders, students do not become distracted by the other gender's actions in the classrooms, therefore making them pay attention more to class than their peers.

The benefits of single-sex schools include decrease in distractions in learning, reduction in students' behavior problems. It provides more leadership opportunities as well as promoting a sense of community among students and staff. It helps address unique learning styles and interests of boys or girls as well as reducing sexual harassment among students. 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 had 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).

Using quartile system students in a class can be placed into four groups after arranging their scores in a descending order. Every first student in a quartile will be assigned ordinal number one followed by the rest. This was expected to make such students feel that they are "the best" in that group. That will have a positive psychological influence on such students and motivate them to continue being part of that class thereby reducing dropout rates. It may also motivate those individual students leading the lower three groups to work harder in their effort to improve and join the next upper group(s). Unfortunately, for the best student in the class, this may be a cause to feel complacent and achievement leading to under performance in the subsequent examinations.

Quartile system is a way of continuously challenging students to work harder either to score a better grade or remain in a competitive quartile for a long time.

Table 4.3 Descriptive Statistics of the Different Strata.

GIRLS IN CONTROL SCHOOLS		
STATISTIC	TERM I	TERM III
MEAN	12.81	10.41
SD	9.1	8.6
SE		0.8331
CV	70.3%	82.6%
N		237
r		58.8%
Z		-0.28
SIGNIFICANT	Yes,(P<0.05), SE*3(2.43993)	

Due to the absence of teachers and the lack of cooperation among students, the general performance of the students in this stratum show a significant change as indicated by the reduction in the values of the Means between the two terms. Like all control schools in this study, these schools have not had single teacher during the entire study duration except for some former students acting as volunteer teachers while not using peer learning. However, it will be noted that the SD of term three reduced but in proportion to its Mean.

The CV increased in the third term as the Mean reduced. This, together with the increased SD over the same period was an indication of dispersion of the scores from the Mean of the term. Dispersions are common where there is no consistency of doing things and competition was low.

BOYS IN CONTROL SCHOOLS		
STATISTIC	TERM I	TERM III
MEAN	16.9	16.0
SD	12.2	11.7
SE		0.89463
CV	72.2%	73.1%
N		357
r		52.2%
Z		-0.078
SIGNIFICANT TEST	Yes,(P<0.05) SE*3 (2.68389)	

GIRLS IN EXPERIMENTAL SCHOOLS		
STATISTIC	TERM I	TERM III
MEAN	14.53	19.48
SD	12.6	11.95
SE		1.12094
CV	86.72%	61.34%
N		240
r		64.22%
Z		0.414
SIGNIFICANT	Yes, (P<0.05),SE*3(3.36282)	

BOYS IN EXPERIMENTAL SCHOOLS		
STATISTIC	TERM I	TERM III
MEAN	37.49	35.01
SD	19.0	17.7
SE		1.6456
CV	50.7%	50.6%
N		249
r		63.52%
Z		-0.14
SIGNIFICANT	Yes,(P< 0.05),SE*3(4.9368)	

BOYS IN MIXED-SEX SCHOOLS		
STATISTIC	TERM I	TERM III
MEAN	21.19	19.18
SD	15.56	15.57
SE		1.62719
CV	73.4%	81.2%
N		183
r		49.8%
Z		-2.112
SIGNIFICANT	Yes,(P<0.05),SE*3(4.88157)	

GIRLS IN MIXED-SEX SCHOOLS		
STATISTIC	TERM I	TERM III
MEAN	19.82	14.19
SD	15.4	10.9
SE	2.27134	
CV	77.7%	76.8%
N		69
r		73.5%
Z		-0.52
SIGNIFICANT	Yes,(P<0.05),SE*3 (6.81417)	

Both in Experimental and Control groups, boys performed better in Mathematics than the girls in the county schools.

The group Means for boys' schools was found to be significantly higher than that of the girls' in the single-sex schools. This makes the general efforts to reduce gender disparity as far as academic performance was concerned an uphill task and challenging.

Based on the above fact, it can be concluded that boys in the boys-only schools had the highest SD then followed by Mixed-sex schools while the girls in the girls-only schools had the least. This was because girls in the mixed-sex schools can be said to be benefitting from the stiff competition they face from the boys with whom they study.

Saaka girls' secondary school that had a Mean score of 39.48 against a Median value of 13.605 in the girls' only stratum was a positive outlier. Garissa High School had a positive outlier Mean score of 44.86 against the boys' only stratum Median value of 25.865 while Shanta-Abaq led the pack of the mixed-sex schools with its Mean score of 25.75 against the group Median of 19.325. The Mean scores of all schools between Term One and Term Three had a correlation coefficient of 0.72089

Table 4.4 Influence of gender of students on their performance in Mathematics.

Factor	Grades						Total	χ^2
	C+	B-	B	B+	A-	A		
Boys Only	21	21	10	13	06	23	94	
Girls Only	08	09	02	03	02	04	28	
Mixed-Sex	05	03	06	04	02	04	24	
Total	34	33	18	20	10	31	146	

The findings indicated that the observed chi-square value of 8.3859 was less than the critical chi-square value of 28.87 at the 95 percent significant level and degree of freedom of 18.

This means that there was significant evidence to suggest that the gender of the students had a significant influence on their performance in Mathematics. Based on this fact, the null hypothesis was rejected. To support these findings 64 percent of students who got a Mean grade of C+ and above were boys and only 18.7 percent were girls. The remaining 16.4 percent 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 even when they go to the same school and were therefore rejected. 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 had 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).

4.7 Teacher student ratio and their performance in Mathematics.

Class size is a hotly-debated topic and continues to be at the forefront of the educational and political agenda in many countries. Apart from optimizing public resources, reducing class size to increase student achievements is an approach that has been tried, debated and analyzed for several decades. Some countries like Finland favor smaller class sizes (20 students or fewer) and are among the most successful

countries in the PISA study. Studies set a ratio of 13:1 as their benchmark for “small” classes, which are compared to “large” classes with a ratio of 20:1 (or higher). Others considered classes with a ratio of 20:1 to be “small”. In other words, one program’s “small” class could be another program’s “large” class, making comparisons even more difficult.

The landmark 1978 study by Glass and Smith strongly endorsed reduced class size as a reform likely to produce improvement in achievements. The most influential contemporary evidence that smaller classes lead to improved achievement is Tennessee’s Project STAR (Student Teacher Adjustment Ratio).

Because this program set up randomly selected control and experimental groups of students, researchers could compare students who had four years of small class participation to students who had none. This meant that researchers could more reliably evaluate the impact of the class size reform. Project STAR (Finn, 2002).

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”, Bohrnstedt 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. The state’s rapid implementation of CSR also left researchers without a control group of students enrolled in larger classes! The average number of available and actively teaching staff allocated to Form Two classes was found to be one teacher for every forty students (1:40) in the visited schools.

It worth mentioning that the bulk of teachers discussed above are not employees of Teachers Service Commission (TSC) – The national commission that regulates matters related to teachers in Kenya and are employed by the local school boards.

Table 4.5 summarizes the effect of the number of teachers in a school on the performance of their students in mathematics.

Table 4.5 Influence of Teacher-Student Ratio on Students' Performance in Mathematics.

Factor		Grades						Total	χ^2
Teacher	Student	C+	B-	B	B	A-	A		
Ratio									
1:40		10	12	8	12	5	14	61	
1:80		5	7	0	2	1	2	17	
>1:80		1	14	10	6	4	14	67	
Total		34	33	18	20	10	30	145	11.3888

The above results indicated that the observed chi-square value of 11.3888 was less than the critical chi-square value of 28.87 obtained at a confidence level of 5% under 18 degrees of freedom. The result shows that there is enough evidence to suggest that the scores students obtained in mathematics varied with the number of students in a class for a teacher, also known as class size. The findings mean that the fewer the number of students in a class the greater the amount of attention every student will get from the teacher hence the better the performance in Mathematics in this case. The data fails to support the null hypothesis. Smaller classes are favored by parents and teachers alike but they come at a price. Class size, together with students' instruction time, teachers' teaching time and teachers' salaries, is one of the key variables that policy makers use to control spending on education. Between 2000 and 2009, many countries invested additional resources to decrease class size; however, student performance has improved in only a few of them.

Countries like China have much bigger classes (34 students and over) but also feature at the top of the PISA ranking. Asian countries filled the first 7 positions in the world. What other variables than class size may be used to explain the success of countries like China? Programme for International Student Assessment (PISA) suggest that systems prioritizing higher teacher salaries over smaller classes tend to perform better,

which confirms research showing that raising teacher quality is a more effective measure to improve student outcomes.

In a resource limited country like Kenya, investment on educational resources is taking great leaps albeit in slow and erratic motions. There are glaring differences in the quantity and quality of educational infrastructures within and between the sub-counties of Garissa County however, the best of them will pale into the worst of those in down country.

Following the infamous massacre of the students and staff of Garissa University College that led to the exodus of teachers from Northeastern Province in general and Garissa County in particular, the local primary and secondary schools still continue to pay the price if the Kenya certificate of primary education examination (KCPE) results of 2015 was anything to go by.

Over the years, educational policies in use in Kenya had and continued to have costly assumption that all pupils and students in the country are equitably accessing the national resources allocated to the education ministry and therefore, any variations in the outcomes of the implementation of those policies were blamed on the local management.

4.8 Text Book Student Ratio and their performance in Mathematics.

Sharing of text books in Kenya is a common trend since many students come from poor homes where the parents cannot afford all or none of the required text books for their children. Therefore such students get the opportunity to access all or some of the books they need only when in school. Studies have shown that text books favor more the already above average students and less of the rest while others indicate the other way. The table below summarizes the influence of the number of text book shared by different number of students in various schools in the county.

Table 4.6 Influence of Text Book Student Ratio on Students' Performance In Mathematics.

Factor		Grades							Total	χ^2
Textbook	Student	C+	B-	B	B+	A-	A			
Ratio										
	1:1	2	2	0	01	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 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.

This suggested that there was sufficient evidence to suggest that the performance of a student in Mathematics was partly dependent on the number of other students with whom he/she was sharing Mathematics text book. However, the main benefit of sharing a text book was in the discussion of, and the contribution from the group members and not the sharing per se. This was 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. This finding was consistent with the report that providing the government official textbooks in Kenya did not increase the average test scores, although the test scores for students with initial high achievement did increase. This suggested that the official government textbooks were ill-suited for the typical student, which was supported by the fact that the median student in lower grades had difficult reading the official English textbook in their study, Kremer et al., (2007).

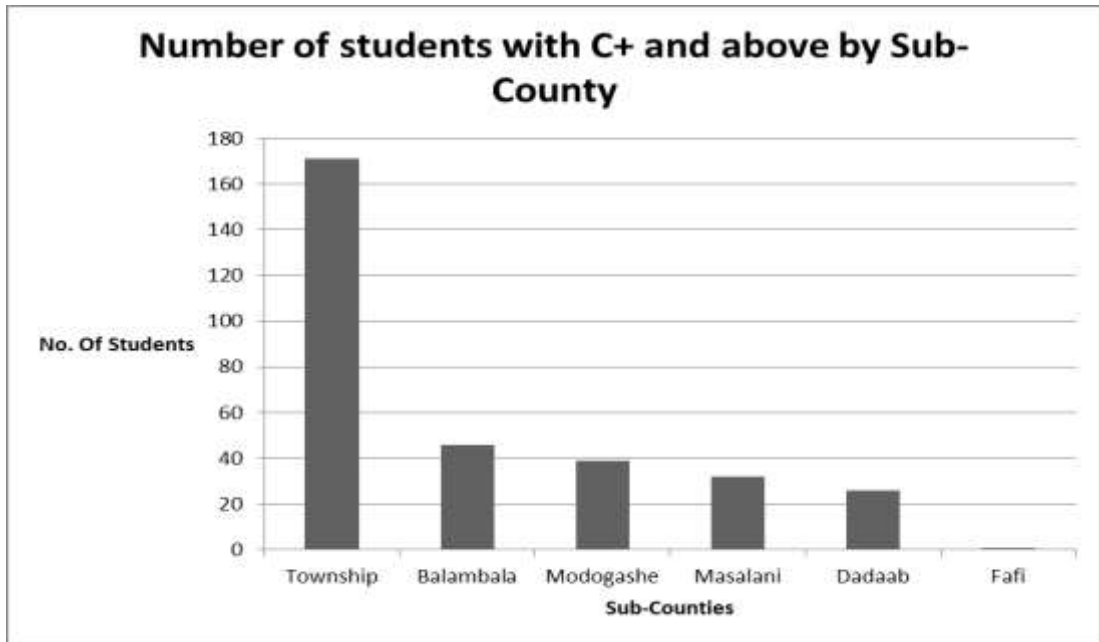


Figure 4.0 Number of students who scored C+ and above in Garissa County.

Garissa Township had the highest number of students scoring the cutoff point for university admission than all the other sub-counties while Fafi had the least.

CHAPTER FIVE

5.0 SUMMARY, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction.

The purpose of the study was to investigate whether peer learning in Mathematics yields better results for Garissa County public secondary school students when compared with other teaching methodologies used. Other confounding factors such as the gender of the students, teacher student ratio in the school and text book student ratio were also investigated. It is important to collect pre-intervention and post-intervention scores in order to make a comprehensive comparison and conclusion. Implications for using peer learning by the county schools, determining which confounding factor had the greatest influence compared with the rest and focus for future research are important to discuss.

5.2 Summary

To pass knowledge from one generation to another there has to be proven methods that stand the test of time. Teachers must ensure their students grasp facts and concepts of a topic at hand in real time. He/she must act like a professional story-teller who makes his/her listeners see the mental pictures of the story. He/she must leave more questions than answers in the heads of his/her students. In Mathematics, finding real life applications of the topic was as important as the topic itself. Meaning, it must have a utility in the universe. In Garissa county of Kenya, human resource was the biggest limiting factor due to insecurity. This study investigates whether students learn Mathematics better from colleagues (peers) than from teachers. Using peer learning and other conventional teaching methodologies, performance in Mathematics by Garissa County public secondary school students was studied. Based on the gender of their students schools were grouped as 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. All the Mixed-sex schools were treated as a stratum. Post-test Mathematics scores were collected from all the groups. The Control groups were taught using the conventional methodologies while the Experimental and the students in the Mixed-sex schools that were being studied for effects of interaction were taught by peer learning methodology, all under a double-blinded setup. Pretest Mathematics scores were collected from 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, SDs, SE and CVs as well as Pearson' Correlation of the Experimental and the Control groups were calculated using R Statistical Software. Paired and unpaired t-test was also calculated. Using Chi-squared test, the influence of peer learning on the exposed groups was tested for significance at 5% confidence level while the confounding factors such as gender of students, text book student ratio, and teacher student ratio were also calculated at the same confidence level. The study 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 those of girls' schools. The Mixed-sex schools showed significant effects of interaction. There was high coefficient of variations within scores of the same term than between the two terms. The confounding effects were found to be significant on their own and on peer learning. The findings suggested that peer learning was a superior teaching methodology compared to the conventional ones for Garissa County public secondary schools.

5.3 Discussion

There was sufficient evidence to suggest that the learning methodology (Peer learning and Conventional) influences the scores students obtained in Mathematics. Based on the available data, 63.1% of students got a Mean Grade of C+ and above when taught by Peer learning methodology while 36.9% of students taught by the conventional method who managed to get C+ and above making peer learning the better of the two. However, as a survival necessity, most of the 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 vacation from their institutions of higher learning who were employed by the school boards became lifeline for a good number of schools in the county. It is one of the mysteries of our time that, the local private schools that were making a booming business out of the created gap had a

good number of non-local teachers who do not feel the threat of insecurity. The Experimental groups had a larger Mean score than the Control group. The boys in the Experimental group made a relatively better improvement than the girls. This could be due to the fact that the boys had higher mean grades in their Kenya certificate of secondary education (KCPE) than girls which in a way has a positive influence a student's performance in high school, Misanya Sophy Mapesa (2013). This was a carryover phenomenon from the primary school cycle where boys generally do better than girls in most of the subjects and particularly in Mathematics. There were high SD both in Term One and Term Three of all the strata. This was attributed to the high number of students who scored zero percent in Term One being compared with the same students getting better scores in Terms Two and Term Three. However, there was reduction in the coefficient of variation of scores of the boys and that of girls in the Experimental groups between terms one and two. The reduction could be attributed to the effect of the treatment which reduced the dispersion of the scores around the Mean of the groups.

Paradoxically, most of these private schools and tuition centers schools were registered by the Ministry of Education and even owned by senior education officers in the county. Most of the School Heads cited lack of supportive supervision from the county education office as the biggest challenge they faced.

There was significant evidence to suggest that the gender of the student, among other factors that were not controlled for in this study had significant influence on the students' performance in Mathematics. To support these findings 64 percent of students who got a Mean grade of C+ and above were boys and 18.7 percent were girls. The remaining 16.4 percent 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 even when they go to the same school and was therefore rejected. 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 had 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).

There was enough evidence to suggest that the scores students obtained in Mathematics varied with the number of students in a class for a teacher, also known as class size. The findings mean that the fewer the number of students in a class the greater the amount of attention every student will get from the teacher hence the better the performance in Mathematics in this case. Smaller classes are favored by parents and teachers alike but they come at a price. Countries can spend their money only once and money spent on smaller classes would be spent on better teacher salaries, more instruction time, better opportunities for the professional development of teachers.

Class size, together with students' instruction time, teachers' teaching time and teachers' salaries, is one of the key variables that policy makers use to control spending on education.

Between 2000 and 2009, many countries invested additional resources to decrease class size; however, student performance has improved in only a few of them.

In a resource limited country like Kenya, investment on educational resources is taking great leaps albeit in slow and erratic motions. There are glaring differences in the quantity and quality of educational infrastructures within and between the sub-counties of Garissa County however, the best of them will pale into the worst of those in down country.

Average class size in educational institutions, by level of education (2010)

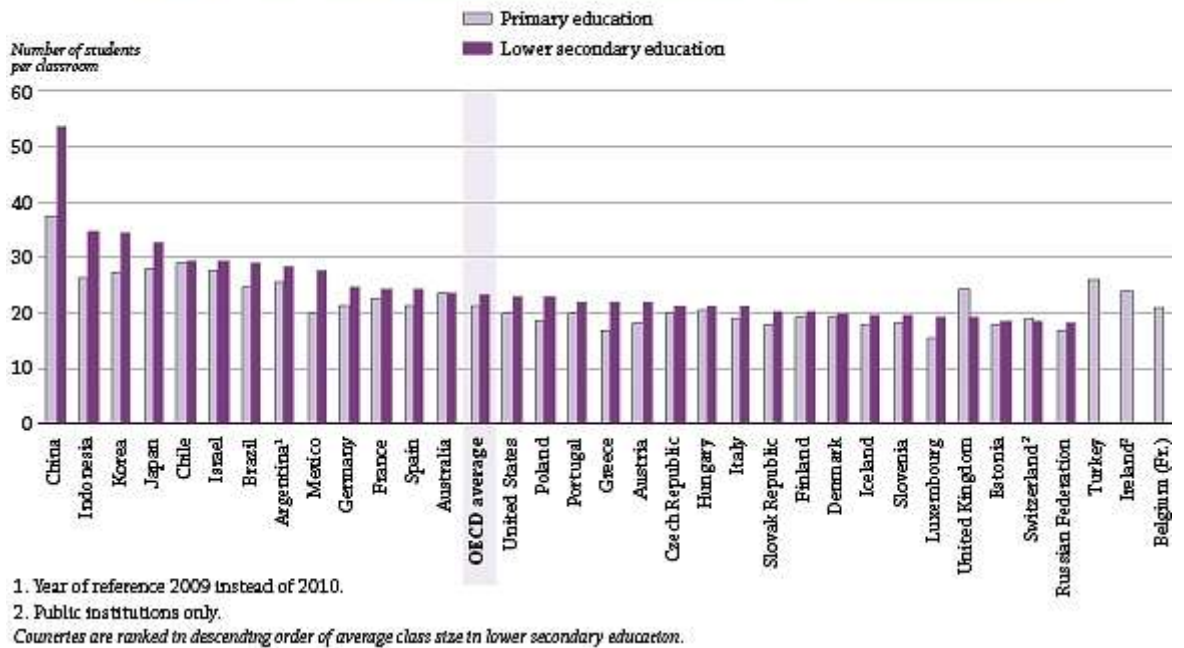


Figure 5.0 Average Class Size in Education Institutions, by Level of Education (2010).

The Mean scores of both boys and girls in the Control and the Mixed-sex schools dropped in the term two. Of all the groups under investigation, only girls in the Experiment group had showed statistically non-significant change between the means scores of the two terms as that of the girls in the mixed-sex schools dropped but by statistically non-significant value too. The level of competition among girls was relatively low. Girls generally waste a lot of their times fidgeting with their mobile phones while in school. At home, they are committed by domestic work unlike boys who may end up having time both for leisure and study.

In general, 92 (63%) of the Form Two students managed to get a Mean Grade of C+ and above when taught by peer learning methodology while it was only 54 (37%) who managed to get the same Mean Grade when taught by conventional methodologies.

However, as a survival necessity and not by design, most of the 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.

5.4 Conclusion

From the data, it was deduced that peer learning had better performance outcomes than the conventional methods commonly used in teaching mathematics to the county public secondary schools.

Girls performed relatively poor in Mathematics when compared with boys in the county secondary schools but there were rare cases of some girls scoring better grades in Mathematics than boys of the same class.

The study also found out that among the confounding factors, gender had the least influence as some girls were found to do much better in Mathematics than many boys with a Chi-square Value of 8.3859 against a Critical Value of 28.87.

The teacher –student ratio had a significant influence on the performance of students on Mathematics. Term One data from the schools supports that when teachers were around and teaching, their number in the various schools had significant influence on the performance of their students on Mathematics.

Text book student ratio had the highest positive influence on students' performance in Mathematics though the study did not establish the appropriate ratio with the highest influence with a Chi-square Value of 24.5 against a Critical Value of 43.77.

The performance of the Control groups of both girls and boys in the single sex schools had dropped by 2.41 and 0.33 scores respectively between terms one and two. Four of the total six mixed-sex schools in the county were in Lagdera sub-county.

The Mixed-sex schools had showed a significant negative main effect of interaction where girls lost more than the boys between term one and term two.

5.5 Recommendations

On the bases of the findings and conclusion above, the following recommendations are being made;

1.0 The county secondary schools should adopt peer learning as a model for teaching.

2.0 The national government should consider adopting the peer learning model to teach other subjects such as Physics, Chemistry and Biology.

3.0 The county government of Garissa needs to construct more secondary schools in Lagdera sub-counties to reduce the negative effects of interaction.

4.0 Education ministry to consider setting school-based national examinations that test students only on what their school managed to cover in the course of their study cycle.

5.0 Education ministry to consider including teaching of presentation skills in the national secondary schools curriculum in order to train students on the art of public speaking.

6.0 The government of Kenya, with the help of United Nations high commission for refugees (UNHCR) should consider relocating Dadaab refugee camp into Somalia or anywhere else outside Kenya to reduce incidences of abductions, arm smuggling and attacking of our security personnel.

7.0 The national government should consider adopting the peer learning model to teach other subjects such as Physics, Chemistry and Biology.

5.6 Recommendations for Further Studies

Since text book student ratio had the greatest confounding effects on peer learning, the county education representative should consider:

(1) Conducting further research on the most appropriate text book student ratio for use.

(2) Investigating the retention model of the non-local teachers by the private secondary schools in the county and adopt it in the public secondary schools.

REFERENCES

- Anderson, G. and Boud, D.**, (1996). Extending the role of peer learning in university courses. *Research and development in higher education*: 19, pp. 15-19.
- Barbara, G. D.**, (2009). *Tools for teaching*: San Francisco: John Willey and sons Inc.
- Bernd Heinrich**, (1997). *The trees In my forest*: New York: Harper Collins Publishers. pp.141-151.
- Bohrstedt, G.W. and Stecher, B. M.** (2002). *What we have learned about class size reduction in California*. Sacramento, CA: California department of Education.
- Chin-Min, H.**, (2010). *Identification of dysfunctional cooperative Learning teams* Cliffs, N.J.
- Duflo, Esther, Pascaline Dupas and Micheal Kremer**, (2007), "Peer effects, pupil-teacher ratios, and teacher incentives: Evidence from a randomized evaluation in Kenya". Unpublished.
- Duke, D. L.** (1990). *Teaching: An introduction*, (pp. 89-106). New York, NY: McGraw-Hill Publishing Co.
- Edward, L., Deci, L. G., Pelletier, Richard, M. Ryan and Robert, J. Vallerand**, (1985, 1991). *Class room organization and student behavior*.
- Fidler, P.** (2001). *The Impact of class size reduction on student achievements*. Los Angeles,
- Finn, J.D.** (2002). *Class-size reduction in grades K-3*. In A. Molnar (Ed.). *School Reform Proposals: The Research Evidence* (pp. 15-24). Tempe, AZ: Education policy research unit Arizona State University.
- Garissa County Report: Exploring Kenya's inequality**: (2013).

- Glass, G.V., and 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.
- Griffiths, S., Houston, K. and Lazenbatt, A.** (1995). Enhancing student learning Through peer- Hoxby, C.M. (2002). The cost of accountability. Evers, W.M., and Walberg, H.J. (Eds.). School accountability. Stanford, CA: Hoover Institution Press.
- Groves, R. M.,** (1987). Research on survey data quality. Public opinion quarterly, pp. 156- 172.
- John Hattie, (2013).** Visible learning and the science of how we learn
- John I. Goodlad,** (2004). A place called school prospect for the future: New York: McGraw- Hill.
- 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.
- Joyce, B. and Weil, M. (1980).** Models of teaching, (pp. 374-380). New Jersey, NJ: Prentice-Hall.
- Krätli , S. (2001).** Education provisions to nomadic pastoralists a literature review. IDS Working Paper 126.
- Kurecka, P. and Claus, R.N.,** (2000). A Study of a Reduced Class Size Program, Grades 1 and 2 1999/2000. Evaluation report. Saginaw, MI: Saginaw public Schools, department of evaluation Services.
- Mitchell, D. E. and 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.

Molnar, A., Smith, P., and Zahorik, J., (1999). Evaluation results of the student achievements guarantee in education (SAGE) program, 1998-99. Madison, WI: University of Wisconsin Madison, School of education. Motivation and education: The self-determination perspective: New York: University of Rochester. pp. 325-346.

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.

Nachmias, David, (1992). Research methods in the social sciences, Volume 1: New York: Saint Martin.

Nelson Mandela, (1994). Long walk to freedom. Martin's Press. (p. 144).

Ngome, C.K. (2005). Mobile school programme for Nomadic pastoralists in Kenya: Pilot project in Wajir, Ijara and Turkana Districts.

Norland-Tilburg, E. V., (1990). Controlling error in evaluation instruments. Journal of extension, 28(2). Retrieved from http://www.joe.org/joe/1990_summer/tt2.html

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.

Nye, B., Hedges, L. V., and Konstantopoulos, S. (2001). Are effects of small Classes Cumulative? Evidence from a Tennessee experiment. *Journal of educational research*, 94, 336-345.

- Nye, B., Hedges, L. V., and 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.
- Nye, B., Hedges, L. V. and Konstantopoulos, S.** (2004). Do minorities experience larger lasting benefits from small classes? *Journal of educational research*, 98, 94-100.
- Phadke, S. M.,** (1989.) *Quality engineering using robust design*, Prentice Hall, Englewood
- Pollard, J. P., and Yap, K. O.,** (1995). *The Nevada class Size reduction evaluation Study 1995*. Carson City, NV: Nevada department of education, planning, Research, and Evaluation. Program for International Students' Assessment (PISA). United States Department for Education. Pupil achievement outcomes. *Research in the Schools*, p. 23-30.
- Pritchett, Lant and Deon, F.**(1999). What education productions really show: A positive theory of education expenditures". *Economies of education review*, 18(2): 223-39.
- Rosenthal, R. and Babad, E.Y.** (1985). Pygmalion in the gymnasium. *Educational leadership*.
- Sapon-Shevin, M. and Schniedewind, N.** (1990). Selling cooperative learning without selling it short. *educational leadership*, 47 (4), 63-65.
- Sara, Ruto. Zipporah, N. O. and John, K. M.** (2009). Education for all global monitoring report 2010: Educational marginalization in Northern Kenya.
- Sifuna, D.N.** (2005). Increasing access and participation of pastoralist communities in Primary education in Kenya. *An international review of education* (2005) 51: 499-516.

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.

The Daily Nation, 31st March 2016. (p. 5).

Tutoring in higher education (Colerain: Educational Development Unit, Using Taguchi quality indexes University of Ulster).

William, G. Huitt. (2000). The spiritual nature of a human being, in educational psychology interactive.

APPENDICES

APPENDIX ONE: CONSENT FORM

Participant No:

My name is Yussuf Ali Hassan, Student Registration/No: AG 332-3067/2014. I am a student At Jomo Kenyatta of University of Agriculture and Technology pursuing Master's degree in Research Methods. The study your school is about to participate in is part of an experiment to find out whether peer learning is a better teaching model than the didactic method commonly used in our schools. The study has been approved by the Ethical Committee of Institutional Review Board (IRB) for Ethical Standards at Jomo Kenyatta University of Agriculture andTechnology.

Should you voluntarily agree to be in the study, you will be required to fill this questionnaire as well as provide the scores obtained in Mathematics by the current Form Two students in your school during the first term of the year. All data collected from you will be coded in order to protect your identity. Following this study, there will be no way to connect your name with your data.

Any additional information about the study results will be provided to you at its conclusion upon your request. You are free to withdraw from the study at any time. Should you agree to participate, please sign your name below as an indication that you have read and understood the nature of the study, and that all your inquiries concerning the activity has been answered to your satisfaction.

Signature of participant and date

Signature of researcher and date

Name_____

Address_____

SCHOOL PROFILE

Name of the School						
Gender of Students	Boys only		Girls only		Mixed	
Year of Establishment						
Current Enrolment	Single Gender		Mixed Gender			
		Male		Female		Total
County						
Sub-County						

School Mission

School Vision.....

Motto:

OBJECTIVE ONE

PEER LEARNING AND STUDENTS PERFORMANCE IN MATHEMATICS

(1) Does this school teach Form Two students by peer learning Methodology?

(Please write 1 for Yes or, 2 for No).

(2) Does this school teach Mathematics to Form Two students by Peer learning Methodology? (Please write 1 for Yes or, 2 for No).

(3) If yes in (2) above, for how many days per week do students in Form Two in this school practice Mathematics by peer learning methodology? (Please tick the most appropriate number of days).

1 Day	2 Days	3 Days	4 Days	5 Days

(4) If any, what other subject (s) does this teach Form Two students by Peer Learning method? (Please indicate 1 for Yes or, 2 for No).

Chemistr y	Physic s	Biolog y	Islami c	Busines s	Histor y	Englis h	Kiswahil i	Other s

(5) Is the Mean score of Form Two Mathematics significantly higher than the Mean scores of other subject(s) also taught by peer learning? (Please write 1 for Yes or, 2 for No).

OBJECTIVE TWO

INFLUENCE OF SCHOOL ENVIRONMENT IN LEARNING OF.

MATHEMATICS

(6) What is the current Student-Teacher Ratio in Form Two class of this school?

(Please mark 1 for choice A, 2 for choice B, 3 for choice C or 4 for choice D).

A	B	C	D
<1:40	40:1	>1:40	> 1:80

(7) What is the current Class-Size of Form Two in your school? (Please write 1 for choice A, 2 for B, 3 for choice C or 4 for choice D).

A	B	C	D
1-40	41-80	81-120	>120

(8) How many days in a week is mathematics homework given to Form Two class of this school? (Please tick the most appropriate number of days per week).

1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	7 Days

(9) What percent of Form Two students in this school complete their mathematics homework on time? (Please write 1 for 0-25, 2 for 26-51, 3 for 52-77 or, 4 for 78-100%).

Between 0 -25	Between 26-51	Between 52-77	Between 78-100

(10) How many Mathematics lessons per week are given to Form Two class (es) in this school? (Please tick the most appropriate number of lessons per week).

1	2	3	4	5	6	7

OBJECTIVE THREE

INFLUENCE OF STUDENTS GENDER ON LEARNING OF MATHEMATICS.

(11) For single-gender schools only: How many students in Form Two class of this school scored the following grades in Mathematics in the end of Term One?

C+	B-	B	B+	A-	A

(12) For single-gender schools only: How many students in Form Two class of this school scored the following grades in Mathematics in the end of Term Three?

C+	B-	B	B+	A-	A

(13) For mixed –gender schools only: How many of the Form Two students who scored the following grades in Mathematics in the end of third term of the year (2015) were boys?

Grades	C+	B-	B	B+	A-	A
Total						

(14) For mixed –gender schools only: How many of the Form Two students who scored the following grades in Mathematics in the end of third term of the year (2015) were girls?

Grades	C+	B-	B	B	A-	A
Total						

(15) For mixed-gender schools only: On average, which gender in Form Two class in this school scored higher grades in Mathematics than the other? (Please indicate 1 for Males or, 2 for Females).

(16) What is the current Text Book Student ratio of Mathematics in Form Two class of this school? (Please mark 1 for choice A, 2 for choice B, 3 for choice C or 4 for choice D).

A	B	C	D	E
1:1	1:2	1:3	1:4	>1:4

Name Off Respondent	
Designation	
School Official Stamp	
Date	

APPENDIX TWO: LETTER OF INTRODUCTION



JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
P.O.BOX 62000, NAIROBI, KENYA. TELEPHONE : (067)-52181-4, 52711, FAX:(067)-52197
Email: dean@agr.jkuat.ac.ke
Office of the Dean, Faculty of Agriculture

OUR Ref: JKU/2/12/048

DATE: 29th June, 2015

To Whom It May Concern.

Dear Sir/Madam;

**RE: INTRODUCTION OF MR. YUSUF ALI HASSAN AS A MSC. RESEARCH METHOD
STUDENT AT JKUAT.**

I would to introduce Mr. Yussuf Ali Hassan (Registration number. AG332-3067/2014) as a student Jomo Kenyatta University of Agriculture and Technology.

He is currently conducting a research titled: "Peer- learning: An alternative teaching model for Garissa county public secondary schools".

This is to request you to support him in any way possible to enable him conduct this study.

The student will be expected to show his national ID, and valid Student ID at all times when using this letter for purposes of introduction.

Thank you for your time and consideration.

Yours sincerely,

A circular blue ink stamp of JKUAT is placed over the signature. The stamp contains the text "JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY" around the perimeter and "NAIROBI" at the bottom. The signature "OCHIENG AGGREY ADIMO" is written in blue ink across the center of the stamp.

DR. Ochieng Aggrey Adimo

RESEARCH METHODS PROGRAM COORDINATOR

Copy to: Chairman, Horticulture
Dean Faculty of Agriculture



JKUAT is ISO9001-2008 Certified
Setting Trends in Higher Education, Research and Innovation

APPENDIX THREE: COUNTY RESEARCH PERMIT
**MINISTRY OF EDUCATION, SCIENCE &
TECHNOLOGY**

STATE DEPARTMENT OF EDUCATION

Telegram: "SCHOOLING" Garissa
Telephone: 046-210-2458, Garissa.
Fax: 046-210-2002
Email: pdeducation.nep@gmail.com
When replying please quote



COUNTY DIRECTOR OF EDUCATION
GARISSA
P. O. Box 8-70100
GARISSA

REF:NEP/ED/6.26/vol.111/53

DATE; 2th June 2015

TO
THE PRINCIPALS
GARISSA COUNTY PUBLIC SECONDARY SCHOOLS

RE: RESEARCH AUTHORIZATION: YUSSUF ALI HASAN NO.AG332-3067/2014

Following his authorization by the research method program coordinator of Jomo Kenyatta University of Agriculture and Technology, Mr Yusuf is a Masters Degree student in the above university and has reported to this office on 2nd June 2015 for research permit.

His research topic is titled "**Peer learning: An alternative teaching method for Garissa County public Secondary schools**".

He needs to test the model and collect data before and after its implementation.

Therefore, this office is requesting you to give him the necessary support.

The research during the period will be between September 2015 and end of November 2015.

We wish him well in his endeavour.

A handwritten signature in black ink, appearing to read 'Maina J.K.', written over a light-colored rectangular background.

Maina J.K
For: County Director of Education
GARISSA

APPENDIX FOUR: THEORETICAL SAMPLE SIZE GENERATION

Required Sample Size[†]								
Population Size	Confidence = 95%				Confidence = 99%			
	Margin of Error				Margin of Error			
	5.0%	3.5%	2.5%	1.0%	5.0%	3.5%	2.5%	1.0%
10	10	10	10	10	10	10	10	10
20	19	20	20	20	19	20	20	20
30	28	29	29	30	29	29	30	30
50	44	47	48	50	47	48	49	50
75	63	69	72	74	67	71	73	75
100	80	89	94	99	87	93	96	99
150	108	126	137	148	122	135	142	149
200	132	160	177	196	154	174	186	198
250	152	190	215	244	182	211	229	246
300	169	217	251	291	207	246	270	295
400	196	265	318	384	250	309	348	391
500	217	306	377	475	285	365	421	485
600	234	340	432	565	315	416	490	579
700	248	370	481	653	341	462	554	672
800	260	396	526	739	363	503	615	763
1,000	278	440	606	906	399	575	727	943
1,200	291	474	674	1067	427	636	827	1119
1,500	306	515	759	1297	460	712	959	1376
2,000	322	563	869	1655	498	808	1141	1785
2,500	333	597	952	1984	524	879	1288	2173
3,500	346	641	1068	2565	558	977	1510	2890
5,000	357	678	1176	3288	586	1066	1734	3842
7,500	365	710	1275	4211	610	1147	1960	5165
10,000	370	727	1332	4899	622	1193	2098	6239
25,000	378	760	1448	6939	646	1285	2399	9972
50,000	381	772	1491	8056	655	1318	2520	12455
75,000	382	776	1506	8514	658	1330	2563	13583
100,000	383	778	1513	8762	659	1336	2585	14227
250,000	384	782	1527	9248	662	1347	2626	15555
500,000	384	783	1532	9423	663	1350	2640	16055
1,000,000	384	783	1534	9512	663	1352	2647	16317
2,500,000	384	784	1536	9567	663	1353	2651	16478
10,000,000	384	784	1536	9594	663	1354	2653	16560
100,000,000	384	784	1537	9603	663	1354	2654	16584
300,000,000	384	784	1537	9603	663	1354	2654	16586

[†] Copyright, The Research Advisors (2006). All rights reserved.