INFLUENCE OF CO-EDUCATIONAL SECONDARY SCHOOL GENDER STREAMED CLASSES ON MATHEMATICS TEACHERS ATTITUDES, PERCEPTIONS AND CLASSROOM PRACTICES IN FOUR COUNTIES OF KENYA

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A Thesis Submitted to the Graduate School in Partial Fulfillment of the Requirements for the Award of the Degree of Doctor of Philosophy in Curriculum and Instruction of Egerton University

EGERTON UNIVERSITY

JUNE 2016

DECLARATION AND RECOMMENDATION

Declaration

This is my original work and has not been presented for conferment of a degree, award of diploma or any other award in this or any other university.

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Recommendation

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This work is dedicated to my parents Mr and Mrs Hosea Barmao Chemweno, husband Dave K. Bowen and children Harry Kiprotich, Stacy Jebet and Mark Kigen

ACKNOWLEDGEMENT

I would like to acknowledge several individuals and organizations that supported me and greatly assisted me in my research work. First and foremost, my special gratitude to the Almighty God for granting me life, strength and good health to see the end of the work. I would like to thank Egerton University for granting me research funds and fee waiver and the National Commission for Science, Technology and Innovation for permiting me to conduct this study. I wish to sincerely thank my two supervisors Prof. Bernard N. Githua and Prof. Johnson M. Changeiywo for their tireless efforts in refining this document, providing direction and encouragement throughout the research work. Special thanks to my colleagues at Egerton University's Department of Curriculum, Instruction and Educational Management for their moral and technical support. Special thanks also to the County Directors of Education and Principals who granted me permission to conduct the study in their counties and schools. This research work would not have succeeded without the mathematics teachers and students who provided valuable information that informed the study, hence is greatly indebted to them. Finally I would like to thank all the individuals who may have provided immense assistance in one way or another and have not been mentioned. To you all, I say thank you very much and may the Almighty God richly bless you.

ABSTRACT

The major goal of most developing countries including Kenya is to achieve high levels of technological advancement. In order to achieve this goal, the citizens of these countries should among other skills be competent in mathematics. This is because the skills acquired in the subject provide the country with a human resource that is highly educated and able to tackle most of the country's problems. Hence, it is imperative that students excel in the subject especially in secondary school, since a good grade in the subject at this level is a criterion for enrollement in advanced science, mathematics and technology courses in colleges and universities. However, the performance of students at the Kenya Certificate Secondary Education (KCSE) mathematics examinations in Kenya has been dismal since 1989. Further statistics indicate that girls perform poorly than their male counterparts. Studies conducted in Kenya to establish the cause of this have concluded that teachers in mixed sex classroom learning environments foster unequal treatment of male and female students. As a possible remedy to this, single sex classes within co-educational secondary schools were created. There is however limited research, which has been carried out to establish the impact of this intervention on mathematics teachers' attitude, perceptions and classroom practices. Therefore, this study sought to determine the influences of the intervention within public co-educational secondary schools. Since it was not possible to manipulate the independent variable, the study adopted an *ex post facto* causal comparative research design. A sample of 203 mathematics teachers and 516 form four students drawn from co-educational secondary schools (those with mixed sex classes and single sex classes) in Nakuru, Kericho, Baringo and Uasin Gishu counties of Kenya participated in the study. Data were obtained using self-report questionnaires for mathematics teachers and a student's questionnaire for the purposes of triangulation. The instruments were validated and pilot tested to improve them before actual data collection. Chronbach alpha reliability coefficient of 0.87 for Mathematics Teacher Questionnaire and 0.82 for Mathematics Student Questionnaire were obtained. These were considered appropriate as they were within the accepted threshold of 0.70 and above in social science research. The collected data were then analyzed using descriptive statistics which included means, standard deviation and percentages and inferential statistics which were t-tests and ANOVA at a statistical significance of alpha equal to 0.05.The findings indicate that mathematics teachers' perceptions of their classes are favourable irrespective of the class gender composition.The statistical tests of significance show that there were no statistically significant differences in their perceptions and classroom practices in both the sub-county and county schools. However, the mathematics teachers' attitudes towards girls' only classes were lower than towards boys' only and mixed sex classes. These differences in attitudes were also statistically significant at coefficient alpha (α) equal to 0.05. The results from the study have yielded valuable information that may inform the intervention in Kenya's co--educational secondary schools and advice policy makers, teachers and administrators of the schools on appropriate measures to undertake to enhance its effectiveness in the teaching and learning of mathematics.

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LIST OF ABBREVIATIONS AND ACRONYMS

DEO District Education Officer

IPI Integrated Programmed Instruction

KCPE Kenya Certificate of Primary Education

KCSE Kenya Certificate of Secondary Education

KNEC Kenya National Examinations Council.

KIE Kenya Institute of Education

KICD Kenya Institute of Curriculum Development

MoHEST Ministry of Higher Education Science and Technology.

MSQ Mathematics Students Questionnaire

MTQ Mathematics Teachers' Questionnaire

NASSPE National Association of Single Sex Public Education

NCST National Council of Science and Technology

PDE Provincial Director of Education

PI Programmed Instruction

SPSS Statistical Package for Social Science.

CHAPTER ONE
INTRODUCTION

1.1 Background Information

Among the ancient Chinese and Greek societies, education was solely provided to males (Wikipedia, 2014). Plato was the first significant advocate of female education (Wexler, 2000). According to Wexler, Plato argued that women should equally access the same educational opportunities as men. As a result, women were gradually provided with education but were taught separately from men. This marked the beginning of single sex schools, which has been the norm in some institutions of learning to date (Rury, 2008).

The Catholic Encyclopedia of 1908 has defined co-education as the practice of providing education to both males and females by the same teachers governed by the same school administration within the same learning institution. This kind of education can either be provided as co-ordinate education or as identical education. The author of the encyclopedia argues that co-education can be co-ordinate if each gender has its own class. Co-education on the other hand can take the form of identical education if both sexes are taught in the same class.

According to Knight (1999) and Rury (2008), identical co-education in America was initially introduced in higher and technical educational institutions. Oberline College in Ohio was the first to introduce it in 1837 (Rury, 2008). The system then spread to other colleges so that by 1900, seventy five percent of colleges in northern, central and western America had embraced it. However in larger cities as well as in South America single sex institutions continued to exist due to the persistence of conservative European traditions. In other countries of the world, the pace of adoption of identical co-education was rather slow. Scandinavian countries were the first to adopt it as early as the eighteenth century by Denmark and the nineteenth century by Norway (Rury, 2008). There also existed some few cases of its adoption in Europe especially in Great Britain.

In America, identical co-education within the secondary level of education was first introduced in public high schools. Carrie (2007) posited that these schools had initially begun as boys' only schools and later enrolled girls on the same terms as boys. The pressure to admit girls into hitherto boys' only schools was occasioned by the industrial changes that were being experienced at the time. In English speaking regions of North America, especially New England

the pressure stemmed from the growing female population in churches and from the need to find a sizeable number of children to support schools in regions with smaller populations (Rury, 2008). The proponents argued that women were crucial in the socialization of children and thus the need for them to be educated. Others argued that it should be embraced since it ensures the admission of both sexes in school which was a replica of their interaction in church and at home (Mael, 1998).

The continued practice of identical co-education was not without controversy. There arose intense criticisms of the system especially in high schools from doctors, churches and educators. In America, such criticisms necessitated the formation of special inquiries by school committees, staff boards and the United States Bureau of Education (Knight, 1999). According to Knight, the findings of the inquiries brought to the fore diverse opinions of its effects in secondary school. These opinions centered on religious, vocational, physiological and educational grounds.

From the religious point of view, the Catholics argued that identical co-education in secondary schools eroded the morals of learners (Wikipedia, 2014). They argued that at this stage learners were in the adolescent stage of development hence it was hazardous especially for females if they remained in close contact with males for long periods. Therefore they recommended that the system be left for the elementary and post secondary levels of education. From the physiological grounds, there were arguments that the society assigned each gender different roles (Riordan, 1990). As such it was not possible to devise an education that will make their learning conditions identical. The group further criticized it as subjecting females to an education that was at the onset intended for males. They argued that each sex has unique mental constitutions and special capabilities. As such, each should be subjected to a different form of learning which could only be achieved through gender segregated schooling. From the vocational point of view, the critics argued, that in the world, the work of men and women are different, hence there should also be a difference in their preparation .The last critics of identical co-education were the doctors who argued that the system was likely to harm female students due to the extreme competition from the male students (Rury, 2008). From the foregoing, it is clear that education that was provided initially was only for the males. Gradually, females were admitted in school marking the birth of identical co-education. Later due to a lot criticism of the system based on moral, physiological

and vocational grounds, gender segregated education especially in the secondary cycle of education was introduced.

In Kenya, many societies had some semblance of education which was less elaborate (Shiundu & Omulando, 1992). These forms of education were tailored to prepare young people to perform specific roles in their societies. This may suggest that education that was provided was heavily gender specific since each gender had specific roles that they played. However with the coming of missionaries into Kenya in 1846, western type of formal education was introduced. Johann Krapf and Johannes Rebmann were the first to arrive in the country. Rebmann undertook to provide instruction to boys. In addition, one of the recommendations of the Fraser report (1909) was to order all headmen and chiefs to send their sons to school for learning. The above scenarios indicate that traditional education in Kenya was gender specific. It also indicates that the western type of education in Kenya was initially heavily gender biased with boys being the first to be taken to school. Moreover, a look at the early secondary schools in the country suggests that most of them were boys' only schools. These include; Alliance (1926) Mang'u High School (1927), Maseno school (1938) and Yala (1939).

The concern for the education of girls and their under-achievement in mathematics in the country can be traced back to the 1970s (Mondoh, 2002). Eshiwani (1975) began in earnest to investigate some of the causes of this scenario by conducting a study on gender differences and mathematical abilities among Kenyan High School children. The results of the study indicated that the teaching methods used by teachers in mathematics classes could be responsible for girls' underachievement in the subject. The findings indicated that girls prefered to be taught the subject using the programmed instruction (PI) and Integrated Programmed Instruction (IPI) methods as opposed to the conventional classroom Approach (CCA) method preferred by boys and mostly used by teachers during mathematics lessons. This finding is supported by those of Githua and Mbugua (2004) who found that there are gender differences in the preference of instructional methods used during mathematics lessons.

Mondoh (2002) argues that there exist certain factors within co-educational schools that aggravate the problem of girls' poor performance in mathematics. These include; method of

instruction, gender-role stereotyping, past academic experiences, examinations, the teaching staff, syllabuses and text books. Mathematics teachers in these schools have also been accused of disrespecting the cognitive styles of learners through their use of teaching methods that do not agree with learners' learning styles and their inability to encourage girls to pursue mathematics (Saitoti, 2005; Suchia, 2001).

Mondoh (2002) further points out that, differences in cognitive styles is an area that has been accorded little attention in terms of providing reasons for gender differences in mathematics. Mondoh defines cognitive styles as the various ways in which learners receive, understand, store, process and utilize information from the environment. Several scholars seem to agree that the cognitive styles of males and females are different (Bryden, 1979; Husen & Postlethwaite, 1991; McCarthy, 1981). As a result, they assert that gender differences in cognitive styles demand that teachers employ different instructional methods and media for effective teaching and learning to take place. Other scholars who have criticized mixed sex classes include; Githua (2002) and Mukwa and Too (2005). They argue that the mixed sex classroom environment has been found to inhibit classroom participation by both sexes due to the existence of some form of fear. Both sexes fear giving incorrect responses hence do not respond to questions in class. This situation is further aggravated by societal stereotypes which seem to allude to the fact that boys should be superior in mathematics and sciences than girls. From the foregoing, all these scholars seem to agree that the mixed sex classroom learning environment tends to foster unequal treatment of boys and girls which could be responsible for gender disparities in their K.C.S.E mathematics examinations performance.Table1 illustrates the gender differences in performance at KCSE mathematics examinations from the year 2002 to 2012.

Table 1

Students Percentage Mean Scores by Gender in K.C.S.E Mathematics Examinations, 2002-2012

	PERCENTAGE MEANS		
Year	Boys	Girls	Mean Differences
2002	22.53	16.44	6.09
2003	22.10	16.05	6.05
2004	21.34	15.39	5.95
2005	18.49	12.97	5.52
2006	21.87	15.78	6.09
2007	23.10	15.78	7.36
2008	24.31	17.71	6.06
2009	23.63	18.11	5.52
2010			
Math A	25.75	19.71	6.04
Math B	20.20	17.94	2.26
2011			
Math A	27.80	21.00	6.8
Math B	14.00	12.51	1.49
2012			
Math A	31.38	25.30	6.08
Math B	9.95	8.96	0.99

Source: KNEC 2003-2013 K.C.S.E Examinations Candidates Performance Reports.

Note: Math A and B refer to mathematics alternatives a and b respectively

The data in Table 1 shows that from the year 2002 to 2009 students sat for one mathematics examination, however from 2010 students chose to study either mathematics alternative A or B. From the data in Table 1, performance of both boys and girls in mathematics continues to plummet. Of particular concern is the gender disparity in performance in favour of boys. By observing the mean differences column, one realizes that initially the differences were higher, then reduced and later started widening by the year 2006. It is important to note that streaming

by gender in Kenya was introduced in some co-educational schools in the country during year 2000 (PDE, 2010). The Table shows that gender differences in mathematics decreased up to the year 2005 and increased towards the year 2007. This could mean that gender streaming may have initially generated some positive results which are no longer there. It could also indicate that learners were separated in class and yet the teachers continued with their conventional way of teaching in mathematics classes. The general poor performance in mathematics of boys and girls may close out many of them from mathematics related career opportunities in higher education. This would in turn negatively affect the country's efforts towards industrialization and technological advancement by the year 2030.

Cockroft (1982) underscores the importance of mathematics if a country is to experience scientific progress and development. This assertion is supported by Ahuja (2006) who argues that the subject is both academically and vocationally important for students. Kenya Institute of Education (KIE, 2008) supports Cockroft and Ahuja by contending that mathematics enables the learners to play positive roles in developing modern societies. Furthermore, mathematical knowledge is a prerequisite to learning other subjects such as management studies, business economics geography, medicine, engineering, biological sciences and physical sciences among others (Mondoh, 2005). Consequently, if students need to pursue competitive and lucrative mathematics based courses at higher levels, they must perform well in the subject. Such courses in mathematics related areas enable learners to join and pursue careers that are highly paid and attract high status in the society. Furthermore, a numerate populace is desirable to enable Kenya attain the vision 2030 goals. There is therefore, need to look for ways of improving performance of students in mathematics by employing strategies and educational practices that will raise the scores obtained by students in KCSE mathematics examinations and bring gender parity in mathematics achievement.

As earlier stated, some co-educational secondary schools in Kenya created separate classes for each gender in the year 2000 with the hope that the gender differences in performance may be eliminated. However, it is not clear whether the teachers are aware of the various reasons for gender disparities in mathematics performance and whether the same were incorporated when creating these classes. The following critical issues come to fore; do the teachers understand and

respect the various learning styles of boys and girls, are they gender sensitive, have the teachers made any significant adjustments to their teaching methods and materials, have their attitudes towards boys and girls as learners of mathematics changed, have the teachers altered classroom practices to improve girls' participation in mathematics classes, do they structure mathematics questions to reflect the various experiences that boys and girls come with to class and finally have the performances of boys and girls in KCSE mathematics examinations improved?.

Teachers are very crucial in enhancing mathematics performance of students and eliminating gender disparities. Further, they are key role models for learners both inside and outside the school (Ahmad & Sahak, 2009). Carr (2000) further reiterates that students rate the teachers and parents at par as far as role modeling is concerned. Choinard (2008) supports Carr by arguing that apart from parents, teachers play a critical role in shaping learners' attitudes towards mathematics. In addition, teachers' attitude towards children as learners of mathematics affects students' feelings about the subject. Choinard contends that if teachers make mathematics enjoyable, learners are likely to have positive attitudes towards the subject and would always long to attend mathematics clsses. The teachers' attitudes towards boys and girls as learners of mathematics may influence their behavior towards these learners in class and consequently their expectations of their performance (Gina & Moshe, 2001; Pahle, Hyde &Allison, 2014).

Gender streaming is a policy that has been adopted by some co-educational secondary schools in order to improve students' performance especially in Mathematics. Teo (2008) has argued that teachers are key agents in ensuring the success of such initiatives in school. Therefore it is imperative that teachers who are key agents of change possess positive attitudes towards the intervention. Kreiter and Kinicki (2007) have argued that teachers' attitudes are directly linked to their commitment to the policy. Therefore it was important to establish mathematics teachers' attitudes towards the creation of single-sex classes within co-educational secondary schools. It was also important to compare the attitudes between those who teach single and mixed sex mathematics classes.

Teachers'support is very vital in determining the success of school policies and initiatives (Kreiter & Kinicki, 2007). Their support will depend on their perceptions of the benefits of such

policies and initiatives. Hence it was crucial to investigate these teacher perceptions of gender streamed mathematics classes and compare them with those of teachers teaching mixed sex mathematics classes. Studies conducted on teachers' perspectives of single sex mathematics classes reveal conflicting results (Rennie & Parker, 1997; Willis, Kilpatrick & Hutton, 2006; Younger & Warrington, 2002). Rennie and Parker (1997) conducted a study on teachers' perceptions of single and mixed sex mathematics classes within co-educational schools in Australia. The researchers found that teachers perceived that single sex classes provided a more supportive environment for girls and rather a less supportive one for boys. Teachers also reported that they used different teaching strategies with the two kinds of classes. This finding is supported by Willis, Kilpatrick and Hutton (2006) who found that teachers perceived single sex classes as avenues upon which they would tailor their instruction in ways that will mitigate inter-gender difficulties. According to the teachers, this was possible since such classes provided them with opportunities to identify and adjust their teaching styles to suit the different learning styles of males and females. In contrast, in a report published by the American Association of University Women in 1998 found that girls' mathematics achievement did not improve following the creation of single sex classes in co-educational schools. The report noted that for boys, teachers did not notice their reading and writing problems, handled inappropriately their emotional and social needs and often interpreted their behavior as discipline problems. The report concluded that generally teachers failed to adjust their teaching methods to take into account boys and girls unique learning styles.

Holthouse (2010) and Warrington and Younger (2003) have argued that putting boys in one class and girls in another does not raise their academic performance in mathematics. The scholars contend that this move should be accompanied by use of radically different methods in their teaching. Other scholars such as Gill (2004), Haag (2000), and Thompson and Ungerleider (2004) have argued that the intervention's ability to lead to an increase in boys' performance in mathematics is in doubt. Holthouse agrees with these scholars by contending that single sex classes are inherently unequal and disadvantage both boys and girls. Their assertions are further supported by Lavy and Schlosser (2011) in their study on mechanisms and impacts of gender peer effects at school in Israel. They found that boys are likely to lose in terms of mathematics achievement if they learn the subject in single sex classes.

In Kenya, public secondary schools are categorized into four; these are national, extra county, county and sub-county secondary schools. National schools admit the best students in performance in KCPE examinations followed by extra- county, county and finally sub-county schools. Barmao and Mondoh (2007) in their study on the effect of gender streaming on students performance in mathematics in national secondary schools in Nakuru district found that irrespective of the type of school or mathematics class (mixed sex or single sex) that learners are taught in, gender disparities in mathematics performance still existed. This may be an indication that teachers did very little in terms of significantly adjusting their classroom teaching practices. It is also not clear what kind of attitudes and perceptions mathematics teachers have of the creation of single sex classes within co-educational secondary schools.

1.2 Statement of the Problem

Mathematics is a key subject in the secondary school curriculum in Kenya. Good grades obtained by students in the subject are critical in their enrollment in advanced mathematics, science and technology courses in colleges and universities. Such courses attract high salaries and status and are critical in Kenya's quest for industrialization and technological advancement by the year 2030. However, students' performance in mathematics examinations in Kenya continues to remain very poor in addition to gender disparities in performance in the subject. Boys continue to perform better than the girls. Researchers have pointed out that the mixed sex classroom learning environment especially within co-educational schools could be aggravating this problem. Therefore in recent years, attention has been drawn to addressing this difference in mathematics performance of adolescent boys and girls. This has led to the provision of single sex mathematics classes within co-educational secondary schools. Teachers being key mathematics curriculum implementers are crucial in improving girls' performance in the subject as well as eliminating gender disparities. However, there is limited research pertaining to this relatively new phenomenon of gender streamed classes with regard to mathematics teachers' attitudes towards them, their perceptions of the classes and classroom practices. Therefore, this study was designed to compare mathematics teachers' perceptions of their classes, attitudes towards their classes and classroom practices between those who teach in gender streamed and in mixed sex mathematics classes within public co-educational secondary schools.

1.3 Purpose of the Study

The purpose of the study was to compare mathematics teachers' perceptions of their classes, attitudes towards their classes and classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within public co-educational secondary schools in Nakuru, Kericho Baringo and Uasin Gishu counties, Kenya.

1.4 Objectives of the Study

The study was guided by the following specific objectives.

a) To compare mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within sub-county co-educational secondary schools.
b) To compare mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls'only) and in mixed sex mathematics classes within county co-educational secondary schools.
c) To compare mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within sub-county co-educational secondary schools.
d) To compare mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within county co-educational secondary schools.
e) To compare mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within sub-county co-educational secondary schools.
f) To compare mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within county co-educational secondary schools.

1.5 Hypotheses of the Study

Ho1: There is no statistically significant difference between mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.

Ho2: There is no statistically significant difference between mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.

Ho3: There is no statistically significant difference between mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.

Ho4: There is no statistically significant difference between mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.

Ho5: There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.

Ho6: There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.

1.6 Significance of the Study

The findings of the study have brought to the fore the influences of gender streamed classes on mathematics teachers attitudes towards their classes, their perceptions of the classes and classroom practices within public co-educational secondary schools. Information from this study may be useful to mathematics teachers', in designing innovative instructional methods and materials that conform to the various learning styles of learners in their classes. Teachers may also appreciate that learner come to class with previous gender related learning experiences and that they need to diagnose these difficulties and help learners to mitigate some of these learning difficulties. The results may assist in enhancing teachers understanding and incorporation of gender perspectives in mathematics instruction. They may also be able to take care of the specialized needs of both males and females in mathematics.

Mathematics teacher educators and curriculum developers may also benefit, since the study has availed more information that may assist in preparing mathematics teachers to cope with the emerging gender issues in the teaching of the subject.

Finally, the Directorate of Quality Assurance and Standards now has access to additional information that may assist in designing mathematics teachers in-service training packages aimed at enhancing teachers attitudes towards their classes and perceptions of their classes.The packages may also be designed to ensure that mathematics teachers adopt classroom practices that conform to their learners' learning styles.

1.7 Scope of the Study

This study was conducted in sub-county and county public co-educational secondary schools in Nakuru, Kericho, Baringo and Uasin Gishu counties of Kenya. The main features of Counties in Kenya's former Rift Valley can be categorized in to two; cosmopolitan nature and socio-economic activities of the residents. Nakuru County was chosen because of its highly cosmopolitan nature, Uasin Gishu and Kericho counties because of the nature of farming activities while Baringo was chosen due to the nature of climate which favours both agricultural and pastrolist activities. Hence they were found to be adequately representative of Kenya's former Rift Valley Province. In addition, the counties had a good number of county and sub-county co-educational schools with the types of streaming that was the study's focus. Hence it was possible to access the respondents. The study's focus was to compare mathematics teachers' attitudes towards their classes, perceptions of their classes and classroom practices between those who teach in gender streamed (boys' and girls' only) and mixed sex classes. The teachers were selected since they were responsible for coming up with school policies and implementing them. Therefore, the success and or failure of the policies largely depend on them as key curriculum implementers. Sub-county and county public categories of schools were selected since these are the categories of schools with a good number of co-educational secondary schools which have created separate classes for males and females. In addition the majority of students in these schools have been performing poorly in the subject.

1.8 Limitations of the Study

The sample used in the study was drawn from Nakuru, Kericho, Baringo and Uasin Gishu counties of Kenya, consequently generalization of its findings will be limited to mathematics teachers who are in co-educational secondary schools with similar characteristics.

1.9 Assumptions of the Study

The study was carried out with the following assumptions;

i. The teacher's gender did not influence his/her attitudes towards his/her mathematics class, perceptions of his/her mathematics class and classroom practices adopted in class.
ii. All the participants were sincere in responding to the items in the questionnaires.

1.10 Definitions of Terms

The following operational definitions of terms were pertinent to the study.

Co-educational secondary school: Refers to a school that provides education to both males and females by the same teachers governed by the same school administration within the same learning institution (Knight, 1999). In this study a co-educational secondary school refers to a school that admits both sexes. There are two types of co-educational secondary schools; identical and co-ordinate co-educational schools

Identical co-educational school: Refers to a co-educational secondary school where both males and females are taught in the same class.

Co-ordinate co-educational school: Refers to a co-educational secondary school that teaches males and females in different classes.

Teachers' Classroom Practices:-A practice is a way of doing an activity especially regularly (Hornby, 2006). In this study classroom practices referred to teacher's activities or actions during mathematics lessons. This included; way of praising learners, behavior towards learner, instructional methods and materials used in teaching mathematics. The frequency of occurrence of these classroom practices were rated using a five point scale in questionnaires administered to both the mathematics teachers and learners. The scale ranged from never, rarely, sometimes, often and always.

Public secondary school:-This refers to a school that is partially financially supported by the Government. In Kenya, the government supports these schools by paying salaries to the teachers and provision of funds for the purchase of tuition materials.

School Category:-This refers to the various divisions of secondary schools. In Kenya, public secondary schools are divided into four categories namely; national, extra county, county and sub-county schools. The current study focused on the county and sub-county categories of public secondary schools.

Streaming: This refers to putting students in to groups according to a characteristic such as age ability and gender (Hornby, 2006). In this study, streaming refered to assigning students to different mathematics classes. There were two types of streaming; gender streaming (girls and boys learn in separate mathematics classes) and mixed sex (girls and boys learn in the same class).

Gender Streaming: Refers to assigning students to various classes based on their gender such that males and females are taught in separate classes.

Mixed Sex: Refers to a class where both males and females are taught together in the same class.

Teachers' attitudes: An attitude refers to feelings or involves feelings which are directed towards a target. These feelings vary in intensity and are consistent (Husen & Postlethwaite, 1991). In the current study, teachers' attitudes referred to their feelings towards gender streamed (girls' and boys'only) and mixed sex mathematics classes.

Teachers' perceptions: Refers to the way one sees and understands things (Hornby, 2006). In this, study, teachers' perceptions referred to their knowledge and understanding of gender streamed and mixed sex mathematics classes. It particularly referred to mathematics teachers' knowledge of the benefits and disadvantages of gender streamed (girls and boys'only) and mixed sex classes.

CHAPTER TWO
LITERATURE REVIEW

2.1. Introduction

This chapter reviews literature related to mathematics education. The section highlights the importance of mathematics, gender differences in cognitive styles, teaching methods and instructional media used in mathematics classes. It also describes teachers' attitudes towards and their perceptions of gender streamed and mixed sex mathematics classes, theoretical framework and finally the conceptual framework of the study.

2.2 Importance of Mathematics in Society

Mathematics is a core subject in the secondary cycle of the Kenyan education system. This means that it is compulsory for all students in secondary school to do the subject. As a core subject, it enjoys special status in that many lessons are allocated to it in the school timetable (KIE, 2002). According to the curriculum developers at the Kenya Institute of Curriculum Development (K.I.C.D), mathematics is essential since it helps to develop in the learners certain important skills (KIE, 2008). These skills include: numeracy, accuracy, logical thinking and precision of thought. Wasiche (2006) and Mondoh (2005) agree with the above view by asserting that the subject enables learners to think logically, creatively and independently in addition to developing in them powers of spatial awareness.

Mondoh (2005) further contends that the study of mathematics helps in character building. According to her, it assists the learners to acquire certain character traits such as patience, curiosity, criticism and stimulation. Furthermore, Ahuja (2006) argues that individuals who are competent in mathematics both in numerical manipulation and understanding of its conceptual foundations are able to handle more ambitious and qualitative relationships that are common in making day to day decisions. Koedel and Tyhurst (2012) add that such individuals are likely to benefit from higher returns from their mathematical skills as compared to other skills. As a result the skills acquired in the subject provide the society with highly educated workers who are adept at logical reasoning, problem solving and making sense of things (Schroter, Joensen & Nielsen, 2010).

Wasiche (2006) continues to argue that the subject provides a way of communication or language which is highly effective in presenting information in the most concise and precise manner. Mondoh (2005) argues that this is achieved through use of symbols, numbers, operations, tables, diagrams, charts, graphs, geometrical or technical drawings and figures. Therefore, it is imperative that the above attributes associated with mathematics learning should be inculcated in students.

Besides its importance to the individual and society, the knowledge of mathematics is crucial for further learning in the subject and in the understanding of other subjects (Mondoh, 2005; Wasiche, 2006). They contend that the subject shapes individuals minds and prepares them to study pure sciences, social sciences, physical sciences, engineering, medicine, biological sciences, geography, economics and business management studies. According to Koedel and Tyhurst (2012), such areas of study enable learners to join careers and jobs that are lucrative and those that attract higher incomes and status.

Despite its importance, students' performance at the KCSE mathematics examinations has been poor (Aduda, 2015; KNEC, 2003-2012). The poor examination results posted by learners in addition to gender disparities in the same continue to raise concerns by educational researchers, policy makers in the Ministry of Education and the parents. It is therefore important to investigate the influence of gender streamed classes on mathematics teachers' attitudes towards their classes, perceptions of their classes and classroom practices.

2.3 Gender Differences in Cognitive Styles

Husen and Postlethwaite (1991) have defined cognitive styles as the various differences in people in information processing. This includes perception, storage, transformation and utilization of information from the environment. Mondoh (2001) defined cognition as the process of perceiving, thinking, reasoning and understanding, problem solving and remembering. Therefore, cognitive styles refer to the different ways in which people perceive and process information in terms of thinking and learning. These are relevant to student' learning of mathematics and problem solving.

The concept of cognitive style attempts to describe various ways in which human beings think and learn (Husen & Postlethwaite 1991). In solving mathematics problems, children have been found to obtain varying scores. This is an indicator of differences in their cognitive styles. Some scholars have observed that students perform differently on easier and difficult mathematical problems (McPherson, 2006; Mondoh, 2001). Mondoh argues that a good performance on difficult items require the learner's clear understanding of concepts while a poor performance on relatively easier items could be as a result of mistakes.

The varying differences in cognitive styles exhibited by boys and girls in mathematics may explain the differences in their performance. Several authors have outlined some of these cognitive styles. These include Husen and Postelthwaite (1991), Mc Cathy (1981), and Bryden (1979).

2.3.1 Bryden's Theory of Brain Lateralization

Bryden (1979) and McPherson (2006) hypothesized that the differences in mathematics performance between boys and girls could be due to their cerebral organization. According to them, there are two hemispheres in a human brain; the left and right hemispheres. The left hemisphere controls the linguistic skills while the right controls spatial related skills. The left hemisphere among the girls develops faster while for the boys it is the right hemisphere. Bryden contends that since the right hemisphere of boys' brains develops faster than that of the girls' then they are likely to be superior in spatial related skills which are critical in learning mathematics while girls are likely to be superior in linguistic skills. Costello (1991) supported this view by arguing that apart from the asymmetrical nature of the brain, people's brains process information differently. NASSPE (2010) supports Costello's view, by asserting that girls use their brain's cerebral cortex in the learning of mathematics and science. Mondoh (2001) reiterates that differences in information processing may explain gender differences in mathematics performance. Fryer and Levitt (2010) supports Mondoh by asserting that the differences could explain the gender gap in mathematics performance. This could imply that boys and girls handle differently mathematics content and problems. NASSPE (2010) recommends that to teach girls mathematics effectively, teachers should present mathematics lessons couched in language. They can do the same by relating the subject to the real world using

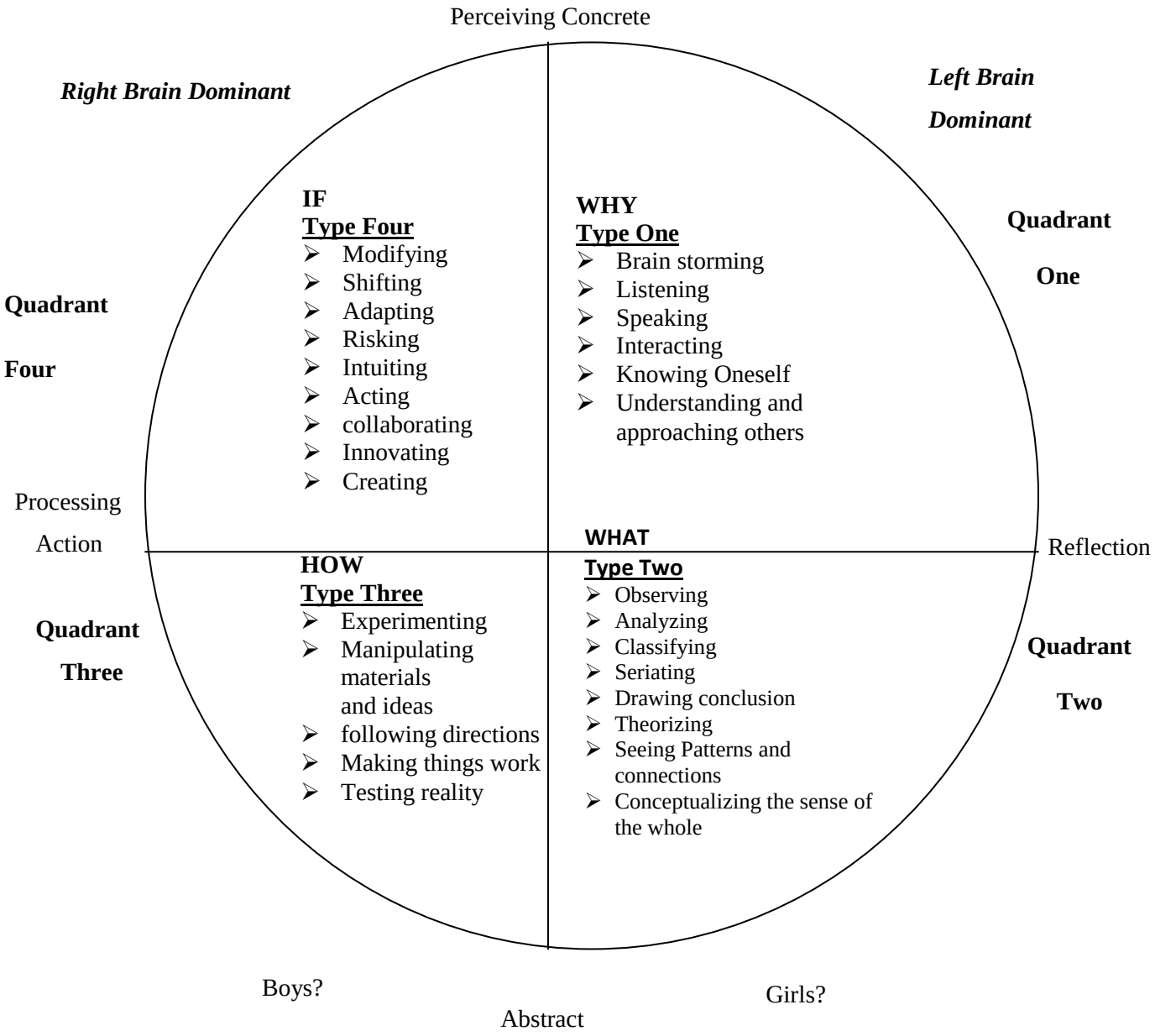
story problems and hands on experiences. In addition Holthouse (2010) supports the above scholars by arguing that since the males' and females' brains are different in terms of the way they function and develop from childhood to adolescent, then they should also be taught differently in different classes and using radically different methods. Therefore, it is imperative that teachers are aware of these differences in information processing by boys and girls. If they are aware, then they will strive to adjust their classroom practices to suit the cognitive styles of their learners.

2.3.2 McCarthy's 4 – Mat System

The 4 mat system was developed by Dr Bernice McCarthy in 1981. The system explains learning in terms of the ways people perceive and process information (Hutt, 2009). The foundation of this system is that there are differences in the way people learn in terms of perception and processing of information from the environment. Some people perceive by sensing and feeling their way while others prefer to think things through (Changeiywo & Mbugua, 2010; Mondoh, 2001). To process information, some people will reflect and watch while others will jump right in and try things out.

McCarthy argues that learners perceive experience and information differently. They range between concrete experience (C.E) and abstract conceptualization (AC). In terms of processing experience and information, people range from active experimentation (AE) to reflective observation (RO).

Mondoh (2001) combined McCarthy's perceiving and processing techniques with Bryden's (1979) right and left brain dominant processing techniques and came up with four unique cognitive styles of people as illustrated in figure 1.



Source: Mondoh (2001) pg 5

Figure 1. Four learning styles, the 4-mat system

From figure 1, there are four types of learners. The features and implications for each type of learners are as follows. Type one learners perceive experiences and information concretely and process the same reflectively. These learners ask the question why? To such learners if the question why is answered, then meaning is injected into whatever is being learnt. Mathematics teachers need to constantly provide these learners with reasons for learning particular concepts in class (Mondoh, 2001). From the figure, majority of type one learners are girls and prefer interacting and discussing with other learners in the learning process (Changeiywo & Mbugua, 2010; Zanders, 1993). Zanders argue that girls' learning styles are characterized by more open-endedness, reflection, are emphathetic and engage in tasks related to real life situations. Therefore, this has implications on the teaching strategy that the teachers need to adopt. Teachers should adopt methods of teaching that would encourage interaction and discussion. Such methods include group work and cooperative learning. Girls are the majority in this group and should therefore be taught using group work.

Bryden (1979) and McPherson (2006) had earlier indicated that learners who are left brain dominant are good in linguistic skills and that girls are the majority. As a result in figure 1, majority of types one and two learners are girls. Type one and two learners perceive information concretely and abstractly but process it reflectively. Such learners don't just jump in and try things out. Instead, they prefer to watch and reflect before acting (Changeiywo & Mbugua, 2010). Type one learners' favorite question is 'why' while type two is 'what'. During teaching, teachers need to justify the learning of a particular concept. Such justifications inject meaning into subject matter. Both types of learners prefer working with others (Mondoh, 2001).In the case of type two learners, mathematics teachers need to give them facts since their favorite question is 'what'. Such learners are analytical and require to be directed towards greater understanding of concepts.

From figure 1, types three and four learners are right brain dominant. Bryden (1979) contends that boys form a majority of these learners. Type three and four learners perceive information abstractly and concretely respectively (Gobstein, 2008). However both of them process the information actively. These are learners who are always active. They like trying things out. Type three learners favorite question is 'how' while that of type four is 'if'. Mondoh (2001) and

Changeiywo & Mbugua (2010) assert that such learners like trying things out for themselves. This suggests that types three and four learners learn best by being actively involved in terms of doing or through "hands on" experiences. Type three and four learners prefer being left alone to try things out and learn by improving on their mistakes. The above features of the various types of learners have implications on the classroom practices to be used by mathematics teachers. It seems that majority of the girls prefer co-operative modes of learning and group work. Boys on the other hand may prefer self discovery modes of teaching.

2.3.3. Husen and Postlethwaite's Ten Cognitive Styles

Husen and Postlethwaite (1991) have identified ten different types of cognitive styles of people. These include: field independence versus dependence, reflection versus impulsivity, convergence versus divergence, leveling versus sharpening, verbalizers versus visualizers, serialist versus holist, confidence versus caution, conceptual style, category width and cognitive complexity.

Changeiywo and Mbugua (2010) have argued that the differences in students' performance in Mathematics and sciences can be attributed to the discord in the cognitive styles of the teacher and the learner. According to the scholars, there could be discord in the reflective versus impulsive styles, holist versus serialist and field dependence versus field independence. Costello (1991) has argued that the reflective versus impulsive cognitive styles could influence students' performance in mathematics. Reflectives are individuals who have to think carefully and examine the potential answers. These learners take more time before responding to questions (Dembo, 1977; Husen & Postlethwaite 1991). Impulsivists on the other hand are very fast and take the shortest possible time before responding to questions asked. It appears that reflectives are likely to make fewer mistakes than impulsivists. The majority of boys are impulsive while girls are reflective in nature. The knowledge of these differences in cognitive styles enables teachers to understand the various reasons why students fail. With these knowledge teachers will be able to encourage reflectives to process information fast if the tasks at hand demands so and also encourage boys to acquire reflective style of thinking which is a more mature intellectual strategy according (Mondoh, 2001).

Husen and Postlethwaite (1991) have defined a holist cognitive style as one in which the learners view problems under investigation as one whole unit while serialists view the problem in small parts. Changeiywo and Mbugua (2010) have argued that holists focus on understanding the whole content of a topic first, while serialists try to understand the content of a topic bit by bit after which they are able to systematically understand the whole topic. Further, serialists are cautious, prefer step by step procedures while relying on detailed information when building up a case. Pask (1976) in Husen and Postlethwaite did an experiment using teaching materials which were based on extreme holist and serialist principles. He observed that students' whose learning styles are in discord with the teaching materials learn inaccurately and at a slower pace while those students whose cognitive styles agree with the teaching materials grasp the concepts learnt faster and are able to remember them vividly. This finding agrees with Richford's (2004) study of students at an urban community college. He found that the use of learning style responsive materials in teaching resulted in significantly higher achievement by the students.

Learners who exhibit the field – independent cognitive style work independently, prefer task oriented activities, like competing with one another and are not interfered by what goes on in their learning environment. Field dependent thinkers on the other hand prefer working with others and assisting one another, are very sensitive to their learning environment such that any slight change or disturbance affects them (Changeiywo & Mbugua, 2010; Mondoh 2001). In addition, they are affected by the feelings and opinions of others and more often seek the teacher's direction and guidance. Most of the boys' exhibit field independent cognitive style characteristics while girls are field dependent (Garret 1987). NASSPE (2010) agrees with Mondoh and Garret by asserting that girls' are four times sensitive to their social learning environment than the boys. Further NASSPE argues that a majority of the girls prefer treating their teachers as friends and allies; they also prefer pleasing them and enjoy learning in small informal discussion groups. From NASSPE's findings then teachers need to think about how they organize their classrooms and teaching so as to agree with the cognitive or learning styles of their learners.

The other dichotomy of cognitive style that is likely to bring about gender differences in mathematics performance is the convergence versus divergence style. Husen and Postlethwaite

(1991) explains the convergence style as possessed by learners who are good in answering questions that require a single correct answer such as in mathematics, while divergent thinkers are good in answering questions that require a variety of responses such as in art subjects. Hudson 1966 in Husen and Postlethwaite (1991) argues that convergees are emotionally inhibited and prefer to study science and mathematics while divergees are expansive, emotionally uninhibited and prefer to study arts subjects. Mathematics teachers, therefore need to provide special assistance and encouragement to divergent thinkers so as to enable them think in a convergent way and generate single correct answers required in mathematics. Mondoh (2001) contends that majority of the boys are convergent thinkers while the girls are divergent thinkers.

From the foregoing, it is clear that differences in cognitive styles of the learners may demand that teachers employ classroom practices that match with the learners cognitive styles. In addition, the literature seems to suggest that boys and girls have different learning styles. Therefore, this study will investigate whether by creating separate mathematics classes for each gender; teachers incorporate students' learning styles in their choice of classroom practices in mathematics lessons.

2.4 Teaching Methods and Materials Used in Teaching Mathematics in Secondary Schools in Kenya

Mondoh (2005) has defined teaching methods as practices and actions which are aimed at attaining certain goals. According to her, the methods of teaching mathematics can broadly be divided in to two; teacher centered and learner centered. Kiruhi, Githua and Mboroki (2009) have defined teaching methods as teaching practices or actions that depict certain teaching strategies. Teaching strategies have been defined as ways in which the teaching has been organized and implemented (Kiruhi, et, al., 2009). These teaching strategies can be categorized as either those that merely inform or provides knowledge (expository) and those that make the learner look for knowledge or explore (discovery / heuristic).

For this study, teaching methods will refer to the teachers' actions, practices and methods used in teaching mathematics and are geared towards improving students' performance in mathematics. The methods of teaching used by a teacher are dictated by certain factors. These include; age, gender and ability of the pupils together with the level of knowledge possessed by the learners

(Mondoh, 2002 & 2005). In terms of students age, learners who are 14 years and above should be taught more using practical methods that involve them or 'hands on activities', while learners who are above 18 years should be taught more using the expository methods. In case of students of lower academic abilities then they should be taught using a variety of teaching methods from the bright ones. Lastly, students' who possess adequate knowledge required in a particular topic should be taught differently from those who possess inadequate knowledge in the particular topic. Brahier (2005) argues that for effective mathematics teaching, teachers must understand what students know and need to learn. Teachers will then use the information to guide the learners to learn what they need to know well. This study addressed the teaching of mathematics to secondary schools students who are between the ages of 14 and 18 and perform poorly in mathematics. This implies that for teachers to effectively teach this category of learners then they need to use practicals which require teaching materials / media and employ a variety of teaching methods.

Several mathematics teacher educators have identified some teaching methods and materials used in the teaching of mathematics in Kenyan secondary schools. The teaching methods include; deductive / inductive lecture, working in small groups, question and answer, supervised practice from a mathematics text book, teachers' feedback from assignments and tests, guided discovery practical mathematical activities, revision questions from tests and past papers, mathematical games and puzzles during lessons / buzz group technique discussion of problem-solving steps, worked out class examples of mathematical problems, programmed learning brainstorming, independent study methods, problem solving, experimentation, project work, simulation, field trips (Githua, 2002; Kiruhi et al, 2009; Mondoh, 2005).

The instructional materials identified have been categorized in two; visual and audio (Githua, 2002). The visual materials include; real objects, chalkboard, charts, models, posters, diagrams and photographs, overhead projector, episcope, computer image projection, slides, film strips, micro projectors, textbooks, worksheets and newspapers. The audio materials include; cassette tapes, phonograph records, compact discs, audio-cards and radio broadcasts (Githua, 2002; Mondoh, 2005).

From the previous section 2.3 on gender differences in cognitive styles; it is clear that the cognitive styles of boys and girls may be different. Due to these differences, then mathematics teachers may need to adjust their teaching techniques and use teaching materials that match the cognitive styles of their learners. The use of gender insensitive instructional methods and media has been identified as a possible cause for gender disparity in mathematics performance. (Eshiwani, 1975; NASSPE, 2010; Baudino, 2007).

Eshiwani (1975) in a study on gender differences and mathematical abilities among Kenyan High School children found that girls scored higher on mathematics tests when taught using the Programmed Instruction Method (PI) and integrated programmed Instruction (IPI) method. While boys achieved higher scores when taught using the Conventional Classroom Approach (CCA). Programmed Instruction (PI) is a method of learning where material to be learnt is carefully designed in a sequence of small units of work through which pupils work to achieve knowledge and understanding. Each unit becomes an effective stimulus and the correct response leads to the next unit. The sequencing of activities into small units is effectively done by the teacher to enable learners reach set objectives. Integrated Programmed Instruction (IPI) is a method where the learning material is carefully organized in a sequence of tiny units of work through which pupils are guided by the teacher to achieve knowledge and understanding. The teacher leads pupils to the next unit only after the previous one has been successfully covered and the objectives met. Conventional classroom approach (CCA) is a method commonly used in our mathematics classrooms. In this method, the teacher prepares his/her work based on the syllabus and the scheme of work. He/she then explains the various concepts to be learnt through use of different methods while the class listens and carries out the activities as directed by the teacher. The learning pace is dictated by the teacher.

Eshiwani's findings are supported by NASSPE(2010) and Holthouse (2010) who argue that since males' and females' brains are different in development and function from childhood through to adolescence then they should not only be taught in different classes but also through use of radically different teaching methods. This argument agrees with Geist and King (2008) who have concluded that there are differences in the way males and females perceive and process mathematics and that the difference should be taken into account by the educational

system. According to NASSPE, co-educational schools which have experienced a dramatic improvement in mathematics grades and test scores have gone beyond creation of separate classes for boys and girls. NASSPE organized training for teachers in practical gender specific classroom strategies and best practices for the gender separate classroom. NASSPE also found out that girls preferred being taught in small informal discussion groups where teachers assign two or three girls to co-operate in class presentations and projects while boys preferred formal situations with clear structure and discipline methods and teachers dealing with them in an aggressive way (Holthouse, 2010). NASSPE further found that girls learned mathematics using the part of the brain that controls linguistic skills. As such, mathematics teachers should connect mathematics to the real world through use of story problems and practical applications. They also found out that boys enjoy pure number theory and teachers should therefore build mathematics lessons around charts, graphs and matrices.

In a study on teaching techniques that enhance students' performance in mathematics in selected public secondary schools in Butere – Mumias district in Kenya, Wasiche (2006) found that there are some teaching techniques that enhance performance in mathematics. The teaching methods include; small group instructions during the lesson, teacher assisting one student at a time especially weak students, teacher encouraging students to demonstrate to each other during the lesson, providing frequent feedback by giving assignment, marking and revising immediately, motivating students by providing incentives like material things for any small progress and finally encouraging students to interact freely in class which allows them to fully participate in classroom activities. In another study by Onyango (2004) on differential perceptual learning style preferences among pupils in selected public secondary schools in Kenya, the findings seemed to indicate that the teaching methods used are the ones that are likely to attract learners to the subject being taught. The same study also found that matching the teaching style with the learner's styles led to higher academic achievement especially for the low achievers.

Githua and Mbugua (2004) in their study on the gender differences in the preferences for instructional methods in secondary school mathematics in classrooms in Kenya found that there are indeed gender differences. They found that girls preferred being taught using group work, out-of-class mathematics lessons and use of mathematics games. Boys were found to prefer the

guided discovery method. These findings tend to concur with the gender differences in cognitive styles mentioned in section 2.3.3.

Therefore from the foregoing discussion, it is clear that there are some teaching methods and techniques that enhance students' performance in mathematics. It is also clear that boys and girls prefer being taught mathematics using different teaching methods. Mathematics teachers need to be aware of the same so as to adjust their instructional approaches to be in line with the learner's preferred methods. Hence, it is clearly not enough simply to separate learners in class on the basis of sex. This study investigated the teaching practices and materials used by mathematics teachers in single sex classes and the extent to which the same are in line with the gender preferred teaching methods and media. The study also compared the methods used in single sex settings and those used in mixed sex classes.

2.5 Teachers' Attitudes towards Gender Streamed Mathematics Classes in Secondary School

Attitudes refer to feelings directed towards or away from some target (Husen & Postlethwaite, 1991). It involves emotion, target, direction, intensity and consistency. Ahmad and Sahak (2009) contend that attitude influences peoples' views, actions, thinking and what they are likely to hear. These attitudes are as a result of experiences and determine how individuals tend to respond favorably or unfavorably to an object or situation. In this study, attitudes referred to the intensity and strength of the teachers' feelings directed towards or away from their mathematics classes.

Kreiter and Kinicki (2007) posit that attitudes are in three categories; affective, cognitive and behavioral. Attitude is affective when it touches on individuals' feelings or emotions towards an object or situation. It is cognitive, when it influences peoples' beliefs or ideas and lastly it is behavioral if it influences individual's behavior towards an object or situation. Therefore, the attitudes of an individual towards an object or situation will influence how they feel, think and behave towards the same. Hence in this study, the teachers' attitudes towards their mathematics classes influenced their thinking, feelings and behavior towards boys and girls as learners of mathematics.

Teachers are very important persons to the learners. Learners perceive them as always true and right. Ahmad and Sahak (2009) have argued that learners perceive their teachers as role models both inside and outside the classroom. Rose (2005) agrees with the above assertion by further adding that as role models teachers can expose their learners to certain attitudes, lifestyles and outlooks. Carr (2000) supports Rose and Ahmad and Sahak (2009) by arguing that learners rate the teachers and parents to be at par in role modeling. Chouinard (2008) further adds that parents and teachers play an important role in shaping a student's attitude towards mathematics. Chouinard contends that their attitude towards mathematics and towards the children as learners of the subject affects the childrens' perceptions of their competence and values attached to mathematics. Teachers have also been found to affect students' feelings about certain subjects. This can be achieved through making their subjects enjoyable thereby making learners to feel successful in class. As a result, students are more likely to have a better attitude towards the class and may want to come to it (Chouinard, 2008).

Apart from being role models, Teo (2008) asserts that teachers are key change agents in any school. They play crucial roles in the success of initiatives or policies initiated in schools. The success of school policies and initiatives is a function of the teachers' support and attitudes. It is important therefore for these teachers to possess positive attitudes towards streaming in mathematics classes since this attitudes are linked to their commitment to the policy. According to Kreiter and Kinicki (2007), job satisfaction is likely to affect teacher-student interaction. They continue to assert that effective communication is vital in creating and maintaining an effective school policy. The success of policies in school is directly linked to what teachers think and do. Therefore, teachers' attitudes and behavior are strongly influenced by their perceptions towards school policies. Lastly, alienation would determine the level in which the teachers feel disappointed with the policy.

The teachers' attitudes towards boys and girls as learners of mathematics may influence their behaviour towards them in mathematics classes and their expectations of performance of these learners (Gina & Moshe, 2001; Pahle, Hyde & Allison, 2014). It will also influence their relationship and interaction with learners in mathematics classes (Gina & Moshe, 2001; Ahmad & Sahak, 2009). These teacher attitudes are largely influenced by the general societal

stereotypes. Fryer and Levitt (2010) and Mukwa and Too (2005) add that teachers treat boys and girls differently and use teaching methods that depict the societal norms and beliefs about gender differences. These teacher actions will in turn affect the learners' thinking, questioning, problem solving and classroom discussions.

McCoy, Smyth and Burke (2012) and Changeiywo (2000) observed that there are differences in the way teachers interact with boys and girls in co-educational mathematics and science classes. They observed that boys seek out and receive a lot of teacher attention. Teachers call upon more on male students than females' students to answer questions and participate in class demonstrations. These teacher actions make the female students to be passive, develop low self esteem, loose interest and perform poorly. These findings are supported by Gina and Moshe (2001) who found that teachers perceive boys as their best mathematics students and hence concentrate more on them than the girls. Mc Coy et al also reported that apart from the differential treatment of males and females in a co-educational class by teachers, girls' in single sex primary schools in Ireland are more likely to have positive attitudes towards mathematics than their counterparts in a co-educational setting. For boys, the same study observed that, they were more positively disposed towards mathematics than girls. However the study found little differences in attitudes towards mathematics between boys and girls taught in single-sex schools. This could suggest that single sex settings promote positive attitudes towards mathematics of both boys and girls. This study sought to establish the teachers' attitudes towards gender streamed and mixed sex mathematics classes.

2.6 Teachers' Perceptions of Mixed and Gender Streamed Mathematics Classes.

Perception refers to the way in which something is regarded, understood or interpreted (Hornby, 2006). It may also refer to way of thinking about or understanding of someone or something. In this study, teachers' perceptions of mixed and gender streamed classes referred to their understanding and interpretation of such classes especially pertaining to their mathematics learning benefits and shortcomings.

As ealier noted, teachers are very important elements of a school system. Teo (2008) posits that teachers are key agents of change in any school. Their support is very vital in the success of

school policies and initiatives. Kreiter and Kinicki (2007) have argued that in addition to teacher support, effective communication is also key in creating and maintaining an effective school policy. Therefore, it was important to establish mathematics teachers' perceptions of gender streamed classes within co-educational secondary schools. This is because their positive perceptions towards the policy will ultimately ensure its success.

There are very few studies which have been conducted to establish teachers' perceptions of teaching learners in mixed and single sex mathematics classes within co-educational secondary schools. However; there is a preponderance of studies which have been conducted on the effects of this policy on students' achievement in mathematics and sciences among other factors. Rennie and Parker (1997) conducted a study on students' and teachers' perceptions of single- sex and mixed-sex mathematics classes in Australia. The study was conducted following a recommendation that co-educational schools create single sex classes for males and females as a strategy for improving their performance in mathematics. The study found that, teachers perceived that single sex classes provided a more supportive environment for girls but rather a less supportive one for boys. It also found that teachers used different teaching strategies with the two kinds of classes. Finally, the study found that the single sex class environment afforded opportunities for teachers to mitigate apparent shortcomings that arose from boys' and girls' previous educational experience. This brought about improved students'attitudes and performance. From the study, it is clear that teachers'perceive that single sex classes provides an opportunity for them to adjust their teaching strategies and address some of the unique gender related challenges in the teaching of mathematics.

Willis, Kilpatrick and Hutton (2006) interviewed teachers in single sex settings in co-educational schools found that girls became more assertive within the second year of implementation of the policy as demonstrated by their willingness to try new activities. Teachers reported that the single gender classes gave them an opportunity to identify and adjust their teaching styles to suit the different learning styles of boys and girls. The teachers also observed that both boys' and girls 'behavior were generally better at school both inside and outside the classroom. From the findings of this study it is clear that teachers' perceptions of gender streamed classes in co-educational schools is positive.They perceive single sex classes in co-educational schools as

avenues upon which they could tailor instruction in ways that will overcome inter-gender difficulties.

Younger and Warrington (2002) carried out another study on Single Sex teaching in a co-educational comprehensive school in England: An Evaluation based upon Students Performance and classroom Interactions. The researchers interviewed teachers and students of one co-educational school where single sex teaching had been the practice from the time the school was started. The findings of the study indicated that both male and female students benefited from having their own learning space. The teachers indicated that they explicitly adjusted their teaching styles when teaching boys' or girls' classes. The study's findings further indicated that girls consistently achieved better results than boys in most subjects and that the improvement levels of both girls and boys were similar and significantly higher than the national average.This study's findings may imply that single sex teaching has the potential of raising students' achievement levels especially for girls provided that different teaching approaches are planned and implemented for males and females.

Studies conducted to determine the effect of this policy on factors related to students reveal conflicting results. Booth and Nolen (2012) conducted a study using a sample of English fifteen year old students from co-educational and single sex schools to examine the role of nurture in explaining why women may shy away from competition. They found that girls in single sex schools are significantly more likely to be competitive. The behavior of boys and girls attending single sex and co-educational schools was also compared. The researchers found that girls attending single sex schools behave more competitively than their counterparts in co-educational schools. For boys they found that neither attendance in single sex nor co-educational school influences whether they choose to compete. This finding suggests that class type has no effect on the competitive nature of boys while girls become competitive in single sex classes.

Eisenkopf, Hessami, Fischbacher and Ursprung (2012) analysed the impact of female only mathematics classes on mathematical achievement of girs. The researchers randomly assigned girls into single sex and co-educational classes in a swiss secondary school. Their finding indicated that girls' performance in mathematics improved in single sex classes and that this improvement was greater when taught by a male teacher. This could be an indication that apart from the single sex setting, girls' also thrive if taught the subject by male teachers.

However, a report published by the American Association of University Women in 1998 contrasts the findings by Younger and Warrington (2002) and Rennie and Parker (1997). The report noted that though girls' achievement improved in single sex schools the same did not happen for girls in single sex classes within co-educational schools. It further noted that in single sex classes for boys, the teachers often failed to notice their reading and writing problems, handled inappropriately their emotional and social needs and tended to interpret their behavior as discipline problems.The report concluded that teachers generally failed to adjust `their teaching methods to take into account boys' unique learning styles.

Studies conducted on the effect of creation of single sex classes within co-educational schools reveal a lot of inconsistencies pertaining to the benefits and shortcomings of such classes especially regarding mathematics teaching and learning. Sadker and Sadker (1995) conducted a three year study where trained observers visited more than 100 classrooms in Connecticut, Maryland, Masachusets, Virginia and the District of Columbia. The findings of the study indicated that teachers indeed handled boys and girls in class differently. Teachers were found to value boys' comments more than girls' comments, responded to girls with a simple nod or okey but praising, correcting, helping and criticizing the boys. In addition, the teachers encouraged boys to solve problems on their own while helping girls who were stuck on problems. It is important to note that these teacher behaviours toward boys encourage them to perservere, be patient and not to give up easily. Mondoh (2002) argued that learners who possess such attributes are likely to be good mathematics students. Therefore, this could imply that the teachers could be responsible for cultivating good attributes in boys for mathematics learning while not doing the same for girls.

2.7 Theoretical Framework

The study was guided by two theories. These are the sex role and the school and neighborhood resources theories. The sex role socialization theory was developed by Thorne (1993). Thorne hypothesizes that girls and boys interact separately from each other at school in same sex groups. This kind of interaction can be traced to the early childhood socialization of children at home by parents. Mondoh (2002) argued that parents treat their children differently. For instance, boys are bought toys which are more spatial and scientific than those bought for girls. In addition, girls are expected to assist their mothers in the house rather than assisting the fathers in activities that

are related to specific aspects of mathematics such as measurement, shape, calculation as opposed to washing and cooking. This encourages boys to be more independent which is important in problem solving while girls end up becoming passive. Leach and Davies (1990) have criticized this theory by arguing that it simplifies the socialization process as happening to individuals who are passive and does not recognize that these individuals are unique and are capable of being actively involved in their socialization process.

Ashenden, Connel, Dowsett and Kessler, (1985) have contended that gender is a socially complicated structure which involves the interaction of many social agents such as the family, state and education. Schools socialize their learners in ways that conform to societal expectations. This assertion is supported by Eshiwani (1983) who argues that this scenario was more pronounced in mixed schools than in single sex schools. In mixed schools, there exists polarization of students' performance and subject preference along gender-role lines which conform to societal expectations. According to Baker and Jones (1993), this is indicated by the different courses that boys and girls learn differences in teacher treatment and classroom organization. Such biases are responsible for gender differences in mathematics performance.

Alexander, Ehtwisle and Oslon (1994) developed the school and neighborhoods resources theory. This theory particularly attempts to explain the gender disparities in mathematics performance. The proponents of this theory attribute the disparities to the resources available within the school and its neighborhoods. Alexander et, al (1994) argue that both boys and girls are treated differently while playing. Boys are given a lot of freedom while girls are restricted both at home and school. These gendered play activities could be responsible for boys' greater numerical and spatial ability (Bing, 1963). This could also explain their better cognitive growth in mathematics.

The two theories discussed above have singled out the school as an institution that socializes males and females differently according to societal expectations. These differences in socialization have resulted in gender differences in opinions of males' and females' mathematical abilities and career aspirations. In addition, the different opportunities that they are exposed to at school shape students' experiences and later performance at school.

2.8 Conceptual Framework

The conceptual framework presented in Figure 2 shows the relationship among the variables of the study. The diagram particularly shows how the independent and intervening variables of the study interacted to affect the dependent variables.

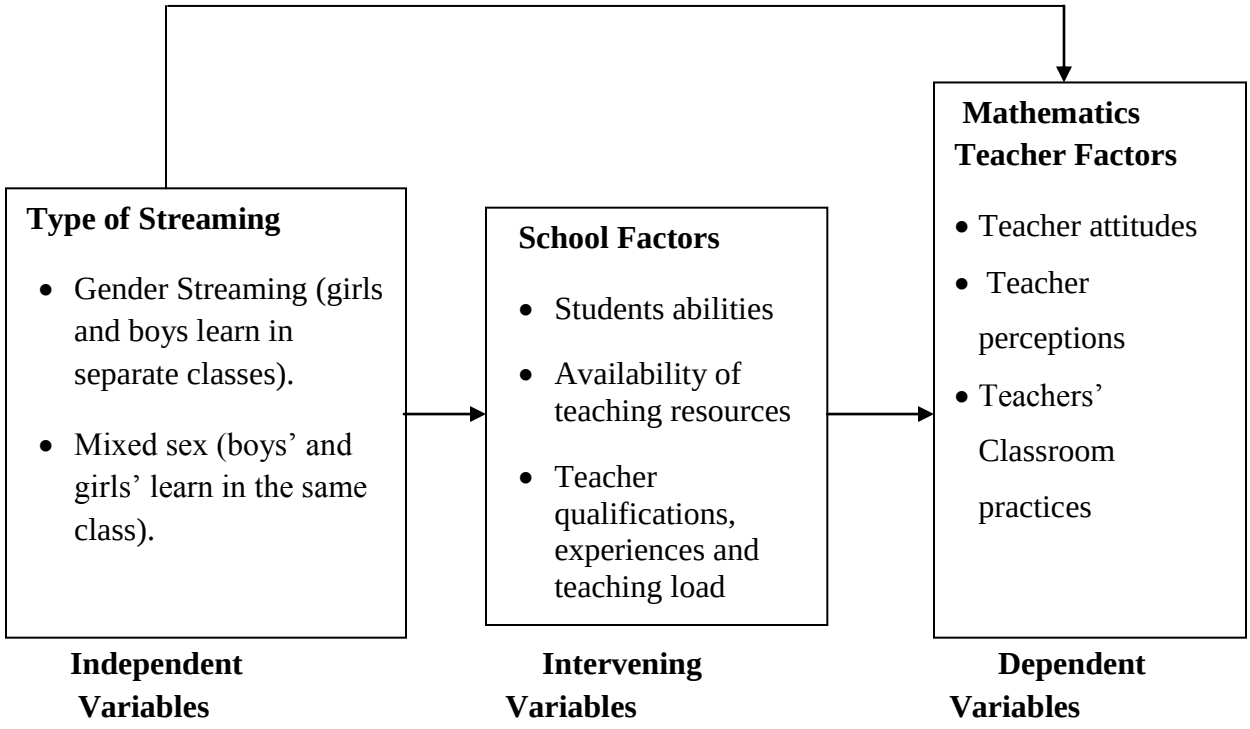


Figure 2 *A conceptual framework showing the relationship among the variables of the study*

Figure 2 shows that the type of streaming (gender streamed or mixed sex) adopted by a co-educational school influences the teachers'attitudes towards it, perceptions of the streaming and classroom practices in gender streamed and mixed sex classes. It shows that the gender composition (girls'only, boys'only and mixed sex) of the mathematics classroom can influence teachers' perceptions of the class, attitudes towards the class, and the classroom practices adopted by the teachers. Teachers who possess positive attitudes towards school policies and perceive them as beneficial are likely to be committed to the same, hence ensuring the success of the policies. Apart from the type of streaming, there are some school factors which are likely to influence teachers' attitudes, their perceptions and classroom practices. These include; students'

abilities, availability of teaching resources, teacher qualifications, experiences and teaching load. A teacher teaching learners of high academic levels is likely to use fewer resources and possess positive attitudes and perceptions of his/her class than the one teaching low achievers. The teacher with abundant resources, highly qualified and experienced with a lower teaching load may not strain to prepare and teach his/her mathematics class. Therefore, he/she will have positive attitudes towards the class, in addition to adopting classroom practices that are in line with the cognitive styles of learners. Consequently, students taught by such teachers are likely to achieve better mathematics scores in KCSE examinations.

The study minimized the intervening variables by studying public co-educational secondary schools which had similar characteristics. The schools were those that had submitted candidates for KCSE examinations at least once and had a minimum of two streams per class so that creation of single sex or mixed sex classes was a matter of choice. County and sub-county categories of schools were chosen. Public secondary schools are similar in that their tuition materials and teachers' salaries are provided by the government. Further, each of the two categories admits students of similar academic abilities based on their performance at KCPE examinations. Mathematics teachers chosen were those that had taught continuously for a minimum of four years. They were considered highly qualified and experienced. The influence of gender streamed classes on mathematics teachers' can be used to evaluate the policy for the purposes of improving students' performance and enhancing classroom teaching practices.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the description and justification of research methodology that was employed in the study. It specifically describes the research design, location of the study population, sampling procedures and sample size, instrumentation, data collection and data analysis procedures.

3.2 Research Design

The study employed an *ex-post facto* research involving causal-comparative research design. According to Cohen, Manion and Morrison (2011) the design is used when the type of the study cannot allow the investigator to manipulate the independent variable in order to observe its effects on the dependent variables. The independent variable already exists; hence the investigator sets out to discover possible effects of a phenomenon by comparing the subjects in which the variable is present with similar subjects who do not possess the variable. The design was appropriate for the current study since the independent variable (gender streamed mathematics classes) is a phenomenon that was already in existence in some co-educational secondary schools. The researcher compared gender streamed classes (boys' and girls' only) with mixed sex classes in public co-educational secondary schools on the dependent variables which were; mathematics teachers' attitudes, perceptions and classroom practices.

3.3 Location of the Study

The study was carried out in Nakuru, Kericho, Baringo and Uasin Gishu counties of Kenya. The counties were purposively selected since they have the sub-county and county categories of co-educational secondary schools with reasonable number which have either mixed or gender streamed (boys' and girls' only) classes hence it was possible to access the respondents. In addition these types of secondary schools' mathematics performance were poor as indicated by the KCSE candidates' performance reports.

3.4 Population of the Study

The target population comprised of mathematics teachers and their form four students drawn from all sub-county and county co-educational secondary schools in Nakuru, Kericho, Baringo and Uasin Gishu counties of Kenya. These co-educational schools were categorized into two. These were those that had gender streamed (boys' and girls' only) classes and those that had mixed sex classes.

3.5 Sampling Procedures and Sample Size

The sample was selected using purposive, stratified, proportionate and simple random sampling techniques. Purposive sampling technique was used to select Nakuru, Kericho, Baringo and Uasin Gishu counties of Kenya. The counties had the two types and categories of co-educational secondary schools that were studied. The two types were those with mixed sex and those with gender streamed (boys' and girls' only) classes, while the two categories were the county and sub-county public co-educational secondary schools.

Gall, Gall and Borg (2007) recommend that for a causal comparative study, there should be at least 15 participants in each subgroup to be compared. However to take care of situations where some data may be lost or insufficient, 20 schools were selected in each school type and category. This gave a total of 80 schools. From each type of mathematics class namely mixed and gender streamed (boys' and girls' only) in each school the researcher randomly selected two mathematics teachers based on gender stratification where possible. This provided a total of 240 mathematics teachers. Table 2 shows how the schools' and mathematics teachers' sample size was arrived at.

Table 2

Schools' and Mathematics Teachers' Sample Size

	School Type			
	Mixed sex classes		**Gender streamed (boys' and girls' only) classes**	
School Category	**No of Schools**	**No of teachers**	**No of Schools**	**No of teachers i.e 2 from each class type (boys and girl'only classes)**
Sub-County	20	2 x 20 = 40	20	4 x 20 = 80
County	20	2 x 20 = 40	20	4 x 20 = 80
Total	40	80	40	160

From Table 2, 80 teachers were selected from co-educational schools with mixed sex classes while 160 teachers were selected from co-educational schools with gender streamed (boys' and girls' only) classes.This gave a total of 240 (80 plus 160) mathematics teachers.

Stratified sampling technique was employed to select the co-educational secondary schools. Schools were stratified based on school category (either county or sub-county) and school type (those with gender streamed classes or those with mixed sex classes). To select the schools, the researcher obtained a list of sub-county and county public secondary schools together with the mobile telephone numbers of the schools' principals from the County Directors of Education of the selected counties. The researcher then contacted each of the principals to obtain information on the type of streaming in their schools. A list of all the schools based on the streaming (those with gender streamed or mixed sex classes) and school category (county or sub-county) was then generated from each county. Proportionate sampling technique was then used to select 20

schools from each school category and type in each of the counties.Once the required number of schools from each county had been determined, simple random sampling was used to select the participating schools. After selecting schools, stratified random sampling based on gender where possible was also used to select the mathematics teachers that participated in the study.

In addition, one form four stream for each class type was randomly selected from each co-educational school out of which 10% of the students were selected to participate in the study. Once the required number of students was obtained from the class, stratified random sampling based on gender where possible was used to select the students that participated in the study. However, some questionnaires were found to be incomplete while some teachers did not submit some. Therefore' the actual number of questionnaires collected from the teachers and students was 203 and 516 respectively.

3.6 Instrumentation

Data was collected using a Mathematics Teachers Questionnaire (MTQ) and a Mathematics Students Questionnaire (MSQ).

3.6.1 Mathematics Teachers' Questionnaire (MTQ)

To construct the questionnaire the researcher adopted items from the following sources and modified them to suit the study; items on attitude were adopted from Hiken (1982) while those on classroom practices and mathematics teachers' perceptions were obtained from review of literature. The mathematics teachers' questionnaire solicited information on the following;

a) Teachers background information in terms of age, sex, teaching load, qualifications, teaching experience and type of mathematics class taught by the teacher.
b) Teachers' perceptions of gender streamed and mixed sex mathematics classes.
c) Teachers' attitudes towards gender streamed and mixed sex mathematics classes.
d) Teachers' Classroom practices during teaching.

Items in the MTQ were likert type with a scale of 1 to 5 for the attitudes and perception items and 0 to 4 for the items on classroom practices. A score of 5 indicated that the teacher strongly agreed with the statement while a score of 1 indicated that the teacher strongly disagreed with the

statement in the case of attitude and perception items. For the classroom practices items, a score of 4 indicated that the practice was always used in almost all mathematics lessons while a score of 0 indicated that the practice was never used in mathematics lessons.

3.6.2 Mathematics Students' Questionnaire (MSQ)

The Mathematics Students' Questionnaire was developed to solicit information from students on the classroom practices by their teachers during mathematics lessons. The frequency of occurrence of each practice was captured in a five point likert scale ranging from never, rarely, sometimes, often and always. A score of 4 indicated that the practice always occurred during mathematics lessons while a score of 0 indicated that the practice never occurred in the lessons.

3.6.3 Validity of Research Instruments

Validity refers to the ability of a research instrument to generate data that the researcher intended it to generate (Gall et al, 2007; Kasomo, 2006). There are different types of validity, but the current study was limited to content – related validity. Kasomo (2006) defines content – related validity as the extent to which the contents of a research instrument measures what it is supposed to measure. Content- related validity is determined by use of expert judgment in a particular study area (Gall et al, 2007; Kasomo, 2006). To determine content validity, the researcher sought the help of five experts in mathematics education and curriculum and instruction. Their recommendations were used to improve the questionnaires before piloting and actual collection of data. Once the research instruments had been validated, they were pilot tested in one co-educational secondary school and 30 teachers in Njoro Sub-county within Nakuru County. The school and teachers did not take part in the study.

3.6.4 Reliability of Research Instruments

Reliability refers to the degree of consistency of a research instrument (Kasomo, 2006). To determine the reliability of the questionnaires, cronbach's coefficient alpha formula was used. Reliability coefficients of 0.87 for teacher questionnaire and 0.82 for students questionnaire were obtained.These were considered appropriate as they were within the threshold of 0.7 and above that is required in social science research. Cronbach's coefficient alpha was suitable for the study

since items in the questionnaires were likert type meaning that several answers can be obtained from each item, each of which was given a different weight (Gall et al, 2007).

3.7 Data Collection Procedures

Before embarking on data collection, the researcher sought for a research permit from the National Council of Science and Technology (NCST) in the Ministry of Higher Education Science and Technology (MoHEST). The researcher then visited the County Directors of Education (CDES) and Sub-county Education officers of the counties and sub-counties respectively to notify them of the intention to collect data.

The Principals of the sampled schools were formally contacted, study purpose explained to them and their cooperation sought. Dates, venues and time were fixed when the research was to be carried out. During the day of actual collection of data, the researcher explained to the respondents the modalities of filling the questionnaires and gave them ample time to fill. The questionnaires were collected immediately after filling in to ensure higher returns but in some schools the teachers requested more time to fill them and were collected later.

3.8 Data Analysis

The questionnaires contained likert type items. The responses on each item were coded in order to obtain the magnitude of what was measured. Coded data was then analyzed using the statistical package for social sciences (SPSS). Quantitative methods of data analysis were used in which descriptive which included means, standard deviation and percentages and inferential which included ANOVA were applied. The statistical significant level for inferential statistics was at coefficient alpha (α) equal to 0.05 levels.

Table 3

Summary of Data Analysis

Hypotheses		Independent variable	Dependent variable	Statistical techniques used
Ho1:	There is no statistically significant difference in mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.	Gender streamed (girls' and boys' only) classes and mixed sex	Mathematics teachers attitudes	Mean SD F-test (ANOVA) with Post Hoc analysis Percentages
Ho2:	There is no statistically significant difference in mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.	Gender streamed (girls' and boys' only) classes and mixed sex	Mathematics teachers attitudes	Mean SD F-test (ANOVA) with Post Hoc analysis Percentages
Ho3:	There is no statistically significant difference in mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.	Gender streamed (girls' and boys' only) classes and mixed sex	Mathematics teachers' perceptions	Mean SD F-test (ANOVA) with Post Hoc analysis Percentages

(Table continues)

Ho4:	There is no statistically significant difference in mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.	Gender streamed (girls' and boys' only) and mixed sex classes	Mathematics teachers' perceptions	Mean SD F-test (ANOVA) with Post Hoc analysis Percentages
Ho5:	There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.	Gender streamed (girls' and boys' only) and mixed sex classes	Mathematics teachers' classroom practices	Mean SD F-test (ANOVA) with Post Hoc analysis Percentages
Ho6:	There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.	Gender streamed (girls' and boys' only) and mixed sex classes	Mathematics teachers' classroom practices	Mean SD F-test (ANOVA) with Post Hoc analysis Percentages

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the findings of the study. The findings were described using both descriptive and inferential statistics. The hypotheses addressed differences in teachers' attitudes, perceptions and classroom practices in gender streamed (boys' and girls' only) and in mixed sex classes in public co-educational secondary schools by school category (county and sub-county). Inferential statistic (ANOVA) was used to show differences in these teacher attitudes perceptions and classroom practices between gender streamed classes (boys' and girls' only classes) and mixed sex classes respectively. To determine which pairs of groups had significant differences, post hoc analysis using Scheffe test was used since the number of mathematics teachers in the subgroups were not the same.

The data were analyzed and discussed under the following research objectives;

a) To compare mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within sub-county co-educational secondary schools.
b) To compare mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls'only) and in mixed sex mathematics classes within county co-educational secondary schools.
c) To compare mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within sub-county co-educational secondary schools.
d) To compare mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within county co-educational secondary schools.
e) To compare mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within sub-county co-educational secondary schools.

f) To compare mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex mathematics classes within county co-educational secondary schools.

From the objectives the following hypotheses were generated and tested statistically:

Ho1: There is no statistically significant difference in mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.

Ho2: There is no statistically significant difference in mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.

Ho3: There is no statistically significant difference in mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.

Ho4: There is no statistically significant difference in mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.

Ho5: There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within sub-county co-educational secondary schools.

Ho6: There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and in mixed sex classes within county co-educational secondary schools.

4.2 Characteristics of the Respondents

This section describes the general characteristics of the respondents involved in the study. The described characteristics include teachers' gender, teaching experience and qualification, type of school category, total number of mathematics lessons and total number of lessons taught by the teacher.

4.2.1 Distribution of the Respondents by Gender

The following is the distribution by gender of the mathematics teachers' that were involved in the study.There were 203 teachers out of which 136 (67%) were male while 67(33%) were female.

The distribution can be illustrated in a pie chart as follows.

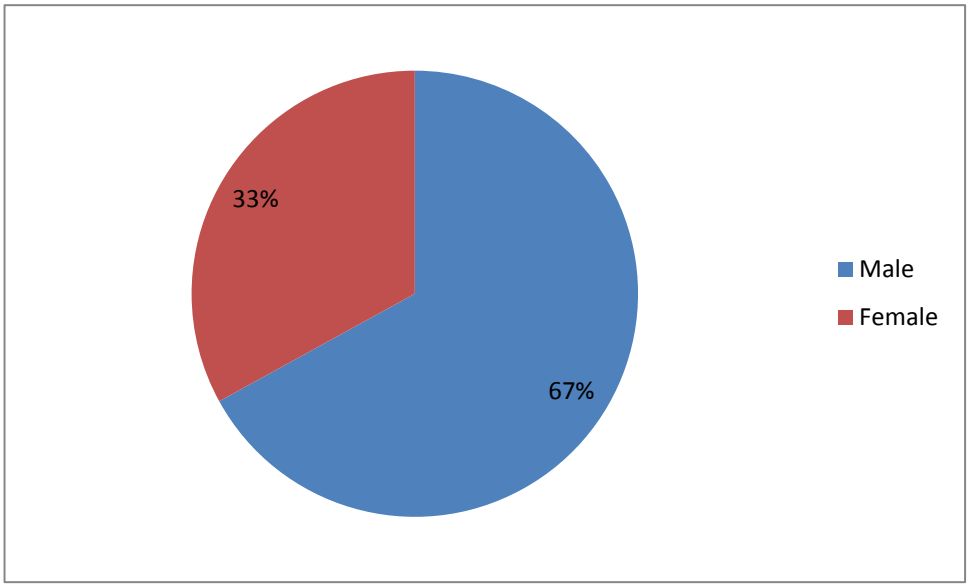


*Figure 3.*Pie chart illustrating respondents' distribution by gender.

Figure 3 shows that the teachers' sample comprised of 67% males while 33% were females. This indicates that there are more male mathematics teachers compared to females.

4.2.2 Distribution of Mathematics Teachers by Teaching Experience

Table 4 shows the mathematics teachers distribution by teaching experience.

Table 4

Distribution of Mathematics Teachers by Teaching Experience

Teaching Experience	N	Percentage (%)
Below 5 years	47	23.2
6 - 10 years	42	20.7
11 - 15 years	46	22.7
16 - 20 years	20	9.9
21 - 25 years	23	11.3
Above 26 years	25	12.3
Total	203	100

The study data indicates that there were more mathematics teachers (67%) who had a teaching experience of 15 years and below, while there were fewer mathematics teachers (33%) with a teaching experience of above 15 years.

4.2.3 Distribution of Mathematics Teachers by Qualification

The mathematics teachers' distribution by qualification is illustrated in Table 5.

Table 5

Distribution of Mathematics Teachers by Qualification

Qualifications	N	Percentage (%)
Diploma	27	13.3
Degree B.Ed	127	62.6
B.A or B.Sc PGDE	33	16.3
M.Ed	8	3.9
Any other Masters	7	3.4
PhD	1	0.5
Total	203	100

The study data in Table 5 indicate that there were more mathematics teachers (62.6 %) with a Bachelor of Education degree compared to the others.This is an indication that a majority of the teachers are highly qualified to teach the subject in secondary schools.

4.2.4 Distribution of Mathematics Teachers by School Category

The mathematics teachers' distribution by school category is illustrated in Figure 4.

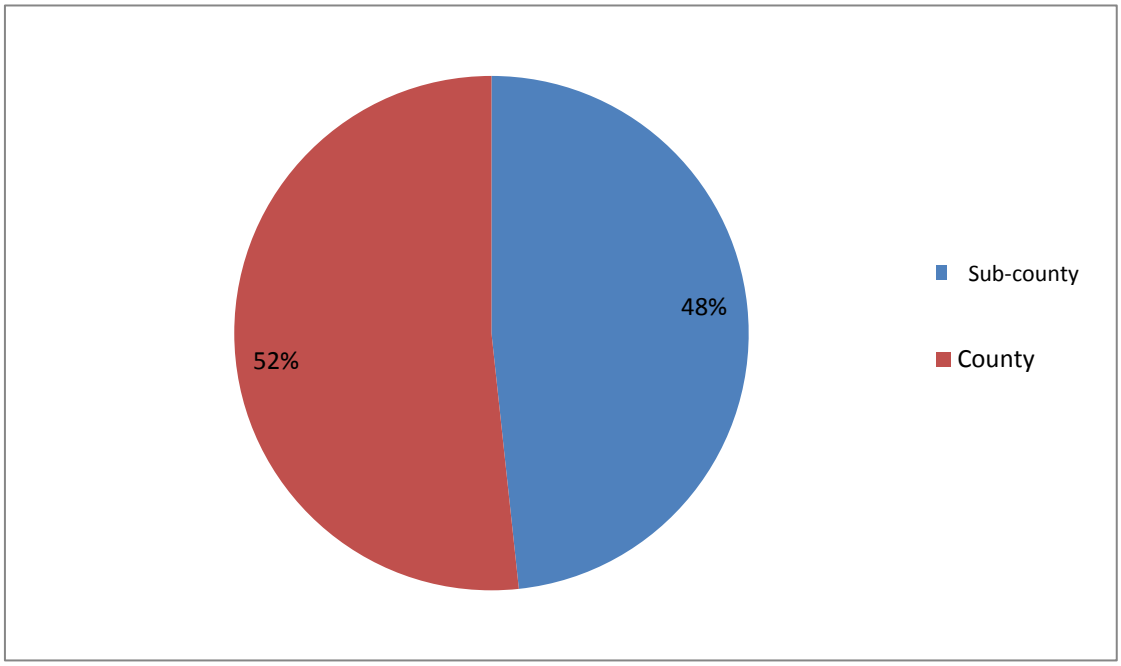


Figure 4. Pie chart showing mathematics teachers' distribution by school category.

From figure 4, it is clear that 48 % of the mathematics teachers were from the sub-county category of Public Co-educational Secondary Schools while 52% were from the county category.This indicates that the mathematics teachers' representation from the two categories in the sample were similar.

4.2.5 Distribution of Mathematics Teachers by Range of Number of Mathematics Lessons per Week

The data on distribution of mathematics teachers' by range of number of mathematics lessons per week is illustrated in Table 6.

Table 6

Distribution of Mathematics Teachers by Range of Number of Mathematics Lessons per Week

Range of mathematics lessons	N	Percentage (%)
Below 10	60	29.6
11 – 16	60	29.6
17 – 22	53	26.1
23 – 28	28	13.1
Missing system	2	-
Total	203	100%)

From Table 6, most of the mathematics teachers (59.2 %) were teaching not more than 16 mathematics lessons which represent utmost 2 mathematics classes. This could indicate that a good number of them teach other subjects besides mathematics.

4.2.6 Distribution of Mathematics Teachers by Range of Total Number of Lessons Taught Per Week

Table 7 shows the mathematics teachers'distribution by range of total number of lessons taught per week.

Table 7

Distribution of Mathematics Teachers by Range of Total Number of Lessons Taught Per Week

Range of total number of lessons taught per week	N	Percentage (%)
Below 10	5	2.5
11 – 16	9	4.4
17 – 22	65	32.0
23 – 28	115	56.7
29 and above	7	3.4
Total	201	100

The data in Table 7 indicate that a majority of mathematics teachers (56.7%) teach between 23 and 28 lessons per week of both mathematics and non mathematics subjects.This implies that

these teachers teach an average of 5 to 6 lessons out of a maximum of 9 lessons per day.Such mathematics teachers are left with limited time for lesson planning and marking of students work.

4.3 A Comparison of Mathematics Teachers Attitudes towards Their Classes between Those who Teach in Gender Streamed (Boys'and Girls' only) and in Mixed Sex Classes within Sub-County Co-educational Secondary Schools.

Hypothesis one of the study sought to compare mathematics teachers' attitudes towards their classes between those who teach gender streamed (boys' and girls'only) and mixed sex classes within sub-county co-educational secondary schools. The mean scores of teachers' attitudes are presented in Table 8.

Table 8

Mean Scores and SD of Sub-County Schools' Mathematics Teachers' Attitudes towards Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

	Statement	Class gender	N	Mean	SD
1	I am always under the terrible strain while teaching mathematics in this class	Boys	30	3.90	1.06
		Girls	28	3.75	1.00
		Mixed	40	3.95	1.04
		Total	98	3.88	1.03
2	Teaching mathematics in my class is very interesting and I enjoy it.	Boys	30	4.10	0.84
		Girls	28	3.71	0.98
		Mixed	40	4.03	0.73
		Total	98	3.96	0.85
3	I do not always like teaching mathematics in this class and it scares me to have to teach it.	Boys	30	4.53	0.68
		Girls	28	4.29	0.90
		Mixed	40	4.43	0.81
		Total	98	4.42	0.80

(Table continues)

	Statement	Class gender	N	Mean	SD
4	Teaching mathematics in this class is fascinating and fun.	Boys	30	3.80	0.71
		Girls	28	3.46	1.07
		Mixed	39	3.49	0.88
		Total	97	3.58	0.90
5	My mind goes blank and I am unable to think clearly when teaching in this class	Boys	30	4.83	0.38
		Girls	28	4.68	0.55
		Mixed	40	4.58	1.01
		Total	98	4.68	0.77
6	Teaching this class mathematics makes me feel secure and stimulated	Boys	30	3.70	0.88
		Girls	28	3.46	1.10
		Mixed	40	3.73	0.91
		Total	98	3.64	0.96
7	I feel a sense of insecurity when teaching mathematics in this class	Boys	30	4.27	1.14
		Girls	28	4.64	0.62
		Mixed	40	4.53	0.60
		Total	98	4.48	0.82
8	I feel good when teaching mathematics in this class	Boys	30	4.13	0.97
		Girls	28	3.86	1.01
		Mixed	40	4.25	0.54
		Total	98	4.10	0.84
9	Teaching mathematics in my class makes me feel uncomfortable	Boys	30	4.67	0.66
		Girls	28	4.54	0.88
		Mixed	40	4.55	0.75
		Total	98	4.58	0.76
10	I really like the gender composition of my maths class	Boys	29	3.90	0.90
		Girls	28	3.36	1.22
		Mixed	40	4.08	0.73
		Total	97	3.81	0.98

(Table continues)

	Statement	Class gender	N	Mean	SD
11	I dislike teaching mathematics in this class	Boys	29	4.66	0.48
		Girls	28	4.25	1.11
		Mixed	39	4.38	0.88
		Total	96	4.43	0.87
12	Teaching maths in this class is something which I enjoy a great deal	Boys	30	4.10	0.71
		Girls	28	3.68	1.09
		Mixed	40	3.88	0.91
		Total	98	3.89	0.92
13	It makes me nervous to even think about having to teach this class mathematics	Boys	30	3.77	0.50
		Girls	28	4.36	0.91
		Mixed	40	4.43	0.87
		Total	98	4.51	0.80
14	I am happier in my maths class than any other class	Boys	30	3.90	1.09
		Girls	28	3.54	1.17
		Mixed	40	3.75	1.13
		Total	98	3.73	1.13
15	I have never liked this maths class and it is my most dreaded class	Boys	30	4.53	1.04
		Girls	28	4.14	1.04
		Mixed	40	4.55	0.68
		Total	98		
16	I am able to teach my class maths without too much difficulty	Boys	30	4.23	0.77
		Girls	28	3.86	1.11
		Mixed	40	3.98	1.23
		Total	98	4.02	1.07
17	Students in my class are dull and boring	Boys	30	4.23	0.97
		Girls	28	3.50	1.20
		Mixed	40	3.80	0.94
		Total	98	3.85	1.06
	Overall	Boys	30	4.23	0.41
		Girls	28	3.95	0.68
		Mixed	40	4.13	0.40

The results in Table 8 indicate that the mean scores of teachers' attitude were higher in boys' only classes followed by mixed sex classes and lastly girls' only classes except in two items. The items were 'I feel a sense of insecurity when teaching mathematics in this class,' and 'I really like the gender composition of my mathematics class,' respectively. In the first item the mean score for teachers' attitude is higher in girls' only class followed by the mixed sex and finally the boys' only class. This could be an indication that the teachers were most secure in girls' only classes and were least secure in boys' only classes. In the second item, the mean score of teachers' attitude is higher in the mixed sex class followed by boys' only and finally girls' only class. This finding implies that the mixed sex class was liked most by teachers in mathematics while the girls only' was the least liked. Hence there is need to determine the reason for this with a view to improve teachers'ttitudes towards girls only mathematics classes.

4.3.1 Differences in Sub-County Schools' Mathematics Teachers' Attitudes towards Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

In order to determine whether there were statistically significant differences in each of the Sub-County schools' mathematics teachers' attitude items, an ANOVA was computed and the results summarized in Table 9**.**

Table 9

ANOVA Results showing the Differences in Sub-Couty Schools' Mathematics Teachers' Attitudes towards Mixed and Gender Streamed (Girls' and Boys' Only) Classes

		Sum of squares	df	Mean square	F	P-value
1	Between groups	0.681	2	0.340	0.317	0.729
	Within groups	101.850	95	10.72		
	Total	102.531	97			
2	Between groups	2.447	2	1.224	1.725	0.184
	Within groups	67.389	95	0.709		
	Total	69.837	97			

(Table continues)

		Sum of	df	Mean	F	P-value

		squares		square		
3	Between groups	0.891	2	0.445	0.694	0.502
	Within groups	60.956	95	0.642		
	Total	61.847	97			
4	Between groups	2.162	2	1.081	1.346	0.265
	Within groups	75.508	94	0.803		
	Total	77.607	96			
5	Between groups	1.145	2	0.573	1.045	0.356
	Within groups	52.049	95	0.548		
	Total	53.194	97			
6	Between groups	1.261	2	0.630	0.686	0.506
	Within groups	87.239	95	0.918		
	Total	88.500	97			
7	Between groups	2.189	2	1.094	1.670	0.194
	Within groups	62.270	95	0.655		
	Total	64.459	97			
8	Between groups	2.584	2	1.292	1.849	0.163
	Within groups	66.395	95	0.699		
	Total	68.980	97			
9	Between groups	0.316	2	0.158	0.270	0.764
	Within groups	55.531	95	0.585		
	Total	55.847	95			
10	Between groups	8.767	2	4.383	4.911*	0.009
	Within groups	83.893	94	0.892		
	Total	92.660	96			
11	Between groups	2.457	2	1.229	1.655	0.197
	Within groups	69.032	93	0.742		
	Total	71.490	95			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
12	Between groups	2.583	2	1.292	1.550	0.218
	Within groups	79.182	95	0.833		
	Total	81.765	97			
13	Between groups	2.920	2	1.460	2.328	0.103
	Within groups	59.570	95	0.627		
	Total	62.490	97			
14	Between groups	1.938	2	0.969	0.760	0.471
	Within groups	121.164	95	1.275		
	Total	123.102	97			
15	Between groups	3.205	2	1.602	1.932	0.151
	Within groups	78.795	95	0.829		
	Total	82.000	97			
16	Between groups	2.189	2	1.094	0.947	0.391
	Within groups	109.770	95	1.155		
	Total	111.959	97			
17	Between groups	7.937	2	3.969	3.742*	0.027
	Within groups	100.767	95	1.061		
	Total	108.704	97			

Critical values F (df= 2, 100, alpha=0.05) = 3.09

The findings in Table 9 show that there are no statistically significant differences in mathematics teachers' attitude in all the items except in 2 items since the calculated F values were higher than the critical value. These two were 'I really like the gender composition of my mathematics class' (F=4.911) and 'Students in my class are dull and boring. ' (F= 3.742). This represents 12% of the total attitude items. Further analysis were done to establish the mathematics classes that differed significantly in the above two items. Table 10 shows the post hoc results with Scheffe.

Table 10

Post Hoc Results showing the Pairs of Mathematics Classes that Differed Significantly in Teachers' Attitudes

Item	I Gender Class	J Class Gender	Mean differences (I-J)	P Value
I really like the gender composition of my maths class	Boys	Girls	0.5394	0.104
		Mixed	-0.1784	0.742
	Girls	Boys	-0.5394	0.104
		Mixed	-0.7179*	0.011
	Mixed	Boys	0.1784	0.742
		Girls	0.7179*	0.011
Students in my class are dull and boring	Boys	Girls	0.7333*	0.029
		Mixed	0.4333	0.225
	Girls	Boys	-0.7333*	0.029
		Mixed	-0.3000	0.5
	Mixed	Boys	-0.4333	0.225
		Girls	0.3000	0.500

*Means significant at $p<0.05$ level

The results show that for item 1 there are only two groups which significantly differed from each other. These were the teachers who teach girls' only and mixed sex classes in favour of the mixed sex class. For item 2, there were only two groups that differed significantly from each other. These were the teachers who teach boys' only classes and those who teach girls' only classes in favour of the boys. This is an indication that mathematics teachers liked teaching mixed sex classes more than girls' only mathematics classes. In addition mathematics teachers felt that girls only' classes were dull and boring as compared to boys' only classes. The overall mean scores of teacher attitudes were also compared and the results presented in Table 11.

Table 11

ANOVA Results showing the Differences in Sub-County Schools' Mathematics Teachers' Attitudes towards Mixed and Gender Streamed Classes (Girls' and Boys' only)

	Sum of squares	df	Mean square	F	P-value
Between groups	1.225	2	0.613	2.47	0.090
Within groups	23.564	95	0.248		
Total	24.789	97			

Critical values F (df = 2, 100, $\alpha = 0.05$) = 3.09; Calculated F = 2.47

The ANOVA results indicate that the calculated F=2.470 is lower than the critical value of F =3.09 at p-value = 0.090 $\geq$ 0.05, level of significance, which indicate that there are no statistically significant differences in mathematics teachers attitudes towards mixed and gender streamed classes within the sub-county co-educational secondary schools. Based on these findings, the null hypothesis that states that there is no statistically significant difference in mathematics teachers' attitudes towards gender streamed and mixed sex classes within sub-county co-educational secondary schools is therefore accepted.

Rennie and Parker (1997) found that the single sex classroom learning environments resulted in improved teachers' attitudes towards boys and girls as learners of mathematics.However they were not statistically different. The study's findings agree with Rennie and Parker. The findings indicate that there were no differences in mathematics teachers' attitudes towards gender streamed (girls and boys' only classes) and mixed sex mathematics classes. Further from the mean scores obtained in teacher attitudes, those from boys'only class were higher followed by mixed sex and finally girls' only class. These findings agree with those of Mukwaa and Too (2005) who found that teachers have more positive attitudes towards boys than girls as mathematics learners. According to the scholars, these attitudes conform to societal stereotypes which allude that boys should be superior in mathematics. The findings also agree with those of Gina and Moshe (2001) who found that teachers view boys to be better mathematics learners than girls.

4.4 A Comparison of Mathematics Teachers Attitudes towards Their Classes between Those who Teach in Gender Streamed (Boys'and Girls' only) and in Mixed Sex Classes within County Co-educational Secondary Schools.

Hypothesis two of the study sought to compare mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls'only) and in mixed sex classes within County co-educational secondary schools. The mean scores of teachers' attitudes are presented in Table 12.

Table 12

Mean Scores and SD of County Schools' Mathematics Teachers' Attitudes towards Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes.

	Statement	Class gender	N	Mean	SD
1	I am always under the terrible strain while teaching mathematics in this class	Boys	40	4.48	0.51
		Girls	25	4.16	0.94
		Mixed	40	4.38	0.84
		Total	105	4.36	0.76
2	Teaching mathematics in my class is very interesting and I enjoy it.	Boys	40	4.43	0.55
		Girls	25	3.96	0.98
		Mixed	40	4.28	0.60
		Total	105	4.26	0.71
3	I do not always like teaching mathematics in this class and it scares me to have to teach it.	Boys	40	4.78	0.42
		Girls	25	4.28	0.79
		Mixed	40	4.75	0.44
		Total	105	4.65	0.57
4	Teaching mathematics in this class is fascinating and fun.	Boys	40	4.13	0.82
		Girls	25	3.56	1.04
		Mixed	40	4.13	0.72
		Total	105	3.99	0.87
5	My mind goes blank and I am unable to think clearly when teaching in this class	Boys	40	4.80	0.46
		Girls	25	4.52	0.59
		Mixed	40	4.69	0.52
		Total	105	4.69	0.52

(Table continues)

	Statement	Class gender	N	Mean	SD
6	Teaching this class mathematics makes me feel secure and stimulated	Boys	40	4.10	0.78
		Girls	25	3.52	1.12
		Mixed	40	4.28	0.55
		Total	105	4.03	0.85
7	I feel a sense of insecurity when teaching mathematics in this class	Boys	40	4.55	0.81
		Girls	25	4.24	0.83
		Mixed	40	4.48	0.82
		Total	105	4.45	0.82
8	I feel good when teaching mathematics in this class	Boys	40	4.45	0.55
		Girls	25	4.00	0.87
		Mixed	40	4.20	0.91
		Total	105	4.25	0.79
9	Teaching mathematics in my class makes me feel uncomfortable	Boys	40	4.68	0.47
		Girls	25	4.28	0.79
		Mixed	40	4.55	0.78
		Total	105	4.53	0.69
10	I really like the gender composition of my maths class	Boys	39	3.97	0.87
		Girls	25	3.80	1.29
		Mixed	40	3.78	1.00
		Total	104	3.86	1.03
11	I dislike teaching mathematics in this class	Boys	39	4.62	0.75
		Girls	25	4.32	0.75
		Mixed	39	4.54	0.85
		Total	103	4.51	0.79
12	Teaching maths in this class is something which I enjoy a great deal	Boys	40	4.40	0.63
		Girls	25	3.92	1.00
		Mixed	40	4.08	0.69
		Total	105	4.16	0.77
13	It makes me nervous to even think about having to teach this class mathematics	Boys	39	4.36	1.22
		Girls	25	4.24	0.93
		Mixed	40	4.48	0.85
		Total	104	4.38	1.02

(Table continues)

	Statement	Class gender	N	Mean	SD
14	I am happier in my maths class than any other class	Boys	40	3.93	1.02
		Girls	25	3.52	1.39
		Mixed	40	3.83	0.93
		Total	105	3.79	1.09
15	I have never liked this maths class and it is my most dreaded class	Boys	40	4.58	0.75
		Girls	25	4.48	0.71
		Mixed	40	4.68	0.53
		Total	105	4.59	0.66
16	I am able to teach my class maths without too much difficulty	Boys	40	4.33	0.73
		Girls	25	3.76	1.30
		Mixed	40	4.25	0.71
		Total	105	4.16	0.91
17	Students in my class are dull and boring	Boys	40	4.15	0.77
		Girls	25	4.08	1.04
		Mixed	40	3.98	0.97
		Total	105	4.07	0.91
	Overall	Boys	40	4.38	0.35
		Girls	25	4.04	0.68
		Mixed	40	4.30	0.06

The results in Table 12 show that the mean scores in teachers' attitudes were higher in boys' classes followed by mixed sex classes and finally girls' only classes in 10 out of 17 attitude items which represents 59% of the total attitude items. In five items (29%), the mean scores in teachers' attitude were higher in mixed sex classes followed by boys' only classes and finally girls' only classes. The mean scores were however higher and equal in mixed sex and boys' only classes followed by girls' only classes in one item (6%). For item 1 that is 'students in my class are dull and boring,' the mean score was higher in boys' only followed by girls' only and finally mixed sex classes.

From the overall mean scores, the results indicate that that the mean scores were higher for teachers teaching boys' only classes with a mean score of 4.38 followed by those teaching mixed

sex classes with a mean score of 4.30 and finally those teaching girls' only classes with a mean score of 4.04 out of a maximum of 5. These findings indicate that the teachers' attitudes towards girls' only mathematics classes were lower than the others. The results are similar to those found in sub-county schools.

4.4.1 Differences in County Schools' Mathematics Teachers' Attitudes towards Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

In order to determine whether there were statistically significant differences in each of the county schools' mathematics teachers' attitude items, an ANOVA was computed and the results summarized in Table 13**.**

Table 13

ANOVA Results showing the Differences in Mathematics Teachers Attitudes towards Mixed and Gender Streamed (Girls' and Boys' Only) Classes within the County Co-educational Secondary Schools

		Sum of squares	df	Mean square	F	P-value
1	Between groups	1.538	2	0.769	1.336	0.268
	Within groups	58.710	102	0.576		
	Total	60.248	104			
2	Between groups	3.347	2	1.674	3.505*	0.034
	Within groups	48.710	102	0.478		
	Total	52.057	104			
3	Between groups	4.447	2	2.223	7.684*	0.001
	Within groups	29.515	102	0.289		
	Total	33.962	104			
4	Between groups	6.080	2	3.040	4.253*	0.017
	Within groups	72.910	102	0.715		
	Total	78.990	104			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
5	Between groups	1.206	2	0.603	2.260	0.110
	Within groups	26.948	101	0.267		
	Total	28.154	103			
6	Between groups	9.099	2	4.550	7.051*	0.001
	Within groups	65.815	102	0.645		
	Total	74.914	104			
7	Between groups	1.527	2	0.763	1.138	0.325
	Within groups	68.435	102	0.671		
	Total	69.962	104			
8	Between groups	3.262	2	1.631	2.670	0.074
	Within groups	62.300	102	0.611		
	Total	65.562	104			
9	Between groups	2.418	2	1.209	2.585	0.080
	Within groups	47.715	102	0.468		
	Total	50.133	104			
10	Between groups	0.887	2	0.444	0.415	0.661
	Within groups	107.949	101	1.069		
	Total	108.837	103			
11	Between groups	1.365	2	0.683	1.094	
	Within groups	62.363	100	0.624		
	Total	63.728	102			
12	Between groups	4.033	2	2.016	3.533*	0.033
	Within groups	58.215	102	0.571		
	Total	62.248				

(Table continues)

		Sum of squares	df	Mean square	F	P-value
13	Between groups	0.866	2	0.433	0.414	0.662
	Within groups	105.509	101	1.045		
	Total	106.375	103			
14	Between groups	2.600	2	1.300	1.098	0.337
	Within groups	120.790	102	1.184		
	Total	123.390	104			
15	Between groups	0.600	2	0.300	0.684	0.507
	Within groups	44.790	102	0.439		
	Total	45.390	104			
16	Between groups	5.413	2	2.706	3.415*	0.037
	Within groups	80.835	102	0.793		
	Total	86.248	104			
17	Between groups	0.618	2	0.309	0.367	0.694
	Within groups	85.915	102	0.842		
	Total	86.533	104			

Critical values F (df = 2, 120, $\alpha = 0.05$) =3.07

The findings show that there are statistically significant differences in six teacher attitude items since their calculated F values were higher than the critical value of F representing 35% of the total items. The items were; 2 (F=3.505),3 (F=7.684),4 (F=4.253),6 (F=7.051), 12 (F=3.533), 16 (F=3.415). To determine the mathematics classes that differed significantly in the six attitudes items, post hoc analysis using scheffe were computed. Table 14 summarizes the post hoc results.

Table 14

Post Hoc Results showing the Pairs of Mathematics Classes that Differed Significantly in Teachers' Attitudes

Item	I Gender Class	J Class Gender	Mean differences (I-J)	p-value
Teaching mathematics in my class is very interesting and I enjoy it.	Boys	Girls	0.4650*	0.034
		Mixed	-0.3150	0.626
	Girls	Boys	-0.4650*	0.034
		Mixed	-0.3150	0.207
	Mixed	Boys	-0.1500	0.626
		Girls	0.3150	0.207
I do not always like teaching mathematics in this class and it scares me to have to teach it	Boys	Girls	0.4950*	0.002
		Mixed	0.0250	0.979
	Girls	Boys	-0.4950*	0.002
		Mixed	-0.4700*	0.004
	Mixed	Boys	-0.0250	0.979
		Girls	0.4700*	0.004
Teaching mathematics in this class is fascinating and fun	Boys	Girls	0.5650*	0.036
		Mixed	0.0000	1.000
	Girls	Boys	-0.5650	0.036
		Mixed	-0.5650	0.036
	Mixed	Boys	0.0000	1.000
		Girls	0.5650*	0.036
Teaching this class mathematics makes me feel secure and stimulated	Boys	Girls	0.5800*	0.021
		Mixed	-0.1750	0.623
	Girls	Boys	-0.5800*	0.021
		Mixed	-0.7550*	0.002
	Mixed	Boys	0.1750	0.623
		Girls	0.7550*	0.002
Teaching mathematics in this class is something which I enjoy a great deal	Boys	Girls	0.4800*	0.049
		Mixed	0.3250	0.162
	Girls	Boys	-0.4800*	0.049
		Mixed	-0.1550	0.724
	Mixed	Boys	-0.3250	0.162
		Girls	0.1550	0.724

(Table Continues)

Item	I Gender Class	J Class Gender	Mean differences (I-J)	p-value
I am able to teach my class mathematics without too much difficulty	Boys	Girls	0.5650*	0.902
		Mixed	0.0750	0.881
	Girls	Boys	-0.5650*	0.902
		Mixed	-0.4900	0.667
	Mixed	Boys	-0.0750	0.881
		Girls	0.4900	0.667

*Means significant at p<0.05 level

The results in Table 14 indicate that the attitudes of mathematics teachers teaching boys' only and girls' only classes significantly differed at alpha (α) = 0.05 in favour of boys in all the six items. The results also indicate that the same teachers' attitudes differed significantly between teachers teaching girls' only and mixed sex classes in items 2, 3, 4 in favour of mixed sex classes at alpha (α) = 0.05. This is an indication that mathematics teachers prefer teaching boys' only and mixed sex classes as opposed to girls' only classes. To find out whether there were statistically significant differences in the overall teacher attitude mean scores, ANOVA was computed and the findings presented in Table 15.

Table 15

ANOVA Results showing the Differences in County Schools' Mathematics Teachers' Attitudes towards Mixed and Gender Streamed (Girls' and Boys' Only) Classes

	Sum of squares	df	Mean square	F	sig(P-value)
Between groups	1.821	2	0.911	4.163	0.018
Within groups	22.311	102	0.219		
Total	24.132	104			

Critical values F (df = 2,120, α = 0.05) = 3.07; Calculated F = 4.163

The ANOVA results in Table 15 indicate that the calculated F = 4.163 is higher than the critical value of F =3.07 at alpha (α) = 0.018 > 0.05, level of significance, which indicate that there is a statistically significant difference in mathematics teachers attitudes towards mixed and gender streamed classes within the county co-educational secondary schools. Therefore, the null

hypothesis that states that there is no statistically significant difference in mathematics teachers' attitudes towards gender streamed and mixed sex classes within county co-educational secondary schools is therefore rejected. The findings indicate that there are statistically significant differences in mathematics teachers' attitudes towards girls' only, boys' only and mixed sex classes within the county co-educational secondary schools.

In order to determine the direction of the difference, a post hoc multiple comparison test using scheffe was performed and the results obtained reported in Table 16.

Table 16

Post Hoc Comparisons of the County Schools' Mathematics Teachers Attitudes Mean Scores

I Gender composition of maths class	J Gender composition of maths class	Mean Differences (I-J)	P-value
Boys	Girls	0.3374*	0.021
	Mixed	-0.2609	0.766
Girls	Boys	-0.3374*	0.021
	Mixed	-0.2609	0.096
Mixed	Boys	-0.0765	0.766
	Girls	-0.2609	0.096

*Means significant at P-Value <0.05 level

The post Hoc results in Table 16 indicate that there are statistically significant differences between the mean scores of mathematics teachers attitudes teaching students in boys' and girls' only classes favouring the boys. However, the attitudes mean scores obtained by teachers teaching learners in girls' only and mixed sex classes were not significantly different. This difference could be attributed to the poor performance of girls in mathematics as compared to the boys. It could also mean that these teachers are anxious during instruction due to lack of appropriate skills and knowledge of gender related classroom techniques and practices.

This finding seems to agree with Mukwaa and Too (2005) who found that teachers' treatment of boys and girls conform to societal stereotypes which allude to the fact that boys should be

superior in mathematics. This perhaps could explain why mathematics teachers have positive and significantly different attitudes towards boys' only classes. However, the finding disagrees with Rennie and Parker (1997) who found that single sex classroom learning environment improved teachers' attitudes towards girls. In contrast, from the study the teachers' attitudes towards girls' only classes seem to have deteriorated. Therefore, it is important to find out the reason for this state of affairs to curb the declining teacher attitudes towards girls' only mathematics classes in County schools.

4.5 A Comparison of Mathematics Teachers' Perceptions of Their Classes between Those who Teach in Gender Streamed (Boys'and Girls' only) and in Mixed Sex Classes within Sub-County Co-educational Secondary Schools.

To achieve this objective, the perception mean scores obtained by mathematics teachers in mixed and gender streamed (girls' and boys' only) classes were used to ascertain whether or not there were significant differences in their perceptions in the Sub-county secondary schools. The purpose was to test the hypothesis that there was no statistically significant difference in mathematics teachers' perceptions of mixed and gender streamed (girls' and boys'only) classes within sub-county co-educational secondary schools. Table 17 shows the mean scores and SD of sub-county schools' mathematics teachers' perceptions of gender streamed (girls' and boys' only) and mixed sex classes.

Table 17

Mean Scores and SD of Sub-County Schools' Mathematics Teachers' Perceptions of Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes.

	Statement		N	Mean score	SD
1	In this mathematics class, students are usually more motivated to work very hard in mathematics problems	Boys	27	4.04	0.65
		Girls	24	3.75	0.85
		Mixed	40	3.95	0.90
		Total	91	3.92	0.82

(Table continues)

	Statement		N	Mean score	SD
2	Teaching students mathematics in this class is frustrating	Boys	27	4.19	0.96
		Girls	24	3.58	1.18
		Mixed	40	3.85	1.08
		Total	91	3.88	1.08
3	I am sure students can learn mathematics well in this class	Boys	27	1.96	0.65
		Girls	24	2.25	0.85
		Mixed	40	2.05	0.90
		Total	91	2.08	0.82
4	This class makes students to be unsure of the need to continue studying mathematics	Boys	27	3.93	0.96
		Girls	24	3.75	1.15
		Mixed	40	3.70	1.04
		Total	91	3.78	1.04
5	Students in this class are afraid of doing maths	Boys	27	4.19	0.96
		Girls	24	4.13	0.80
		Mixed	40	4.35	0.53
		Total	91	4.24	0.75
6	This maths class makes learners to be more competitive	Boys	27	4.00	0.73
		Girls	24	3.50	0.98
		Mixed	40	3.75	1.06
		Total	91	3.76	0.96
7	This maths class makes learners to be more adventurous	Boys	27	3.93	0.62
		Girls	24	3.46	1.14
		Mixed	40	3.58	1.03
		Total	91	3.65	0.97
8	In this maths class, learners volunteer to answer questions.	Boys	27	4.22	0.80
		Girls	24	3.96	0.91
		Mixed	40	4.13	0.88
		Total	91	4.11	0.86

(Table continues)

	Statement		N	Mean score	SD
9	This maths class increase students interest in the subject	Boys	27	4.00	0.92
		Girls	24	3.38	1.17
		Mixed	40	3.85	0.77
		Total	91	3.77	0.96
10	Students in my class hardly practice solving maths problems on their own unless they are asked to do so.	Boys	27	3.59	1.37
		Girls	24	3.13	1.19
		Mixed	40	3.65	1.29
		Total	91	3.49	1.24
11	This class encourages learners to aspire study maths after K.C.S.E	Boys	27	3.70	1.13
		Girls	24	3.17	1.13
		Mixed	40	3.30	1.09
		Total	91	3.38	1.12
12	Learning maths in this class makes the learning of subject rewarding to the learners	Boys	27	3.81	0.88
		Girls	24	3.33	1.01
		Mixed	40	3.48	0.99
		Total	91	3.54	0.97
13	Students end up loving maths if they are taught the subject in this class	Boys	27	3.85	0.77
		Girls	24	3.46	0.98
		Mixed	40	3.45	1.18
		Total	91	3.57	1.02
14	This class encourages learners to study hard in mathematics	Boys	27	3.85	0.99
		Girls	24	3.54	1.10
		Mixed	40	3.68	0.97
		Total	91	3.69	1.01
15	This class discourages students from taking a career that requires maths	Boys	27	4.33	0.88
		Girls	24	3.75	1.29
		Mixed	40	3.78	1.10
		Total	91	3.93	1.11

(Table continues)

	Statement		N	Mean score	SD
16	This mathematics class is livelier	Boys	26	3.69	0.97
		Girls	24	3.71	1.00
		Mixed	40	3.63	0.98
		Total	90	3.67	0.97
17	Learners in this maths class are co-operative	Boys	27	3.96	0.81
		Girls	24	3.79	1.06
		Mixed	40	3.83	0.96
		Total	91	3.86	0.94
18	This maths class has a better working atmosphere for the learners	Boys	27	3.85	1.03
		Girls	24	3.79	0.83
		Mixed	40	3.98	0.86
		Total	91	3.89	0.90
	Overall	Boys	27	3.83	0.52
		Girls	24	3.52	0.63
		Mixed	40	3.66	0.51

The results in Table 17 indicate that the mean scores of teachers' perceptions of mixed and gender streamed classes were above 3.00 out of a total score of 5. This implies that the teachers posses positive perceptions of their mathematics classes. It also implies that they perceive that students can perform very well in mathematics irrespective of the gender composition of the class. However, when the teachers were asked whether students can learn mathematics well in their classes, they answered in a negative way as indicated by a mean score of 2.08 in the item. In the same item those teachers teaching girls' only had a higher mean score of 2.25 followed by mixed sex with a mean score of 2.05 and finally boys' only within a mean score of 1.96. The general lower perception mean score in the item can be attributed to the low academic ability levels of learners enrolled in sub-county co-educational secondary schools which were mostly day schools.

From the overall results it is clear that, mathematics teachers teaching boys' only classes have a higher perception mean score of 3.83 followed by those teaching mixed sex classes with a mean score of 3.66 and lastly by teachers teaching girls' only classes with a mean score of 3.52. The findings generally indicate that teachers have high perceptions of their mathematics classes.

They believe that learners can be able to perform very well in mathematics despite the gender composition of the class.

4.5.1 Differences in Sub-County Schools' Mathematics Teachers' Perceptions of Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

In order to determine whether there were statistically significant differences in each of the sub-county schools' mathematics teachers' perception items, an ANOVA was computed and the results summarized in Table 18**.**

Table 18

ANOVA Results showing the Differences in Sub-County Schools' Mathematics Teachers' Perceptions of Mixed and Gender Streamed (Girls' and Boys' Only) Classes

		Sum of squares	df	Mean square	F	P-value
1	Between groups	1.099	2	0.549	0.814	0.446
	Within groups	59.363	88	0.675		
	Total	60.462	90			
2	Between groups	4.663	2	2.331	2.031	0.137
	Within groups	101.007	88	1.148		
	Total	105.670	90			
3	Between groups	1.099	2	0.549	0.814	0.446
	Within groups	59.363	88	0.675		
	Total	60.462	90			
4	Between groups	0.853	2	0.426	0.388	0.680
	Within groups	96.752	88	1.099		
	Total	97.604	90			
5	Between groups	0.882	2	0.441	0.780	0.462
	Within groups	49.799	88	0.566		
	Total	5.0681	90			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
6	Between groups	3.181	2	1.591	1.761	0.178
	Within groups	79.500	88	0.903		
	Total	82.681	90			
7	Between groups	3.162	2	1.581	1.705	0.188
	Within groups	81.585	88	0.927		
	Total	84.747	90			
8	Between groups	0.901	2	0.451	0.601	0.551
	Within groups	66.000	88	0.750		
	Total	66.901	90			
9	Between groups	5.429	2	2.714	3.113	0.049
	Within groups	76.725	88	0.872		
	Total	82.154	90			
10	Between groups	4.504	2	2.252	1.355	0.263
	Within groups	146.244	88	1.662		
	Total	150.747	90			
11	Between groups	4.175	2	2.088	1.680	0.192
	Within groups	109.363	88	1.243		
	Total	113.538	90			
12	Between groups	3.233	2	1.616	1.748	0.180
	Within groups	81.382	88	0.925		
	Total	84.615	90			
13	Between groups	3.020	2	1.510	1.456	0.239
	Within groups	91.266	88	1.037		
	Total	94.286	90			

(Table continues)

14	Between groups	1.244	2	0.622	0.607	0.547
	Within groups	90.141	88	1.024		
	Total	91.385	90			
15	Between groups	6.129	2	3.065	2.557	0.083
	Within groups	105.475	88	1.199		
	Total	111.604	90			
16	Between groups	0.128	2	0.064	0.066	0.936
	Within groups	83.872	87	0.964		
	Total	84.000	89			
17	Between groups	0.447	2	0.223	0.250	0.780
	Within groups	78.696	88	0.894		
	Total	79.143	90			
18	Between groups	0.560	2	0.280	0.341	0.712
	Within groups	72.341	88	0.822		
	Total	72.901	90			

Critical values F (df 2, 90, $\alpha = 0.05$) =3.10

The findings in Table 18 show that there were no statistically significant differences in all the items. This implies that teachers perceive that the gender composition of their classes have no significant benefits in the learning of mathematics. Further, ANOVA was computed to determine whether there were significant differences in the overall mathematics teachers' perception scores and the results reported in Table 19.

Table 19

ANOVA Results Showing the Differences in Sub-County Schools' Mathematics Teachers' Perceptions of Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes

	Sum of squares	Df	Mean square	F	P-value
Between groups	1.218	2	0.609	2.014	0.140
Within groups	26.601	88	0.302		
Total	27.818				

Critical values F (df = 2, 90 $\alpha = 0.05$) = 3.10; Calculated F = 2.014

The ANOVA results indicate that the calculated F = 2.014 is lower than the critical value of F =3.10 at p- value= $0.140 \geq 0.05$ level of significance, which indicates that there is no statistically significant difference in mathematics teachers perceptions of gender streamed (girls' and boys' only) and mixed sex classes within the sub-county co-educational secondary schools. Therefore, the null hypothesis that states that there is no statistically significant difference in mathematics teachers' perceptions of gender streamed (girls' and boys' only) and mixed sex classes within sub-county co-educational secondary schools is accepted. This implies that there are no differences in perceived benefits by teachers of boys' only, girls' only and mixed sex classes in the teaching and learning of mathematics.

4.6 A Comparison of Mathematics Teachers' Perceptions of Their Classes between Those who Teach in Gender Streamed (Boys'and Girls' only) and in Mixed Sex Classes Within County Co-educational Secondary Schools.

To achieve this objective, the perception mean scores obtained by mathematics teachers teaching in gender streamed (girls' and boys' only) and in mixed sex classes were used to ascertain whether or not there were significant differences in their perceptions within the County secondary schools. The purpose was to test the hypothesis that there was no statistically significant difference in mathematics teachers' perceptions of gender streamed (girls' and boys'only) and mixed sex classes within County co-educational secondary schools. Table 20 shows the mean scores and SD of County schools' mathematics teachers' perceptions of gender streamed (girls' and boys' only) and mixed sex classes.

Table 20

Mean Scores and SD of County Schools' Mathematics Teachers' Perceptions of Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

Item		Class gender	N	Mean score	SD
1	In this mathematics class, students are usually more motivated to work very hard in mathematics problems	Boys' only	38	4.29	0.57
		Girls' only	24	4.13	0.80
		Mixed sex	40	4.10	0.71
		Total	102	4.18	0.68
2	Teaching students mathematics in this class is frustrating	Boys' only	37	4.19	0.78
		Girls' only	24	4.08	0.97
		Mixed sex	39	4.31	0.77
		Total	100	4.21	0.82
3	I am sure students can learn mathematics well in this class	Boys' only	38	1.71	0.56
		Girls' only	24	1.88	0.80
		Mixed sex	40	1.90	0.71
		Total	102	1.82	0.68
4	This class makes students to be unsure of the need to continue studying mathematics	Boys' only	38	4.24	0.71
		Girls' only	24	4.21	0.72
		Mixed sex	40	4.08	0.76
		Total	102	4.17	0.73
5	Students in this class are afraid of doing maths	Boys' only	38	4.58	0.50
		Girls' only	24	4.08	0.93
		Mixed sex	40	4.20	0.61
		Total	102		
6	This maths class makes learners to be more competitive	Boys' only	38	4.18	0.83
		Girls' only	24	4.13	0.99
		Mixed sex	40	4.28	0.55
		Total	102	4.21	0.78

(Table continues)

Item		Class gender	N	Mean score	SD
7	This maths class makes learners to be more adventurous	Boys' only	38	3.87	0.88
		Girls' only	24	3.83	1.13
		Mixed sex	40	3.98	0.73
		Total	102	3.90	0.88
8	In this maths class, learners volunteer to answer questions.				
		Boys' only	38	4.18	0.83
		Girls' only	24	4.17	0.82
		Mixed sex	40	4.10	0.71
		Total	102	4.15	0.78
9	This maths class increase students interest in the subject	Boys' only	39	4.13	0.86
		Girls' only	24	3.92	0.88
		Mixed sex	40	4.03	0.62
		Total	103	4.04	0.78
10	Students in my class hardly practice solving maths problems on their own unless they are asked to do so	Boys' only	39	3.69	1.10
		Girls' only	24	3.79	1.14
		Mixed sex	40	3.98	0.70
		Total	103	3.83	0.97
11	This class encourages learners to aspire to study mathematics after KCSE		39		
		Boys' only		3.90	0.72
		Girls' only	24	3.63	0.92
		Mixed sex	40	3.78	0.58
		Total	103	3.79	0.72
12	Learning maths in this class makes the learning of subject rewarding to the learners	Boys' only	38	4.03	0.59
		Girls' only	24	4.00	0.83
		Mixed sex	40	4.03	0.48
		Total	102	4.02	0.61
13	Students end up loving maths if they are taught the subject in this class	Boys' only	38	3.79	1.04
		Girls' only	24	3.83	1.13
		Mixed sex	40	4.05	0.64
		Total	102	3.90	0.93

(Table continues)

Item	Class	N	Mean	SD

		gender		score	
14	This class encourages learners to study hard in mathematics	Boys' only	38	4.16	0.68
		Girls' only	24	3.79	1.06
		Mixed sex	40	4.15	0.62
		Total	102	4.07	0.77
15	This class discourages students from taking a career that requires maths	Boys' only	38	4.32	1.02
		Girls' only	24	4.04	1.08
		Mixed sex	40	4.25	0.67
		Total	102	4.23	0.91
16	This mathematics class is livelier	Boys' only	37	4.00	0.62
		Girls' only	24	3.88	0.80
		Mixed sex	40	3.78	0.92
		Total	101	3.88	0.79
17	Learners in this maths class are cooperative	Boys' only	38	4.18	0.69
		Girls' only	24	4.00	0.78
		Mixed sex	40	4.10	0.59
		Total	102	4.11	0.67
18	This maths class has a better working atmosphere for the learners	Boys' only	38	4.18	0.56
		Girls' only	24	3.96	1.00
		Mixed sex	40	4.15	0.48
		Total	102	4.12	0.66
	Overall	Boy' only	39	3.88	0.64
		Girls' only	24	3.85	0.65
		Mixed sex	40	3.95	0.37

The findings in Table 20 show that mathematics teachers' perceptions of boys' only, girls' only and mixed sex classes were highly positive as indicated by the total mean score for each item of above 3 out of a maximum score of 5. However, their perceptions scores were lower for item 3 which was 'I am sure students can learn mathematics well in this class,' with a total mean score of 1.82. In the same item teachers teaching mixed sex classes had a higher mean score of 1.90 followed by those teaching girls' only classes with a mean score of 1.88 and lastly those teaching boys' only classes with a mean score of 1.71. This may indicate that teachers don't perceive the gender composition of the class as determining how well the subject will be learnt by the learners.

Further, the findings indicate from the overall mean scores that within the county co-educational secondary schools, mathematics teachers teaching mixed sex classes have a higher perception mean score of 3.95 followed those teaching boys' only classes with a mean score of 3.88 and lastly those teaching girls' only classes with a mean score of 3.85. The results obtained indicate that teachers believe that learners in this school category can perform very well in the subject despite the class gender composition. However, the higher mean perception score obtained by teachers teaching mixed sex classes could imply that such classes are better than the others in preparing learners in mathematics. In addition mathematics teachers' perceptions of girls' only classes were lower in both sub-county and county schools. This could be explained by societal stereotypes which seem to allude that females may not be good mathematics students. It appears that mathematics teachers' still hold on to the view hence may not expect the girls to do well in the subject.

4.6.1 Differences in County Schools' Mathematics Teachers' Perceptions of Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

In order to determine whether there were statistically significant differences in each of the county schools' mathematics teachers' perception items, an ANOVA was computed and the results summarized in Table 21**.**

Table 21

ANOVA Results showing the Differences in County Schools' Mathematics Teachers Perceptions of Mixed and Gender Streamed (Girls' and Boys' Only) Classes

		Sum of squares	df	Mean square	F	P-value
1	Between groups	0.783	2	0.391	0.842	0.434
	Within groups	46.041	99	0.465		
	Total	46.824	101			
2	Between groups	0.773	2	0.387	0.570	0.567
	Within groups	65.817	97	0.679		
	Total	66.590	99			

		Sum of squares	df	Mean square	F	P-value
3	Between groups	0.783	2	0.391	0.842	0.434
	Within groups	46.041	99	0.465		
	Total	46.824	101			
4	Between groups	0.565	2	0.282	0.522	0.595
	Within groups	53.602	99	0.541		
	Total	54.167	101			
5	Between groups	4.464	2	2.232	5.080*	0.008
	Within groups	43.496	99	0.439		
	Total	47.961	101			
6	Between groups	0.366	2	0.183	0.300	0.741
	Within groups	60.311	99	0.609		
	Total	60.676	101			
7	Between groups	0.369	2	0.185	0.232	0.793
	Within groups	78.650	99	0.794		
	Total	79.020	101			
8	Between groups	0.150	2	0.075	0.123	0.885
	Within groups	60.664	99	0.613		
	Total	60.794	101			
9	Between groups	0.677	2	0.339	0.554	0.577
	Within groups	61.167	100	0.612		
	Total	61.845	102			
10	Between groups	1.613	2	0.807	0.847	0.432
	Within groups	95.241	100	0.952		
	Total	96.854	102			
11	Between groups	1.111	2	0.556	1.065	0.349
	Within groups	52.190	100	0.522		
	Total	53.301	102			

		Sum of squares	df	Mean square	F	P-value

12	Between groups	0.012	2	0.006	0.016	0.984
	Within groups	37.949	99	0.383		
	Total	37.961	101			
13	Between groups	1.470	2	0.735	0.851	0.430
	Within groups	85.549	99	0.864		
	Total	87.020	101			
14	Between groups	2.409	2	1.204	2.052	0.134
	Within groups	58.111	99	0.587		
	Total	60.520	101			
15	Between groups	1.145	2	0.572	0.686	0.506
	Within groups	82.669	99	0.835		
	Total	83.814	101			
16	Between groups	0.974	2	0.487	0.775	0.464
	Within groups	61.600	98	0.629		
	Total	62.574	100			
17	Between groups	0.503	2	0.252	0.550	0.579
	Within groups	45.311	99	0.458		
	Total	45.814	101			
18	Between groups	0.819	2	0.410	0.927	0.399
	Within groups	43.769	99	0.442		
	Total	44.588	101			

Critical values F (df = 2,120, $\alpha = 0.05$) =3.07

The findings in Table 21 show that there are no statistically significant differences in teachers' perceptions of gender streamed (girls' and boys' only) and mixed sex classes in all the 18 items except in item 5 which was 'students in this class are afraid of doing mathematics' at p-value = 0.05. This is indicated by calculated value of F (5.080) which is higher than the critical value of F (3.07). Post Hoc analysis using Scheffe was computed to determine the pairs of mathematics teachers that differed significantly in the item and also the direction of differences. The results are summarized in Table 22.

Table 22

Post Hoc Results showing the Pairs of Mathematics Teachers that Differed Significantly in Teacher Perceptions

Item	Class Gender (I)	Class Gender (J)	Mean Differences (I-J)	Sig.(p-value)
Students in this class are afraid of doing mathematics	Boys	Girls	0.4956*	0.019
		Mixed	0.3789*	0.046
	Girls	Boys	-0.4956*	0.019
		Mixed	-0.1167	0.793
	Mixed	Boys	-0.3789*	0.046
		Girls	0.1167	0.793

*Means significant at P-Value <0.05 level

From the results in Table 22, it is clear that there are significant differences in perceptions between teachers who teach boys' only and girls' only classes in favour of boys and between teachers who teach boys' only and mixed sex classes in favour of boys' at alpha (α) = 0.05. However, there were no significant differences in perceptions between teachers who teach girls' only and mixed sex classes. This finding may imply that teachers perceive that students from boys' only mathematics classes are not afraid of doing mathematics as compared to mixed sex and girls' only classes. This can be explained by the societal stereotypes which may be posed by teachers that tend to suggest that mathematics is masculine in nature; hence males should not be afraid of it. The researcher further used ANOVA to determine whether there were significant differences in the overall county schools' teacher perceptions. Table 23 shows the results of the ANOVA test.

Table 23

ANOVA Results showing the Differences in County Schools' Mathematics Teachers' Perceptions of Mixed and Gender Streamed (Girls' and Boys' Only) Classes

	Sum of squares	Df	Mean square	F	P-value
Between groups	0.168	2	0.084	0.277	0.759
Within groups	30.399	100	0.304		
Total	30.567	102			

Critical values F (df = 2,120, $\alpha = 0.05$) = 3.07; Calculated values F = 0.277

The ANOVA results in Table 23 indicate that the calculated F = 0.277 is lower than the critical value of F =3.07 at p-value = $0.759 \geq 0.05$ level of significance which indicate that there is no statistically significant difference in mathematics teachers perceptions of gender streamed (girls' and boys' only) and mixed sex classes within county co-educational secondary schools. Based on these findings the null hypothesis that states that there is no statistically significant difference in mathematics teachers' perceptions of gender streamed (girls' and boys' only) and mixed sex classes within county co-educational secondary schools is accepted.

The findings of this study have confirmed that there are no statistically significant differences in mathematics teachers' perceptions of boys' only, girls' only and mixed sex mathematics classes in county co-educational secondary schools. This finding disagree with those of Baker and Jacob (1999) who contend that females loose when they are used to control male behaviour in mixed sex classes and are likely to further fail to reap the benefits both academic and affective of single-sex classes. The current study has not shown any significant benefits of female only mathematics classes from the teachers' perceptions. The findings also contradicts those of Blechle (2007) in her study on comparisons of attitudes towards mathematics and Mathematical performance in single –sex and mixed sex classes, found that male students perceived less support and experienced more harassment from their peers in single sex classes. This finding seems to suggest that boys are likely to loose in single sex classes.

4.7 A Comparison of Mathematics Teachers' Classroom Practices between Those who Teach in Gender Streamed (Boys'and Girls' only) and in Mixed Sex Classes within Sub-County Co-educational Secondary Schools.

To achieve this objective, the classroom practices mean scores by mathematics teachers teaching learners in boys' only, girls' only and mixed sex classes were compared. The purpose was to test the hypothesis that there is no statistically significant difference in mathematics teachers' classroom practices in mixed and gender-streamed classes within Sub-county co-educational secondary schools. Classroom practices in this study refer to teachers' activities or actions during teaching. They include way of praising, behaviour towards learners, instructional methods and materials used in teaching mathematics. Classroom activities which enhance the teaching and learning of mathematics were given a score of 4 while those that do not were given a lower score of 0. Table 42 shows the descriptive results of sub-county schools' mathematics teachers' classroom practices.

Table 24

Mean Scores and SD of Sub-County Schools' Mathematics Teachers Classroom Practices in Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes

	Practice	Class Gender composition	N	Mean	SD
1	Organize learners in small group discussions	Boys	30	2.27	0.74
		Girls	26	2.42	0.76
		Mixed	40	2.38	0.59
		Total	98	2.35	0.68
2	Requires students to justify their answers to questions asked in class	Boys	30	3.00	1.07
		Girls	27	2.78	1.05
		Mixed	40	2.93	0.83
		Total	97	2.91	0.95
3	Engage students in project based work	Boys	30	1.70	0.75
		Girls	27	2.07	1.07
		Mixed	40	1.98	1.00
		Total	97	1.19	0.95
4	Connect maths with other subjects	Boys	30	2.87	0.97
		Girls	27	3.03	0.76
		Mixed	38	2.82	1.01
		Total	95	2.89	0.93

(Table continues)

	Practice	Class Gender composition	N	Mean	SD
5	Ask students to explain maths concepts to one another	Boys	30	2.83	0.95
		Girls	26	2.96	0.96
		Mixed	40	2.75	0.90
		Total	96	2.83	0.93
6	Engage the whole class in discussions	Boys	30	2.87	0.82
		Girls	27	3.30	0.78
		Mixed	40	2.70	1.20
		Total	97	2.92	1.01
7	Recognise the learners way of thinking and respond by teaching to their cognitive styles	Boys	30	2.87	0.90
		Girls	27	3.00	0.88
		Mixed	40	2.43	0.90
		Total	97	2.72	0.92
8	Engage learners in maths activities using real objects for example;models and other materials	Boys	30	2.50	0.90
		Girls	27	2.59	1.08
		Mixed	40	2.58	0.90
		Total	97	2.56	0.95
9	Make formal mathematics presentations to the rest of the class	Boys	30	2.40	1.38
		Girls	27	2.78	1.05
		Mixed	40	2.33	1.14
		Total	97	2.47	1.20
10	Present maths lessons informally	Boys	29	2.59	1.15
		Girls	27	2.56	1.15
		Mixed	39	2.31	1.12
		Total	95	2.46	1.14
11	Allow students to design their own mathematics activities or investigations	Boys	30	1.93	0.94
		Girls	27	2.22	0.93
		Mixed	39	2.00	1.00
		Total	96	2.04	0.96
12	Teach at the learners pace	Boys	29	2.97	0.91
		Girls	26	3.00	0.98
		Mixed	39	2.80	1.03
		Total	94	2.90	0.97

(Table continues)

	Practice	Class Gender composition	N	Mean	SD
13	Allow students some time to respond to questions asked in class	Boys	30	3.40	0.72
		Girls	25	3.24	0.93
		Mixed	40	3.40	0.78
		Total	95	3.36	0.80
14	Relate maths to the real world	Boys	30	3.33	0.66
		Girls	27	3.26	1.02
		Mixed	40	3.20	0.79
		Total	97	3.26	0.82
15	Teach maths using story problems	Boys	30	1.87	1.07
		Girls	26	2.15	0.83
		Mixed	40	2.18	0.98
		Total	96	2.07	0.98
16	Change teaching methods with respect to students gender	Boys	30	1.93	1.36
		Girls	27	2.30	1.30
		Mixed	40	1.83	1.28
		Total	97	1.99	1.31
17	Provide reasons for learning particular maths concepts	Boys	28	2.82	1.12
		Girls	25	3.00	1.00
		Mixed	39	2.77	0.96
		Total	92	2.85	1.01
18	Provide formulae during instruction as opposed to lead learners to arrive at the formulae	Boys	29	1.79	1.15
		Girls	28	1.57	1.29
		Mixed	40	1.75	1.28
		Total	97	1.71	1.23
19	Direct students towards a deeper understanding of concepts	Boys	30	3.07	0.83
		Girls	28	3.07	1.02
		Mixed	40	2.83	0.78
		Total	98	2.97	0.87
20	Arrange maths content in a topic in a step by, step form	Boys	30	3.47	0.82
		Girls	28	3.54	0.74
		Mixed	40	3.50	0.85
		Total	98	3.50	0.80

(Table continues)

	Practice	Class Gender composition	N	Mean	SD
21	Treat learners as allies	Boys	28	2.57	1.50
		Girls	28	1.86	1.41
		Mixed	38	2.03	1.60
		Total	94	2.14	1.53
22	Choose teaching materials according to students gender	Boys	30	2.10	1.52
		Girls	26	1.81	1.27
		Mixed	40	1.50	1.24
		Total	96	1.77	1.35
23	Teach using maths games and puzzles	Boys	30	1.63	1.19
		Girls	28	1.68	1.02
		Mixed	40	1.75	0.95
		Total	98	1.70	1.04
24	Teach using out of class maths lessons	Boys	30	1.47	0.94
		Girls	28	1.90	0.96
		Mixed	38	1.92	0.94
		Total	96	1.77	0.96
25	Teach in class using excessively loud voice accompanied with a lot of movements	Boys	30	2.80	1.21
		Girls	28	2.60	1.34
		Mixed	40	2.98	1.12
		Total	98	2.82	1.21
26	Prefer to be still and use a calming tone when teaching	Boys	30	1.77	1.43
		Girls	27	1.70	1.44
		Mixed	40	1.80	1.44
		Total	97	1.76	1.42
27	Precise students for trying to provide answers to questions	Boys	30	3.40	0.77
		Girls	27	3.44	0.75
		Mixed	40	3.53	0.72
		Total	97	3.46	0.74
28	Withhold praise from students until they produce a correct answer	Boys	30	2.33	1.40
		Girls	28	2.71	1.12
		Mixed	40	2.90	1.15
		Total	98	2.67	1.23

(Table continues)

Practice	Class Gender composition	N	Mean	SD
Overall	Boys	30	2.50	0.35
	Girls	28	2.49	0.55
	Mixed	40	2.47	0.43
	Total	98	2.49	0.44

The descriptive results in table 24 indicate that within the Sub-county schools, the mean score of classroom practices by teachers teaching boys' only classes were higher with a mean score of 2.50 followed by those teaching girls' only classes with a mean score of 2.49 and lastly those who teach mixed sex classes with a mean score of 2.47. The findings show that generally the teachers' use of classroom practices that enhance the learning of mathematics is average with a total mean score of 2.49 out of a maximum of 4. Further, their mean scores are similar implying that there are no major differences in the way mathematics teachers present their lessons in boys' only, girls' only and mixed sex classes.

4.7.1 Differences in Sub-county Schools' Mathematics Teachers' Classroom Practices in Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

In order to determine whether there were statistically significant differences in each of the sub-county schools' mathematics teachers' classroom practice items, an ANOVA was computed and the results summarized in Table 25**.**

Table 25

ANOVA Results showing the Differences in Sub-County Schools' Mathematics Teachers Classroom Practices in Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes

		Sum of squares	df	Mean square	F	P-value
1	Between groups	0.371	2	0.185	0.395	0.675
	Within groups	43.588	93	0.469		
	Total	43.958	95			

(Table continues)

	Sum of	df	Mean	F	P-value

		squares		square		
2	Between groups	0.723	2	0.362	0.398	0.673
	Within groups	85.442	94	0.909		
	Total	86.165	96			
3	Between groups	2.213	2	1.107	1.222	0.299
	Within groups	85.127	94	0.906		
	Total	87.340	96			
4	Between groups	0.807	2	0.404	0.463	0.631
	Within groups	80.140	92	0.871		
	Total	80.947	94			
5	Between groups	0.705	2	0.353	0.407	0.667
	Within groups	80.628	93	0.867		
	Total	81.333	95			
6	Between groups	5.844	2	2.922	3.002	0.054
	Within groups	91.496	94	0.973		
	Total	97.340	96			
7	Between groups	6.243	2	3.121	3.900*	0.024
	Within groups	75.242	94	0.800		
	Total	81.485	96			
8	Between groups	0.145	2	0.072	0.079	0.924
	Within groups	85.794	94	0.913		
	Total	85.938	96			
9	Between groups	3.544	2	1.772	1.237	0.295
	Within groups	134.642	94	1.432		
	Total	138.186	96			
10	Between groups	1.612	2	0.806	0.618	0.541
	Within groups	120.009	92	1.304		
	Total	121.621	94			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
11	Between groups	1.300	2	0.650	0.669	0.500
	Within groups	86.533	93	0.930		
	Total	87.833	95			
12	Between groups	0.814	2	0.407	0.424	0.656
	Within groups	87.324	91	0.960		
	Total	88.134	93			
13	Between groups	0.472	2	0.236	0.365	0.695
	Within groups	59.360	92	0.645		
	Total	59.832	94			
14	Between groups	0.305	2	0.152	0.223	0.801
	Within groups	64.252	94	0.684		
	Total	64.557	96			
15	Between groups	1.863	2	0.932	0.978	0.380
	Within groups	88.626	93	0.953		
	Total	90.490	95			
16	Between groups	3.718	2	1.859	1.084	0.343
	Within groups	161.271	94	1.716		
	Total	164.990	96			
17	Between groups	0.839	2	0.420	0.401	0.671
	Within groups	93.030	89	1.045		
	Total	93.870	91			
18	Between groups	0.802	2	0.401	0.260	0.772
	Within groups	145.116	94	1.544		
	Total	145.918	96			
19	Between groups	1.409	2	0.705	0.936	0.396
	Within groups	71.499	95	0.753		
	Total	72.908	97			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
20	Between groups	0.069	2	0.035	0.053	0.946
	Within groups	62.431	95	0.657		
	Total	62.500	97			
21	Between groups	7.943	2	3.971	1.727	0.184
	Within groups	209.259	91	2.300		
	Total	217.202	93			
22	Between groups	6.220	2	3.110	1.735	0.182
	Within groups	166.738	93	1.793		
	Total	172.958	95			
23	Between groups	0.243	2	0.121	0.110	0.896
	Within groups	104.574	95	1.101		
	Total	104.816	97			
24	Between groups	4.050	2	2.025	2.271	0.109
	Within groups	82.908	93	0.891		
	Total	86.958	95			
25	Between groups	2.240	2	1.120	0.758	0.472
	Within groups	140.454	95	1.478		
	Total	142.694	97			
26	Between groups	0.150	2	0.075	0.036	0.964
	Within groups	193.396	94	2.057		
	Total	193.546	96			
27	Between groups	0.282	2	0.141	0.256	0.775
	Within groups	51.842	94	0.552		
	Total	52.124	96			
28	Between groups	5.570	2	2.785	1.863	0.161
	Within groups	141.981	95	1.495		
	Total	147.551	97			

Critical values F (df = 2, 95, $\alpha = 0.05$) =3.09

The findings in Table 25 indicate that there are no significant differences in mathematics teachers' classroom practices in 27 items. However, there is a significant difference in classroom practice 7 since calculated F (3.900) is greater than the critical F (3.09) at alpha (α) = 0.05. The item is 'recognize the learners' way of thinking and respond by teaching to their cognitive style.' To determine the pairs of mathematics teachers that differed significantly and the direction of difference in the item, post Hoc using Scheffe was run and the results reported in Table 26.

Table 26

Post Hoc Results showing the Pairs of Mathematics Classes that Differed Significantly in Teachers' Classroom Practices

Item	Class Gender (I)	Class Gender (J)	Mean Differences (I-J)	p-value
Recognise the learners way of thinking and respond by teaching to their cognitive styles	Boys	Girls	-1.1333	0.854
		Mixed	0.4417	0.130
	Girls	Boys	0.1333	0.854
		Mixed	0.5750*	0.040
	Mixed	Boys	-0.4417	0.130
		Girls	-0.5750*	0.04

*Means significant at p-value<0.05

The results in Table 26 show that there are statistically significant differences in the classroom practices by teachers teaching girls' only and mixed sex classes in favour of girls' only classes. This may be an indication that the teachers recognize the girls' way of thinking and respond by teaching to their preferred styles of learning. The overall sub-county schools' mathematics teachers' classroom practices mean scores were also compared using ANOVA to determine whether there were any significant differences. The results are summarized in Table 27.

Table 27

ANOVA Results showing the Differences in Sub-county Schools' Mathematics Teachers' Classroom Practices in Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes

	Sum of squares	Df	Mean square	F	P-value
Between groups	0.012	2	0.006	0.031	0.970
Within groups	18.837	95	0.198		
Total	18.849				

Critical values F (df = 2, 95 $\alpha = 0.05$) = 3.09; Calculated F = 0.031

The ANOVA results indicate that the calculated F = 0.031 is lower than the critical value of F =3.07 at p-value = 0.140 > 0.05 level of significance. This is an indication that there is no statistically significant difference in mathematics teachers' classroom practices in gender streamed mathematics and mixed sex classes within the Sub-county co-educational secondary schools. The null hypothesis which stated that there is no statistically significant difference in mathematics teachers' classroom practices in Sub-county co-educational secondary schools is therefore accepted. These findings may imply that the gender composition of the class may not be a factor in choosing classroom practices.

4.8 A Comparison of Mathematics Teachers' Classroom Practices between Those who Teach in Gender Streamed (Boys'and Girls' only) and in Mixed Sex Classes within County Co-educational Secondary Schools.

To achieve this objective, the classroom practices by mathematics teachers teaching learners in boys' only, girls' only and mixed sex classes were compared. The purpose was to test the hypothesis that there is no statistically significant difference in mathematics teachers' classroom practices in gender-streamed and mixed sex classes within county co-educational secondary schools. Table 28 shows the descriptive results of county schools' mathematics teachers' classroom practices

Table 28

Mean Scores and SD of County Schools' Mathematics Teachers Classroom Practices in Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes

	Practice	Class Gender composition	N	Mean	SD
1	Organize learners in small group discussions	Boys	40	2.60	0.93
		Girls	24	2.30	0.81
		Mixed	40	2.50	0.72
		Total	104	2.49	0.82
2	Requires students to justify their answers to questions asked in class	Boys	40	2.80	1.07
		Girls	24	3.21	0.78
		Mixed	40	3.08	0.80
		Total	104	3.00	0.91
3	Engage students in project based work	Boys	39	2.03	0.99
		Girls	24	1.79	0.98
		Mixed	40	1.90	0.98
		Total	103	1.92	0.98
4	Connect maths with other subjects	Boys	39	2.74	1.00
		Girls	24	2.96	1.08
		Mixed	40	2.65	0.92
		Total	103	2.76	0.98
5	Ask students to explain maths concepts to one another	Boys	40	3.05	0.71
		Girls	23	3.22	0.80
		Mixed	39	3.00	0.92
		Total	102	3.07	0.81
6	Engage the whole class in discussions	Boys	39	2.97	1.11
		Girls	24	2.88	1.08
		Mixed	40	2.95	0.81
		Total	103	2.94	0.99
7	Recognise the learners way of thinking and respond by teaching to their cognitive styles	Boys	39	2.90	0.85
		Girls	24	3.13	0.80
		Mixed	40	2.58	1.01
		Total	103	2.83	0.92

(Table continues)

	Practice	Class Gender composition	N	Mean	SD
8	Engage learners in maths activities using real objects for example;models and other materials	Boys	40	2.95	0.96
		Girls	24	3.17	0.70
		Mixed	40	2.40	0.87
		Total	104	2.79	0.92
9	Make formal mathematics presentations to the rest of the class	Boys	40	2.53	1.24
		Girls	24	2.79	0.98
		Mixed	40	2.63	1.10
		Total	104	2.63	1.13
10	Present maths lessons informally	Boys	39	2.44	1.27
		Girls	24	2.67	1.13
		Mixed	40	2.93	0.97
		Total	103	2.68	1.14
11	Allow students to design their own mathematics activities or investigations	Boys	40	1.93	0.92
		Girls	24	2.08	0.97
		Mixed	40	1.90	0.96
		Total	104	1.95	0.94
12	Teach at the learners pace	Boys	37	2.78	1.06
		Girls	24	3.13	0.10
		Mixed	40	2.78	1.10
		Total	101	2.86	1.06
13	Allow students some time to respond to questions asked in class	Boys	39	3.56	0.68
		Girls	24	3.67	0.56
		Mixed	40	3.10	0.90
		Total	103	3.41	0.79
14	Relate maths to the real world	Boys	40	3.13	0.91
		Girls	24	3.25	0.74
		Mixed	40	2.88	0.94
		Total	104	3.06	0.89

(Table continues)

	Practice	Class Gender composition	N	Mean	SD
15	Teach maths using story problems	Boys	40	2.13	1.09
		Girls	24	2.17	1.09
		Mixed	40	1.85	0.98
		Total	104	2.03	1.05
16	Change teaching methods with respect to students gender	Boys	36	1.83	1.21
		Girls	24	2.50	1.29
		Mixed	40	1.43	1.08
		Total	100	1.83	1.24
17	Provide reasons for learning particular maths concepts	Boys	37	2.78	1.06
		Girls	24	3.46	0.66
		Mixed	39	2.62	0.94
		Total	100	2.88	0.98
18	Provide formulae during instruction as opposed to lead learners to arrive at the formulae	Boys	39	2.26	1.19
		Girls	25	1.84	1.60
		Mixed	40	1.40	1.13
		Total	104	1.83	1.32
19	Direct students towards a deeper understanding of concepts	Boys	39	3.03	0.99
		Girls	25	3.44	0.65
		Mixed	40	3.05	0.93
		Total	104	3.13	0.90
20	Arrange maths content in a topic in a step by, step form	Boys	40	3.40	0.87
		Girls	25	3.72	0.54
		Mixed	40	3.23	0.92
		Total	105	3.41	0.84
21	Treat learners as allies	Boys	39	1.87	1.59
		Girls	25	1.48	1.48
		Mixed	40	2.38	1.31
		Total	104	1.97	1.50

(Table continues)

	Practice	Class Gender composition	N	Mean	SD
22	Choose teaching materials according to students gender	Boys	39	1.28	1.34
		Girls	25	2.12	1.42
		Mixed	40	1.38	1.17
		Total	104	1.52	1.33
23	Teach using maths games and puzzles	Boys	39	1.87	1.03
		Girls	25	2.08	1.12
		Mixed	40	1.83	1.08
		Total	104	1.90	1.07
24	Teach using out of class maths lessons	Boys	38	1.71	1.01
		Girls	25	1.96	0.89
		Mixed	40	1.85	0.89
		Total	103	1.83	0.93
25	Teach in class using excessively loud voice accompanied with a lot of movements	Boys	40	2.68	1.12
		Girls	25	2.84	1.18
		Mixed	40	2.90	1.24
		Total	105	2.80	1.17
26	Prefer to be still and use a calming tone when teaching	Boys	40	1.50	1.26
		Girls	25	2.32	1.46
		Mixed	39	1.31	1.22
		Total	104	1.63	1.35
27	Precise students for trying to provide answers to questions	Boys	40	3.33	1.10
		Girls	25	3.72	0.46
		Mixed	40	3.18	1.08
		Total	105	3.36	0.99
28	Withhold praise from students until they produce a correct answer	Boys	39	3.05	0.97
		Girls	25	2.92	1.22
		Mixed	40	2.88	0.91
		Total	104	2.95	1.01
	Overall	Boys	40	2.49	0.52
		Girls	25	2.67	0.42
		Mixed	40	2.44	0.40
		Total	105	2.52	0.46

The descriptive results in Table 28 indicate that the overall mean scores of classroom practices by teachers teaching girls' only classes were higher with a mean score of 2.67 followed by teachers teaching boys' only classes with a mean score of 2.49 and lastly teachers who teach mixed sex classes with a mean score of 2.44 out of a maximum of 4. However, from the overall mean score of 2.52 out of a maximum of 4, the classroom practices by these teachers are average. This implies that their classroom practices neither enhance the learning of mathematics nor debilitate it. Higher means by teachers teaching girls only classes may imply that teaches are aware that girls are weaker in mathematics and may require different interventions so as to perform well in the subject. Each classroom practice was compared to determine whether there were any significant differences and the results summarized in Table 29.

4.8.1 Differences in County Schools' Mathematics Teachers' Classroom Practices in Gender Streamed (Girls' and Boys' only) and Mixed Sex Classes

In order to determine whether there were statistically significant differences in each of the county schools' mathematics teachers' classroom practice items, an ANOVA was computed and the results summarized in Table 29**.**

Table 29

ANOVA Results showing the Differences in County Schools' Mathematics Teachers' Classroom Practices in Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes

		Sum of squares	df	Mean square		P-value
1	Between groups	1.432	2	0.716	1.005	0.352
	Within groups	68.558	101	0.679		
	Total	69.990	103			
2	Between groups	2.867	2	1.433	1.741	0.180
	Within groups	83.133	101	0.823		
	Total	86.000	103			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
3	Between groups	0.846	2	0.423	0.438	0.646
	Within groups	96.533	100	0.965		
	Total	97.379	102			
4	Between groups	1.438	2	0.719	0.531	0.589
	Within groups	97.494	100	0.975		
	Total	98.932	102			
5	Between groups	0.707	2	0.353	0.531	0.589
	Within groups	65.813	99	0.665		
	Total	66.520	101			
6	Between groups	0.151	2	0.076	0.076	0.927
	Within groups	99.499	100	0.995		
	Total	99.650	102			
7	Between groups	4.865	2	2.432	2.967	0.056
	Within groups	81.990	100	0.820		
	Total	86.854	102			
8	Between groups	10.513	2	5.256	6.910*	0.002
	Within groups	76.833	101	0.761		
	Total	87.346	103			
9	Between groups	1.067	2	0.533	0.417	0.660
	Within groups	129.308	101	1.280		
	Total	130.375	103			
10	Between groups	4.729	2	2.365	1.852	0.162
	Within groups	127.698	100	1.277		
	Total	132.427	102			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
11	Between groups	0.551	2	0.276	0.309	0.735
	Within groups	90.208	101	0.893		
	Total	90.760	103			
12	Between groups	2.189	2	1.095	0.976	0.380
	Within groups	109.870	98	1.121		
	Total	112.059	100			
13	Between groups	6.351	2	3.175	5.618*	0.005
	Within groups	56.523	100	0.565		
	Total	62.874	102			
14	Between groups	2.404	2	1.202	1.532	0.221
	Within groups	79.250	101	0.785		
	Total	81.654	103			
15	Between groups	2.105	2	1.053	0.959	0.387
	Within groups	110.808	101	1.097		
	Total	112.913	103			
16	Between groups	17.335	2	8.667	6.238*	0.003
	Within groups	134.775	97	1.389		
	Total	152.110	99			
17	Between groups	11.101	2	5.550	6.451*	0.002
	Within groups	83.459	97	0.860		
	Total	94.560	99			
18	Between groups	14.489	2	7.244	4.451*	0.014
	Within groups	164.396	101	1.628		
	Total	178.885	103			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
19	Between groups	3.081	2	1.541	1.920	0.152
	Within groups	81.034	101	0.802		
	Total	84.115	103			
20	Between groups	3.775	2	1.888	2.766	0.068
	Within groups	69.615	102			
	Total	73.390	103			
21	Between groups	12.939	2	6.470	3.026	0.053
	Within groups	215.974	101	2.138		
	Total	228.913	103			
22	Between groups	12.049	2	6.025	3.581*	0.031
	Within groups	169.912	101	1.682		
	Total	181.962	103			
23	Between groups	1.064	2	0.532	0.464	0.630
	Within groups	115.974	101	1.148		
	Total	117.038	103			
24	Between groups	0.979	2	0.489	0.557	0.575
	Within groups	87.876	100	0.879		
	Total	88.854				
25	Between groups	1.065	2	0.533	0.383	0.683
	Within groups	141.735	102	1.390		
	Total	142.800	104			
26	Between groups	16.627	2	8.314	4.947	0.009
	Within groups	169.748	101	1.681		
	Total	186.375	103			

(Table continues)

		Sum of squares	df	Mean square	F	P-value
27	Between groups	4.658	2	2.329	2.434	0.093
	Within groups	97.590	102	0.957		
	Total	102.248	104			
28	Between groups	0.647	2	0.324	0.314	0.731
	Within groups	104.112	101	1.031		
	Total	104.760	103			

Critical values F (df = 2, 120 $\alpha = 0.05$) = 3.07

The findings in Table 29 show that there are significant differences in seven items out of the 28 items at p-value <0.05 level of significance since the calculated F values were higher than the critical F value. This represents 25% of the total classroom practice items.The seven items were:

'Engage learners in mathematics activities using real objects for example; models and other materials' (F=6.910),

'Prefer to be still and use a calming tone when teaching' (F=4.947),

'Allow students some time to respond to questions asked in class' (F=5.618),

'Change teaching methods with respect to student gender' (F=6.238),

'Provide reasons for learning particular mathematics concepts in class' (F=6.451),

'Provide formulae during instruction as opposed to leading learners to arrive at the formulae' (F=4.451) and

'Change teaching materials according to students' gender,' (F=3.58)

A closer look at the classroom practices indicates that in six of these items, the mathematics teachers' mean scores were higher in girls' only classes except for 'provide formulae during instruction as opposed to leading learners to arrive at the formulae.' The mean score for this item was higher in boys' only classes. This could be an indication that the teachers teaching girls only mathematics classes may be handling girls differently. This may suggest that these teachers realize that their students require different interventions from the boys to excel in mathematics. In the item 'Provide formular during instruction as opposed to leading learners arrive at the formular', the teachers mean score was higher in boys' only mathematics classes. This suggests that the teachers believe that their students are good in mathematics and will stuggle on their own to understand how the formular was arrived at. This agrees with Mondoh (2001) who argues that

males process information actively meaning that they like trying things out and prefer self discovery modes of teaching. Further Post Hoc analysis using Scheffe were computed to determine the pairs of mathematics teachers that differed significantly and also the direction of difference. The results are summarized in Table 30.

Table 30

Post Hoc Results showing the Pairs of Mathematics Classes that Differed Significantly in Teachers' Classroom Practices

	Item	Class Gender (I)	Class gender (J)	Mean difference (I-J)	p-value
1	Engage learners in mathematics activities using real objects for example;models and other materials	Boys	Girls	-0.2167	0.631
			Mixed	0.5500*	0.022
		Girls	Boys	0.2167	0.631
			Mixed	0.7667*	0.004
		Mixed	Boys	-0.5500*	0.022
			Girls	-0.7667*	0.004
2	Allow students sometime before responding to questions asked in class	Boys	Girls	-0.1026	0.871
			Mixed	0.4641*	0.027
		Girls	Boys	0.1026	0.871
			Mixed	0.5667*	0.017
		Mixed	Boys	-0.4641*	0.027
			Girls	-0.5667*	0.017
3	Change teaching methods with respect to students gender	Boys	Girls	-0.6667	0.105
			Mixed	0.4083	0.325
		Girls	Boys	0.6667	0.105
			Mixed	1.0750*	0.003
		Mixed	Boys	-0.4083	0.325
			Girls	-1.0750*	0.003

(Table continues)

	Item	Class Gender (I)	Class gender (J)	Mean difference (I-J)	p-value
4	Provide reasons for learning particular maths concepts in class	Boys	Girls	-0.6745*	0.025
			Mixed	0.1684	0.732
		Girls	Boys	0.6745*	0.025
			Mixed	0.8429*	0.003
		Mixed	Boys	-0.1684	0.732
			Girls	-0.8429*	0.003
5	Provide formulae during instruction as opposed to leading learners to arrive at the formulae	Boys	Girls	0.4164	0.447
			Mixed	0.8564*	0.014
		Girls	Boys	-0.4164	0.447
			Mixed	0.4400	0.404
		Mixed	Boys	-0.8564*	0.014
			Girls	-0.4400	0.404
6	Change teaching materials according to students gender	Boys	Girls	-0.8379*	0.046
			Mixed	-0.0929	0.951
		Girls	Boys	0.8379*	0.046
			Mixed	0.7450	0.084
		Mixed	Boys	0.0929	0.951
			Girls	-0.7450	0.084

*Means significant at p-value<0.05

The findings in Table 30 indicate that for item 1 and 2 there were significant differences between teachers teaching in boys' only and mixed sex classes in favour of boys' only. The findings also indicate that for the same item there are significant differences between girls' only and mixed sex classes in favour of girls' only. This may imply that teachers engaged learners more using concrete materials in single sex classes as compared with mixed sex classes. For practice 3 which was 'change teaching methods with respect to students' gender,' there were significant differences between girls' only and mixed sex classes in favour of girls' only classes. This may imply that the mathematics teachers use different teaching methods in girls' only classes as compared to mixed sex classes.

This could be explained by the fact that this was possible since all the students in the class belonged to the same sex. The finding agrees with NASPPE (2010) which recommends gender friendly teaching methods for effective instruction in girls' only classes. This could imply that mixed sex classes pose serious challenges for mathematics teachers when trying to use gender preferred teaching methodologies. The findings also show that for practice 4 which was 'Provide reasons for learning particular mathematics concepts in class,' there were significant differences between mathematics teachers teaching girls' only and boys' only classes in favour of girls. There were also significant differences between girls' only and mixed sex classes in favour of girls' only classes. This may indicate that teachers provided reasons for learning mathematics concepts more in girls' only classes as compared to both boys' only and mixed sex classes. This finding agrees with Mondoh (2001) who argues that mathematics teachers should constantly provide girls with reasons for learning particular concepts in class. According to Mondoh, this would inject meaning in whatever is being learnt and hopefully motivate them to actively participate in mathematics lessons thereby increasing their performance in the subject.

On the practice 'Provide formulae during instruction as opposed to leading learners to arrive at the formulae,' there were statistically significant differences between the teachers teaching boys' and mixed sex classes in favour of boys' only classes. This could indicate that teachers appreciate the active nature of the majority of boys and therefore only provide them with the formulae and leave them to apply it in real life situations. Mondoh (2001) contends that a majority of boys are active and like trying things out for themselves. This is supported by Changeiywo and Mbugua (2010) who argue that boys prefer being actively involved in terms of doing through 'hands on' experiences.

Finally on whether teachers change teaching materials according to students' gender, the findings show statistically significant differences between those teaching girls and boys' only classes in favour of girls. This indicates that there are differences in the mathematics teaching materials used by teachers in boys' only and girls' only classes. This finding is in line with NASSPE (2010), Baudino (2007) and Younger and Warrington (2013) who argue that teachers need to use gender sensitive instructional media in order to eliminate gender disparity in

mathematics performance. Further, ANOVA was computed to compare the overall mean scores in teachers' classroom practices. The results are reported in Table 31.

Table 31

ANOVA Results showing the Differences in County Schools' Mathematics Teachers' Classroom Practices in Gender Streamed (Girls' and Boys' Only) and Mixed Sex Classes

	Sum of squares	df	Mean square	F	P-value
Between groups	0.841	2	0.421	2.046	0.135
Within groups	20.975	102	0.206		
Total	21.817	104			

Critical values F (df = 2,120 $\alpha = 0.05$) = 3.07; Calculated F = 2.046

From the ANOVA results in Table 31, the calculated F = 2.046 is lower than the critical value of F = 3.07 at alpha (α) = 0.05 level of significance. This indicates that there is no statistically significant difference in mathematics teachers' classroom practices in gender streamed and mixed sex mathematics classes within the county co-educational secondary schools. The null hypothesis which stated that there is no statistically significant difference in mathematics teachers' classroom practices in county co-educational secondary schools is therefore accepted. These findings again indicate that mathematics teachers do not consider the gender composition of their mathematics classes as a factor in their choice of classroom practices.

4.9 A Comparison of Teachers' and Students' Scores on the Classroom Practices in Mathematics Classes

The researcher in this section compared the teachers and their students' views on classroom practices in mathematics classes. The mean scores obtained by teachers and their students on the classroom practices were used. Table 32 shows the descriptive results of the comparison between teachers and their students on the classroom practices.

Table 32

A Comparison of Mean Scores and SD of Mathematics Teachers and Students in County Schools on their Views on Classroom Practices

Gender Composition	Respondent Category	N	Mean	SD
Boys' Only	Students	69	2.53	0.42
	Teachers	40	2.49	0.52
Girls' Only	Students	65	2.49	0.44
	Teachers	25	2.67	0.42
Mixed sex	Students	96	2.44	0.47
	Teachers	40	2.44	0.40

The results in Table 32 show that generally most of the classroom practices in mathematics classes enhance the teaching and learning of the subject as indicated by the mean scores of over 2.0 out of 4.0, obtained by both the teachers and students in boys' only, girls' only and mixed sex classes. These mean scores were further compared using the single t-test and the results presented in Table 33.

Table 33

Single t-test Results of the Comparisons between Mathematics Teachers and Students Views in County Schools on Classroom Practices.

Gender Composition of Class		t	Df	p-value
Boys' only	Equal variances assumed	0.471	107	0.639
	Equal variances not assumed	0.443	67.800	0.659
Girls' only	Equal variances assumed	-1.808	88	0.074
	Equal variances not assumed	-1.835	44.973	0.073
Mixed sex	Equal variances assumed	-0.010	134	0.992
	Equal variances not assumed	-0.010	84.959	0.992

The findings in Table 33 show that there are no statistically significant differences in the classroom practices scores obtained by teachers and students in boys' only, girls' only and mixed sex classes at p-value<0.05. This could indicate that the students were in agreement with what

the teachers stated in terms of the classroom practices in mathematics classes. Table 34 presents the descriptive results on the comparisons of teachers and students views on classroom practices in mathematics classes within the Sub-county public co-educational secondary schools.

Table 34

Mean Scores and SD of Mathematics Teachers and Students in Sub-County Schools' Comparisons on their views on Classroom Practices

Gender Composition of Class	Respondent Category	N	Mean	SD
Boys' only	Students	88	2.05	0.67
	Teachers	29	2.51	0.35
Girls' only	Students	86	2.49	0.43
	Teachers	28	2.49	0.55
Mixed sex	Students	112	2.49	0.43
	Teachers	40	2.47	0.43

The findings in Table 34 show that both students and teachers obtained mean scores of over 2.0 out of a maximum score of 4.0 on the classroom practices. This is an indication that generally the teachers' practices in mathematics classes enhance the teaching and learning of the subject. These mean scores obtained by teachers and students were further compared using the single t-test and the results presented in Table 35.

Table 35

Single t-test Results of the Comparisons between Mathematics Teachers and Students in Sub-County Schools on their views on Classroom Practices

Class Gender Composition		t	df	p-value
Boys' only	Equal variances assumed	-3.471	115	0.001*
	Equal variances not assumed	-4.666	92.296	0.000*
Girls' only	Equal variances assumed	0.002	112	0.998
	Equal variances not assumed	0.002	38.671	0.999
Mixed sex	Equal variances assumed	0.259	150	0.796
	Equal variances not assumed	0.257	68.062	0.798

*Means that the mean difference is statistically significant at P-value < 0.05 level

The results in Table 35 show that the there are statistically significant differences in the mean scores obtained by teachers and students on classroom practices in boys' only classes. However, there are no statistically significant differences in the mean scores obtained by teachers and students on classroom practices in girls' only and mixed sex classes. This indicates that the students in boys' only classes differed with their teachers on the classroom practices in mathematics classes. The students do not seem to agree with what the teachers are saying they practice in mathematics classes. This could mean that may be the students' in boys'only mathematics classes do not approve of the classroom practices used by their teachers during mathematics lessons.

4.10 Discussion of the Findings

The study sought to establish the influences of gender streamed (boys' and girls' only) classes on mathematics teachers attitudes, perceptions and classroom practices in public co-educational secondary schools. To achieve this, two types of co-educational secondary schools were sampled. These were; those that have gender streamed classes (have separate classes for boys and girls) and those that teach both boys and girls in the same class (mixed sex classes). In addition, two school categories were sampled. These were; sub-county and county schools. The mathematics teachers' attitudes, perceptions and classroom practices were compared between the two types of co-educational secondary schools and by school category (sub-county and county schools).

Several studies conducted in mixed sex classes reveal that there have been unequal treatments of boys and girls in such classes by teachers (Mukwa and Too, 2005; Githua 2002; Knight, 1999 and Mondoh, 2002). Knight (1999) and Rury (2008) have criticized such classes arguing that they erode the morals of learners. Knight asserts that in secondary schools, learners are at the adolescent stage of development; hence it was hazardous especially for girls to be in close proximity with boys for long periods. These classes and schools have also been accused of providing identical learning conditions to boys and girls yet the society assigns different roles to men and women (Rury, 2008; Shiundu and Omulando, 1992). Rury further reiterates that mixed sex schools initially began as boys' only schools which later admitted girls. According to him, girls in these schools are being subjected to an education that was initially meant for boys yet each sex has unique mental constitutions and capabilities.

Studies conducted in mixed sex schools and classes have revealed that such mixed sex settings may be detrimental to the effective learning of students especially in mathematics. Some scholars have argued that, teachers use teaching methods that are not preferred by learners especially girls and could be responsible for their underachievement in the subject. Eshiwani (1975) in a study on gender differences and mathematical abilities among Kenyan High School children found that in mathematics classes, teachers use the conventional classroom approach to teach mathematics. Eshiwani contends that this method is preferred by boys and yet disliked by girls who prefer the Programmed Instruction (P.I) and the Integrated Programmed Instruction approach. Eshiwani and Githua and Mbugua (2004) findings confirm that there are in deed gender differences in preferred instructional methods in mathematics by students.

Mondoh (2002) argued that in addition to instructional methods, there exist other factors within mixed sex settings that aggravate girls' poor performance in mathematics. These include; gender role stereotyping, past academic experiences, examinations, teaching staff, syllabus and text books. According to the scholar, mathematics teachers are responsible for this through, disrespecting learners' cognitive styles and their failure to encourage girls to study and excel in mathematics.

As a result of the numerous criticisms of mixed sex learning settings, single sex settings (boys' and girls' 'only classes) have been created especially within co-educational secondary schools in order to increase girls' attitude towards mathematics (Preckel, Goetz, Peckrun and Kleine, 2008). It was on the basis of this that the study was designed to establish the impact of this practice on mathematics teachers' attitudes, perceptions and classroom practices. This study has shed some light on these teacher factors in gender streamed (girls' and boys' only) classes and mixed sex classes.

Hypothesis one and two sought to find out whether there were statistically significant differences in teachers' attitudes towards gender streamed and mixed sex mathematics classes between those who teach gender streamed (boys' and girls' only) and mixed sex classes in sub-county and county co-educational secondary schools. The findings of the study have shown that mathematics teachers' attitudes towards gender streamed (girls' and boys' only) classes and mixed sex classes are positive. The findings indicate that in sub-county schools, mathematics teachers' attitudes were higher in boys' only with a mean of 4.23, followed by mixed sex with a mean of 4.13 and lastly girls' only with a mean of 3.95 out of the highest possible score of 5 points. In the case of county schools, findings show that the teachers attitudes were higher in boys' only classes with a mean score of 4.38 followed by mixed sex with a score of 4.30 and finally girls' only with a mean score of 4.04.

From the results, it is clear that the attitude mean scores were generally higher in county schools for each corresponding class type than sub-county schools. This could be attributed to the fact that students admitted in county schools perform better in mathematics since they were admitted to these schools with higher KCPE scores than their counterparts in sub-county schools. This could imply that the academic ability level of the learners may influence the teachers' attitude towards his or her classes. It is also clear from the findings that these teacher attitudes mean scores were lower in girls' only classes in both sub-county and county schools.Further,there were no statistically significant differences in mathematics teachers' attitudes towards gender streamed (boys' and girls' only) and mixed sex classes in sub-county schools. However, statistically significant differences existed in teachers' attitudes mean scores in the county schools. Post Hoc results indicate that there were statistically significant differences in the

mathematics teachers' attitudes mean scores towards boys' and girls' only classes in favour of boys' only classes.

The findings of this study seem to agree with those of Mukwa and Too (2005) who argue that teachers' treatment of boys and girls in class conform to societal stereotypes. These stereotypes seem to allude to the fact that boys should be superior in mathematics. This may explain why mathematics teachers have more positive attitudes towards boys' only classes as opposed to girls' only classes. The findings also agree with Gina and Moshe (2001) who asserts that teachers view boys as their best mathematics students, hence concentrate more on them than the girls. This study has demonstrated that despite the creation of separate classes for the sexes in co-educational schools, teachers still feel that boys are better learners of mathematics than girls.
However, the findings of this study contradicts those of Rennie and Parker (1997) who found that the single – sex classroom environment resulted in improved teacher attitudes towards boys and girls as learners of mathematics. Rennie and Parker argued that single sex learning environments provided the teachers with opportunities to address apparent gender related short comings arising from boys' and girls' previous educational experiences.

Hypotheses three and four sought to find out whether there were statistically significant differences in teacher perceptions of gender streamed (boys' and girls' only) and mixed sex classes between those who teach gender streamed and mixed sex classes within coeducational secondary schools in sub-county and county schools respectively. Findings show that mathematics teachers' perceptions mean scores were higher in boys' only classes with a mean of 3.83 followed by mixed sex classes with a mean of 3.66 and lastly girls' only classes with a mean of 3.52 in sub-county schools out of the highest possible score of 5. In county schools teacher perception mean scores were higher in mixed sex classes with a mean of 3.95 followed by boys' only classes with a mean of 3.88 and lastly girls' only classes with a mean of 3.85. From the findings, it is clear that mathematics teachers' perceptions mean scores were lower in girls' only classes in each of the two school categories.

Furthermore, the findings show that there are no statistically significant differences in mathematics teachers' perceptions of gender streamed (girls' and boys' only) classes and mixed

sex classes in the two school categories. The findings indicate that from the mathematics teachers' perspectives, there are no special benefits that may accrue to learners learning the subject in boys' only, girls' only and mixed sex classes. To them boys and girls can excel in the subject irrespective of the class type. These findings are in agreement with those of the American Association of University Women (1998), Chouinard (2008), La Fleur (2011) and Hyde and Allison (2014).

American Association of University Women (1998) reported that girls' achievement did not improve as a result of creation of single sex classes within co-educational secondary schools. The report further noted that the teachers did not notice boys' learning and writing problems in single sex classes. As a result, they inappropriately handled their emotional and social needs always interpreting their behaviour as discipline problems. The findings further agree with those of La Fleur (2011) in a study on attitudes and participation in gender specific mathematics classrooms. The study findings showed that creation of single sex settings for boys and girls did not have a significant effect on student's participation and attitudes towards mathematics. Chouinard (2008) studied 340 girls in grades seventh to 11^{th} for three academic years. By the end of the study Chouinard found that irrespective of the school type (single sex or co-educational), there was little impact on girls' achievement, motivation and attitudes towards mathematics.Finally Hyde and Allison's findings did not support the view that both males and females educational outcomes are better in single sex settings.They found little or no advantages of single sex classes over co-educational ones in mathematical performance, attitudes and self concept.

However, there are other studies which found contrary findings which indicate that single sex settings in co-educational secondary schools could be beneficial to the learners (Baker & Jacobs (1999; Ferrara & Ferrara 2004; Willis, Kilpatrick & Hulton, 2006). Willis, Kilpatrick & Hulton, (2006) conducted a study in a Tasmaniam primary school to look at social and academic outcomes from gender – specific classrooms. The findings indicated that both the teachers and students benefited in gender specific classrooms. They discovered that single-sex classrooms improved students' attitude towards school and motivated them to do better in class.

Baker and Jacobs (1999) found that girls preferred the single-sex classes because girls were more supportive of each other and were comfortable in class without the boys. Their study also indicated that girls were more successful in the single sex classroom than the boys.Ferrara and Ferrara (2004) conducted a study in Ellenville central school district over a three year period. The students were placed in single-sex classrooms based on parents' permission. The findings indicated that the boys' classes were behind in the curriculum compared to girls' classes. Boys' behaviours were worse than the girls. However, boys and girls classroom participation increased and were less self – conscious about their academic work.

Hypothesis five and six sought to establish whether there were statistically significant differences in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls' only) and mixed sex classes in sub-county and county co-educational secondary schools respectively. The findings reveal that there were no statistically significant differences in the classroom practices.This implies that mathematics teachers' classroom practices are similar in gender streamed (boys' and girls' only) and mixed sex classes in both sub-county and county schools. This further implies that the class gender composition has no effect on the practices adopted by teachers in their teaching. This could be attributed to the nature of training packages for secondary school mathematics teachers that emphasize on conventional classroom approaches. As a result, mathematics teachers lack the pedagogical skills required in teaching gender specific mathematics classes.

These findings are in agreement with those of Baker and Johns (1999). The researchers conducted a study in single sex two-seventh-grade mathematics and science classes. They found that the teachers did not change their teaching styles to fit the needs of the classes. Eshiwani (1975) concurs with Baker and Johns who found that mathematics teachers still used the conventional classroom approaches to teach boys and girls mathematics. Eshiwani argues that such approaches are not preferred by girls. La Fleur's (2011) findings also agree with the findings of this study, he found that mathematics teachers' teaching methods did not change in both boys' and grils' only mathematics classes in pre-algebra lessons.

However, there are some studies which have found contrary results. Rennie and Parker (1997) conducted a study on students' and teachers' perceptions of single-sex and mixed – sex mathematics classes. The researchers conducted their study in four co-educational schools in Australia. The findings indicated that the teachers used different strategies with the two kinds of classes. The teachers interviewed indicated that the single-sex environment provided them with opportunities to address boys' and girls' shortcomings from their previous educational experiences.

Slater, Lujan and Dicarlo (2007) conducted a study on whether learning style preferences are influenced by gender among first – year medical students in Detroit. The findings of the study showed that there were gender differences in preferred modes of information delivery. Female students' preferences were found to be more diverse than male students. Female students preferred to use all their senses to take in information at any given time. This is affirmed by Anfara and Mertens (2008) who contends that teachers need to be aware that boys and girls are wired differently. This means that they also learn differently. As a result, Ferrara and Ferrara (2004) argues that teachers have to change their teaching strategies in order to meet the learning needs of boys and girls. Baker and Jacobs (1999) warn that if teachers do not make the necessary curricular and pedagogical changes needed to support boys and girls then both are likely to loose in single-sex classes.

This study has demonstrated that with the creation of single sex mathematics classes in co-educational schools, teachers have not adjusted their teaching strategies, methods and resources. The mathematics teacher training institutions should incorporate gender- related teaching strategies and pedagogical skills in their training packages. In-service courses for practicing mathematics teachers on how gender can influence learning should also be conducted.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the major findings and conclusions of the study set out to determine the influence of co-educational secondary school gender streamed classes on mathematics teachers' attitudes, perceptions and classroom practices. The implications of the findings and suggested recommendations have also been presented.

5.2 Summary of the Findings

The following is a summary of the findings of the study that was set to determine the influence of co-educational secondary school gender streamed classes on mathematics teachers' attitudes, perceptions and classroom practices.

i. There is no statistically significant difference in mathematics teachers' attitude towards their classes between those who teach in gender streamed (boys' and girls'only) and in mixed sex classes within the sub-county public co-educational secondary schools.

ii. There is a statistically significant difference in mathematics teachers' attitudes towards their classes between those who teach in gender streamed (boys' and girls'only) and in mixed sex classes within the county public co-educational secondary schools.

iii. There is no statistically significant difference in mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls'only) and in mixed sex classes within the sub-county public co-educational secondary schools.

iv. There is no statistically significant difference in mathematics teachers' perceptions of their classes between those who teach in gender streamed (boys' and girls'only) and in mixed sex classes within the county public co-educational secondary schools.

v. There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls'only) and in mixed sex classes within the sub-county public co-educational secondary schools.

vi. There is no statistically significant difference in mathematics teachers' classroom practices between those who teach in gender streamed (boys' and girls'only) and in mixed sex classes within the county public co-educational secondary schools.

5.3 Conclusions of the Study

From the findings of the study, the researcher arrived at the following conclusions;

i. That the mathematics teachers' attitudes towards gender streamed (boys' and girls' only classes) and mixed sex classes in both sub-county and county categories of co-educational secondary schools were positive. Their mean scores were higher in boys' only classes followed by mixed sex and lastly girls' only classes in the two school categories. Further, these teacher attitudes did not differ significantly in sub-county schools but differed significantly in county schools between boys' only and girls' only classes in favour of boys' only classes.

ii. That there are no special benefits that may accrue to learners learning the subject in gender streamed or mixed sex mathematics classes. The mathematics teachers' perception mean scores were higher in boys' only followed by mixed sex and lastly girls' only classes in sub-county schools. However, the mean scores were higher in mixed sex followed by boys' only and lastly girls' only in classes' county schools. In addition, the mean scores of teacher perceptions in the two school categories did not differ significantly.

iii. That mathematics teachers' classroom practices in gender streamed and mixed sex mathematics classes were similar in the three types of classes in each of the two school categories. However, the teachers' mean score of classroom practices was higher in girls' only classes in the county category of schools.

5.4 Implications of the Findings

The study findings indicate that mathematics teachers' attitudes towards gender streamed (boys' and girls' only) and mixed sex classes in sub-county and county schools are positive. However, their attitude mean scores are lower in girls' only classes. This implies that mathematics teachers do not like teaching girls' only mathematics classes' as much as mixed sex and boys' only classes. This finding seems to suggest that there is need to provide more in-service courses to these teachers so that their attitudes towards these classes may improve. It could also imply that teachers are not well prepared to handle girls' only mathematics classes.

The results of the study have shown that the mathematics teachers perceive that there are no special benefits that may accrue to learners learning mathematics in gender streamed (boys' and

girls' only) and mixed sex mathematics classes in sub-county and county schools. This implies that the teachers do not perceive any significant benefits of any of these classes over the others in the teaching and learning of mathematics. To the teachers, students can learn and excel in the subject in all the three types of mathematics classes (girls' only, boys' only and mixed sex classes).

In the case of the classroom practices by mathematics teachers in gender streamed and mixed sex classes in sub-county and county schools, the study revealed no differences. This implies that the teachers' classroom practices in mathematics lessons are similar in girls' only, boys' only and mixed sex classes. It further implies that the gender composition of the class does not influence the way teachers teach learners mathematics. This is an indication that teachers do not make use of gender specific instructional strategies and methods in their teaching. Hence, they require in-service training to sensitize them on these strategies and methods and thereby apply them in their teaching.

5.5 Recommendations of the Study

In view of the conclusions the following recommendations were made;

i. The Ministry of Education through the Quality Assurance and Standards Officers should establish why mathematics teachers have lower attitudes and perceptions of girls' only classes. They should thereafter organize intensive in-service training for the mathematics teachers.
ii. The mathematics teachers training institutions need to incorporate gender issues in their packages. This would help to sensitize the teachers early enough on the gender appropriate teaching strategies and methods.
iii. That mathematics teachers need to be in-serviced on how to tailor their classroom practices to correspond with the various learning styles of their learners before the creation of gender streamed mathematics classes. If that is not done then such classes' shoud be abolished and co-educational schools advised to revert to mixed sex classes.

5.5.1 Recommendations for Further Research

During the course of this study, certain issues came into light, which may warrant further research. These are;

i. A qualitative study should be undertaken to establish the reasons for lower mathematics teachers' attitudes towards and perceptions of girls' only classes.

ii. An experimental study should be conducted that will incorporate gender friendly teaching strategies and methods and its effects on students' achievement and motivation in mathematics be determined.

iii. A study to be conducted to determine the impact of gender streamed classes in co-educational secondary schools in the teaching of other subjects in the secondary school curriculum.

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APPENDICES

APPENDIX A: MATHEMATICS TEACHERS' QUESTIONNAIRE (MTQ)

Dear respondent,

I am a student undertaking a study entitled: "Influence of co-educational secondary school gender streamed classes on mathematics teachers' attitudes, perceptions and classroom practices in four counties of kenya" at Egerton University. I have selected you to participate in the study. Please note that all the responses will be kept confidential and the information given will only be used for research purpose. Please do not write your name anywhere in this questionnaire. Thanking you in advance.

Thank You

Anne Barmao

PART A: PERSONAL INFORMATION

1. Please tick in the relevant box to indicate your **gender**

Female ☐ Male ☐

2. Teaching Experience, please tick in the relevant box applicable to you

Below 5 years ☐ 6 – 10 years ☐ 11 – 15 years ☐

16 – 20 years ☐ 21 – 25 years ☐ 26 years and above ☐

3. **Qualifications,** please tick in the box appropriate to your qualification

Diploma ☐

Degree (B.Ed) ☐

Degree (B. A or B.Sc etc with Post graduate diploma in Education) ☐

Masters (M.Ed) ☐

Masters (Any other Masters degree) ☐

PhD ☐

4. Please indicate by ticking your **school category** District ☐ County ☐

5. How many **mathematics lessons** in total do you teach per week? _____

6. How many **lessons** in total do you teach per week? _____

PART B AND C: THESE TWO SECTIONS ARE TO BE COMPLETED BY ALL MATHEMATICS TEACHERS INCLUDED IN THE STUDY SAMPLE.

These are teachers who teach both mixed and single sex mathematics classes. However, if you teach in both boys' and girls' only classes, kindly restrict your perceptions and attitudes to either the boys' or girls' only class.

7. Please indicate by ticking against the gender composition of your mathematics class

   i) Boys' Only ☐

   ii) Girls Only ☐

   iii) Mixed Sex ☐

The following statements indicate an **attitude** of teaching boys and girls' mathematics in class. Please indicate the extent to which you agree with each statement using the following five point scale; ***Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD).*** Please tick in the box that best indicate how closely you agree or disagree with each statement.

	STATEMENT	**SA**	**A**	**U**	**D**	**SD**
8.	I am always under a terrible strain while teaching mathematics in this class.					
9.	Teaching mathematics in my class is very interesting and i enjoy it.					
10.	I do not always like teaching mathematics in this class and it scares me to have to teach it.					
11	Teaching mathematics in this class is fascinating and fun.					
12	My mind goes blank and i am unable to think clearly when teaching in this class.					
13	Teaching this class mathematics makes me feel secure and stimulated.					
14	I feel a sense of insecurity when teaching mathematics in this class.					

	STATEMENT	SA	A	U	D	SD
15	I feel good when teaching mathematics in this class.					
16	Teaching mathematics in my class makes me feel uncomfortable.					
17	I really like the gender composition of my mathematics class.					
18	I dislike teaching mathematics in this class.					
19	Teaching mathematics in this class is something which I enjoy a great deal.					
20	It makes me nervous to even think about having to teach this class mathematics.					
21	I am happier in my mathematics class than any other class.					
22	I have never liked this mathematics class and it is my most dreaded class.					
23	I am able to teach my class mathematics without too much difficulty.					
24	Students in my class are dull and boring.					

The following statements indicate a **perception of teaching boys and girls' mathematics in class.** Please indicate the extent to which you agree with each statement using the following five point scale; **S*trongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD).*** Please tick in the box that best indicate how closely you agree or disagree with each statement.

	STATEMENT	**SA**	**A**	**U**	**D**	**SD**
25	In this mathematics class students are usually more motivated to work very hard in mathematics problems.					
26	Teaching students' mathematics in this class is frustrating.					
27	I am sure students can learn mathematics well in this class.					
28	This class makes students to be unsure of the need to continue studying mathematics.					
29	Students in this class are afraid of doing mathematics.					
30	This mathematics class makes learners to be more competitive.					
31	This mathematics class makes learners to be more adventurous.					
32	In this mathematics class learners volunteer to answer questions.					
33	This mathematics class increase students' interest in the subject.					

	STATEMENT	SA	A	U	D	SD
34	Students in my class hardly practice solving mathematics problems on their own unless they are asked to do so.					
35	This class encourages learners to aspire to study mathematics after K.C.S.E.					
36	Learning mathematics in this class makes the learning of the subject rewarding to the learners.					
37	Students end up loving mathematics if they are taught the subject in this class.					
38	This class encourages learners to study hard in mathematics.					
39	This class discourages students from taking a career that requires mathematics.					
40	This mathematics class is livelier.					
41	Learners in this mathematics class are co-operative.					
42	This mathematics class has a better working atmosphere for the learners.					

PART C: The following represents some of the classroom practices practiced by mathematics teachers during their lessons. How often do you practice each of the following in your mathematics instructions? Please put a tick against the practice using the following five-point scale;

i) **Never** means not at all

ii) **Rarely** means a few times in a year

iii) **Sometimes** means once or twice a month

iv) **Often** means once or twice a week

v) **Always** means almost all mathematics lessons

	PRACTICE	**Never**	**Rarely**	**sometimes**	**Often**	**Always**
44	Organize learners in small group discussions					
45	Require students to justify their answers					
46	Engage students in project based work					
47	Connect mathematics with other subjects					
48	Ask students to explain mathematics concepts to one another					
49	Engage the whole class in discussions.					
50	Recognize the learners 'way of thinking and respond by teaching to their cognitive styles.					
51	Engage learners in mathematics activities using real objectsfor example; models and other materials.					
52	Make formal mathematics presentations to the rest of the class.(i.e. follow conventional lesson plan format from introduction, lesson development, supervised practice and finally conclusion)					
	PRACTICE	**Never**	**Rarely**	**sometimes**	**Often**	**Always**

53	Present mathematics lessons informally (do not follow conventional lesson plan format from introduction, lesson development, supervised practice and finally conclusion).					
54	Allow students to design their own mathematics activities or investigations. (Discovery learning)					
55	Teach at the learners pace.					
56	Allow students some time to respond to questions asked in class.					
57	Relate mathematics to the real world.					
58	Teach mathematics using story problems.					
59	Change teaching methods with respect to students' gender.					
60	Provide reasons for learning particular mathematics concepts in class.					
61	Provide formulae during instruction as opposed to leading learners to arrive at the formulae.					
62	Direct students towards a deeper understanding of concepts.					
63	Arrange mathematics content in a topic in a step by step form.					
64	Treat learners as allies.i.e allow learners to call me using my first name.					
65	Choose teaching materials according to students' gender.					
	PRACTICE	**Never**	**Rarely**	**sometimes**	**Often**	**Always**

66	Teach using mathematics games and puzzles.					
67	Teach using out of class mathematics lessons.					
68	Teach in class using excessively loud voice accompanied with a lot of movements.					
69	Prefer to be still and use a calming tone when teaching.					
70	Praise students for trying to provide answers to questions					
71	Withhold praise from students until they produce a correct answer.					

Thank you, for taking your precious time to respond to this questionnaire.

KEY

1) Questions 1-6 seek to establish the background information of the teachers.

2) Questions 8-24 evaluate the teachers' attitudes towards mixed and gender streamed (girls' and boys' only) mathematics classes.
3) Questions 25-43 evaluate the teachers' perceptions of mixed and gender streamed (girls and boys' only) mathematics classes.
4) Questions 44-71 provide information on the classroom practices practiced by mathematics teachers in their classes.

APPENDIX B: MATHEMATICS STUDENTS QUESTIONNAIRE (MSQ)

Dear respondent,

I am a student undertaking a study entitled "Influence of co-educational secondary school gender streamed classes on mathematics teachers' attitudes, perceptions and classroom practices in four counties of Kenya" at Egerton University. I have selected you to participate in the study. Please note that all the responses will be kept confidential and the information given will only be used for research purpose. Please do not write your name anywhere in this questionnaire. Thanking you in advance

Thank You

Anne Barmao

PART A: PERSONAL INFORMATION

5. Please tick in the relevant box to indicate your **gender**

Female ☐ Male ☐

6. Please tick in the relevant box your class level.

Form ONE ☐ Form TWO ☐ Form THREE ☐

Form FOUR ☐

4. Please indicate by ticking your **school category** District ☐ County ☐

5. Kindly indicate in the space provided the name of your **county** ----------

---

6. Kindly indicate in the space provided the name of your **district**----------

---

8. Please indicate by ticking against the **gender composition** of your mathematics class

i) Boys' Only ☐

ii) Girls Only ☐

iii) Mixed Sex ☐

PART B:

The following represents some of the classroom practices practiced by mathematics teachers during their lessons. How often does your teacher practice each of the following in his/her teaching? Please put a tick against the practice using the following five-point scale;

i) **Never** means not at all

ii) **Rarely** means a few times in a year

iii) **Sometimes** means once or twice a month

iv) **Often** means once or twice a week

v) **Always** means almost all mathematics lessons

	PRACTICE	**Never**	**Rarely**	**sometimes**	**Often**	**Always**
1	Organize you (learners) in small group discussions					
2	Require you (learners in class) to justify your answers to questions asked by teacher in class.					
3	Engages us (learners) in project based work					
4	Connect mathematics with other subjects					
5	Asks us (learners) to explain mathematics concepts to one another					
6	Engages the whole class in discussions.					
7	Teach mathematics using my preferred method of teaching or in a way I enjoy most.					
8	Engages us (learners) in mathematics activities using real objects for example; models and other materials.					
9	Present mathematics lessons formally i.e in the following way (introduces each new lesson by asking us questions on the previous lesson, then introduces the day's lesson, gives us an exercise on the same and marks our work and finally concluding the lesson by correcting the work on chalkboard and asking us questions on what was learnt during the lesson.					

	PRACTICE	**Never**	**Rarely**	**sometimes**	**Often**	**Always**
10	Present mathematics lessons informally i.e **does not follow the following format** (introduces each new lesson by asking us questions on the previous lesson, then introduces the day's lesson, gives us an exercise on the same and marks our work and finally concluding the lesson by correcting the work on chalkboard and asking us questions on what was learnt during the lesson.					
11	Allows us (learners) to design our own mathematics activities or investigations (discovery learning).					
12	Teach at my pace of learning i.e. (Teacher is no too fast or too slow for me in teaching mathematics).					
13	Allows (us) learners some time to respond to questions he/ she asks in class.					
14	Relate mathematics to the real world.					
15	Teach mathematics using story problems.					
16	Teach using your preferred method of teaching.eg discussions, discovery learning methods e.t.c					
17	Provide reasons for learning particular mathematics concepts in class.					
18	Provide formulae during instruction as opposed to leading us (learners) to arrive at mathematics formulae during teaching.					

	PRACTICE	**Never**	**Rarely**	**sometimes**	**Often**	**Always**
19	Directs us (learners) towards a deeper understanding of mathematics concepts.					
20	Arrange mathematics content in a topic in a step by step form.					
21	Allows us (learners) to call him/her using his/her first name.					
22	Choose teaching materials according to my preference i.e. based on gender					
23	Teach using mathematics games and puzzles.					
24	Teach using out of class mathematics lessons.					
25	Teach in class using excessively loud voice accompanied with a lot of movements.					
26	Prefer to be still and use a calming tone when teaching.					
27	Praises me and other learners for trying to provide answers to questions					
28	Withhold praise from me and other learners until we produce a correct answer.					

Thank you, for taking your precious time to respond to this questionnaire.

KEY

1) Part A of the questionnaire sought background information of the students.

2) Part B sought information from the students on the classroom practices practiced by mathematics teachers in class.

APPENDIX C: RESEARCH AUTHORIZATION

Noted and recommended.
For: DISTRICT EDUCATION OFFICER
NAKURU DISTRICT

REPUBLIC OF KENYA

HARAMBEE

NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349
254-020-310571, 2213123, 2219420
Fax: 254-020-318245, 318249
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

Our Ref: **NCST/RCD/14/012/131/4**

Date: **24th February, 2012**

Anne Chepchirchir Barmao
Egerton University
P. O. Box 536
EGERTON

Noted and recommended
FOR DISTRICT EDUCATION OFFICER
MOLO DISTRICT
31.7.2012

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on "***Influence of gender streamed classes on Mathematics teachers attitudes, perceptions & classroom practices in Rift Valley Province, Kenya***" I am pleased to inform you that you have been authorized to undertake research **in Rift Valley Province** for a period ending ***31st December 2013.***

You are advised to report to **the District Commissioners & the District Education Officers in Rift Valley Province** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy** - pdf of the research report/thesis to our office.

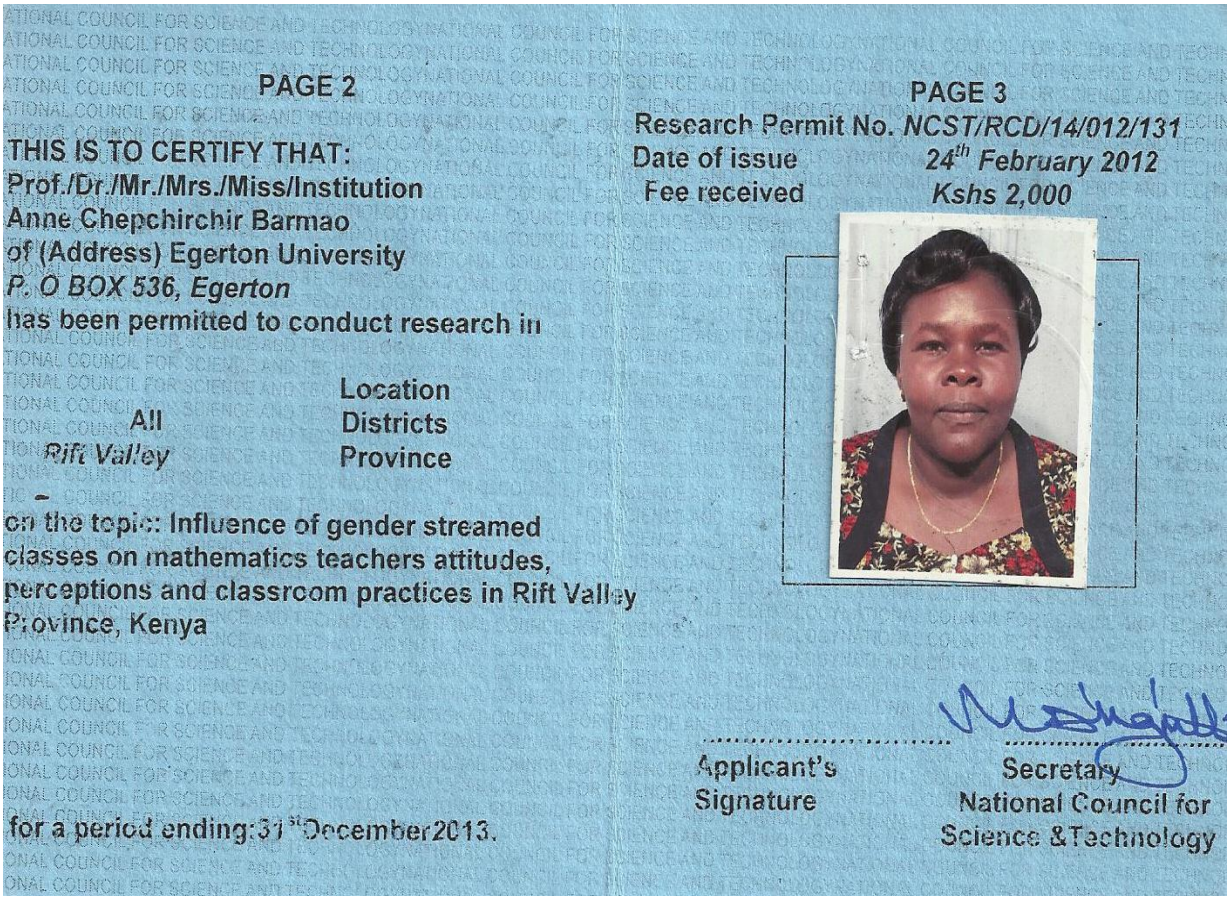
DR. M. K. RUGUTT, PhD, HSC
DEPUTY COUNCIL SECRETARY

Copy to:
The District Commissioner
Rift Valley District

The District Education Officer
Rift Valley District

"The National Council for Science and Technology is Committed to the Promotion of Science and Technology for National Development."

APPENDIX D: RESEARCH CLEARANCE PERMIT



PAGE 2

THIS IS TO CERTIFY THAT:
Prof./Dr./Mr./Mrs./Miss/Institution
Anne Chepchirchir Barmao
of (Address) Egerton University
P. O BOX 536, Egerton
has been permitted to conduct research in

All	Location
Rift Valley	Districts
	Province

on the topic: Influence of gender streamed classes on mathematics teachers attitudes, perceptions and classroom practices in Rift Valley Province, Kenya

for a period ending: 31st December 2013.

PAGE 3

Research Permit No. *NCST/RCD/14/012/131*
Date of issue *24th February 2012*
Fee received *Kshs 2,000*

Applicant's Signature

Secretary
National Council for
Science &Technology