Gender Difference in Mathematics Achievement Based on Instruction Through Cooperative Learning among Students in Secondary Schools in Meru South Sub-County, Kenya

[1]Benedict Mutina Maluni., [2]Caroline Ndunge Mutunga., [3]Prof. Adiel Magana., [4]Dr. Virginia Nyagah, PhD

[1]Department of Education, Chuka University

[2]Department of Social Sciences, Chuka University

[3]Department of Biological Sciences, Chuka University

[4]The Kiambu National Polytechnic

DOI: https://dx.doi.org/10.47772/IJRISS.2025.91100173

Received: 18 November 2025; Accepted: 27 November 2025; Published: 03 December 2025

ABSTRACT

Achievement in Mathematics at Kenya Certificate of Secondary Education (KCSE) examinations has been poor over the years. The low achievement has partly been blamed on teaching methods which do not actively involve learners in the learning process, depriving them of taking charge of their learning. The aim of this study was to investigate the effectiveness of cooperative learning strategy in enhancing students' attitude in Mathematics in secondary schools in Meru South Sub- County. The study employed the Solomon Four-Group, Non-equivalent Control Group Design. The target population for the study was 2430 form three students in 44 co-educational secondary schools in Meru South Sub-County. The sample comprised 164 form three students from four co-educational schools within the Sub-County. Random sampling was used to select the four schools from a list of prequalified schools. Prequalification was based on the number of students, students' entry behaviour, availability of teaching/learning resources and teachers' qualification. Simple random sampling technique was used to assign participating schools to experimental and control groups. A Mathematics Achievement Test (MAT). The instruments were piloted in Maara Sub-County in a co-educational secondary school with similar characteristics as the sampled schools. The reliability of the research instruments was estimated using Cronbach's Alpha. A reliability coefficient of 0.79 for MAT was obtained. Validity of the instruments was ensured through expert judgment. Data was analyzed using both descriptive and inferential statistics. The study found that MAT mean score for male (3.21) was lower than that of female (4.52). further, the t-test analysis established that the difference was no statistically significant between the mean scores for female and male students at α=0.05 significance level (t (86)=11.87, p>0.05).

Key words: Cooperative learning, Conventional teaching, Gender Differences, Mathematics

INTRODUCTION

Mathematics is a very important subject in an individual's daily life (Polya, 2011). Jebson (2012) notes that knowledge of Mathematics is required for science and technological advancement and attainment of the Millennium Development Goals (MDGs) on eradication of extreme poverty and hunger, reduction of child mortality, improvement of maternal health and combating of HIV/AIDS, malaria and other diseases. According to Umameh (2011), Mathematics education is bedrock and an indispensable tool for scientific, technological and economic advancement of any nation. Mathematics permeates the whole society and its use seems to assume ever increasing importance as society advances technologically. Mathematics skills and thinking are therefore not prerogative of scientists, engineers and technologists only, but they are used in everyday decision making by people (Azuka, 2000).

In order to bring desirable change in students learning, teaching methods used by educators should be best for the subject matter (Adunola, 2011). According to Zakaria, Chin and Daud (2010), teaching should not merely focus on dispensing content for students to memorize but should also actively involve students as primary participants. Oloo, Mutsotso and Masibo (2016) indicated that for effective acquisition of mathematical skills, teachers should use heuristic methods as much as possible so as to involve the learners and keep them interested in the subject. Other factors contributing to poor achievement in Mathematics include inadequate teaching and learning facilities, acute shortage of trained personnel and lack of textbooks (SMASSE, 2007).

Various demographic factors are known to be related to Mathematics achievement. Gender, socio-economic status, and parents' educational level are factors that are frequently cited as predictors of Mathematics achievement. Many variables have long been studied as predictors of Mathematics achievement. However, gender issues on Mathematics achievement are studied most frequently by researchers. A meta-analysis of 100 studies by Hyde, Fennema and Lamon (1990) reveals a complex pattern regarding gender differences in Mathematics achievement. While girls are superior to boys in computation, there is no significant gender difference in understanding Mathematics concepts at the elementary and middle school levels. In high school, gender differences emerge where boys are superior to girls on problem solving tasks.

While there are conflicting views concerning success in Mathematics based on gender, females are closing the gap in Mathematics scores possibly making it more accepted for females to succeed in Mathematics (Cech, 2012). Although gender is not the primary factor determining students' success in Mathematics, it can affect how students are treated in the classroom, as well as their self-confidence. According to Cech (2012), girls and boys get different reactions from teachers in Mathematics from an early age. When boys have difficulty, teachers are more likely to encourage them to keep trying and tell them that Mathematics is simply a skill that must be acquired. Alternatively, when girls have trouble teachers often express how Mathematics is difficult and do not necessarily exude confidence in the girls' capacity to understand the problem. As a result of these differing views, girls see Mathematics as a talent, which they can only be successful in for a limited amount of time. Boys are more likely to be motivated to understand Mathematics concepts because they see it as a skill, which can be understood only through practice (Markman, 2008).

Although some studies show that females tend to earn better grades than males in Mathematics (Kimball, 1989), some other studies have revealed that gender differences in Mathematics education seem to be narrowing in many countries. However, studies indicate that as students reach higher grades, gender differences favor increase in Mathematics achievement by males (Campbell, 1995; Gray, 1996; Mullis, Martin, Fierros, Goldberg, & Stemler, 2000). For instance, the results from the Third International Mathematics and Science Study showed that Mathematics achievement scores of each gender group were close to each other at the primary and middle school years (Mills, 1997). However, in the final year of secondary school, evidence was found for gender differences in Mathematics achievement.

In the United States for instance, in 2008, 61% of graduate students were women. Women outnumber men in all major fields of graduate education, except Mathematics, Computer sciences, Engineering, Physical sciences and Business (Snyder & Dillow, 2009). Despite this, women still score lower than men in the mathematics section of the high stakes standardized tests used for admissions to college and graduate school (Halpern, Benbow, Geary, Gur & Hyde, 2007). In China, despite consistent government effort promoting equal education for women and men, most Chinese, both men and women, still see Mathematics and Science as a male domain (Broaded & Liu, 1996). In Germany, past studies suggested that girls are in general more successful in school than boys. The picture of gender differences in Mathematics achievement is however less clear (Hannover & Kessels, 2011). While in some studies boys exceeded girls in Mathematics achievement, in other studies no gender differences in Mathematics achievement were found (Hannover & Kessels, 2011). In Kenya, achievement of girls in Mathematics at KCSE has been lower than that of boys (KNEC 2013, 2014 & 2016).

Eshiwani (1982) points out that girls perform lower than boys in Science and Mathematics at secondary level. According to Mondoh (2001), one of the reasons for this is that most girls underestimate their own academic ability and believe boys to be relatively more superior and intelligent in handling difficult subjects like Mathematics. This is more of a stereotypical perception, which makes boys feel superior to girls in studying what is regarded as a tough subject (Githua, 2002). According to Githua (2002), this underachievement has been

attributed to competitive modes of assessment in favour of boys, gender biased Mathematics textbooks, cultural view of Mathematics as a male domain, lack of positive female role models in Mathematics and modes of teaching that are individualistic or competitive as opposed to being cooperative. Further, Mondoh (2001) points out that due to the way in which girls perceive and process information, they are likely to lag behind boys in situations where Mathematics lessons are teacher-dominated and individualized. Most Mathematics lessons are structured in this manner.

Wasanga (1997) and Zietsman (1997) state that generally, boys perform better because girls have less favorable attitude towards science subjects. They continue to assert that girls tend to ignore some subjects by taking them to be a male domain hence this attitude makes them to be low performers. They cite other related factors as self-confidence, interest, expectation and counseling as critical variables influencing performance. Similarly, a study by Sabita and Modiful (2001) revealed that boys show more positive attitude towards Mathematics than girls and that attitude and achievement are positively related. Saha (2007) conducted a study on gender, attitude to Mathematics, cognitive style and achievement in Mathematics. It was found that all the three contribute to statistically significant difference in achievement in Mathematics. A study by Swetman (1995) shows that initially girls have more positive attitudes towards Mathematics than boys, but as they continue in school, their attitudes decline and become more negative. In order to improve girls' achievement in Mathematics, teachers need to facilitate positive attitudes in girls towards the subject.

Mckeachie and Lin (1991) studied the relationship between student sex, teacher's instructional strategies and student's achievements and found that appropriate teacher instructional strategies resulted in higher mean achievement by students. It is also reported that girls tend to learn Mathematical concepts by means of rules or cooperative activities, while boys have a tendency to be in a competition to master Mathematical concepts (Hopkins, McGillicuddy-De Lisi, & De Lisi, 1997). According to Tsuma (1998), there is need to develop Mathematics and Science curricula that are accessible to girls, those that make them feel less strange, hence perform like their male peers. Teachers have an obligation therefore to employ instructional techniques that involve students, as well as motivate girls to study and excel in Mathematics.

Gender based difference in Mathematics achievement has also been noted at KCSE examinations. The achievement in Mathematics at KCSE of both boys and girls for the years 2018 to 2022 is shown in Table 1.

Table 1Achievement in Mathematics at KCSE of both boys and girls for the years 2018 to 2022

Year	**Number of Girls**	**Mean Score (%)**	**Number of Boys**	**Mean Score (%)**
2018	181,770	21.00	228,117	27.80
2019	195,093	25.30	241,233	30.21
2020	202,129	24.51	242,663	30.13
2021	223,125	21.26	259,091	26.40
2022	242,281	24.27	277,993	29.16

Source: (KNEC, 2018 -2022)

The results indicate, the achievement of boys in Mathematics was higher than that of girls at KCSE. Skaalvik (2004) asserts that there is widespread belief that boys are better in Mathematics than girls. Burton, Chevalier, Pippen, and Stevens (2008) relate the gender difference in Mathematics performance or preference to bias experienced through patterns of socialization over the period from birth to the end of formal education. Githua (2002) attributes the underachievement to teaching methods that are individualistic or competitive as opposed to being cooperative.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue XI November 2025

The poor achievement in Mathematics prompted the Kenyan government through the Ministry of Education, Science and Technology (MOEST) in collaboration with Japanese International Cooperation Agency (JICA), to initiate a programme on Strengthening of Mathematics and Science in Secondary Education (SMASSE) in 1998. The objective of the programme was to provide in-service training to Mathematics and Science teachers in order to strengthen teacher competence by addressing such areas of concern as attitude, teaching methodology, mastery of content, developing learning materials, and administration and management, with a view to improve the performance in Mathematics and Science subjects. Despite this effort, achievement in Mathematics at KCSE is still poor.

METHODOLOGY

The study employed Solomon Four-Group, Non-equivalent Control Group Design. Borg and Gall (1989) hold that this design is rigorous enough for experimental and quasi-experimental studies. It combats many internal validity issues that can affect research so that the observed effect on the dependent variable can be attributed solely to the treatment and allows the researcher to exert complete control over the variables and to check that the pretest does not influence the results (Shuttleworth, 2009). Through this design, intact classes were randomly assigned to four groups. Intact classes were used because school authorities do not allow classes to be reconstituted for research purposes. The design is illustrated below.

Group 1	O1	X	O2
Group 2	O3	O4	
Group 3		X	O5
Group 4		O6	

In this design, group 1 was the experimental group that received the pre-test (O1), the treatment (X), and the post-test (O2). Group 2 was the control group that received the pre-test (O3), post- test (O4), but no treatment. Group 3 on the other hand was the experimental group that received the treatment (X), post-test (O5), but no pre-test. Group four was the control group that received the post-test (O6) only. The post-test O5 and O6 are meant to rule out any interaction between testing and treatment. The groups' equivalence were assessed before the start of the experiment through the use of pre-test. The experimental and control groups were from different schools to avoid experimental contamination as a result of interaction by respondents.

The design may however not control for those threats associated with interaction of selection and history, selection and maturation, as well as selection and instrumentation (Cook & Campbell, 1979). A common manual on cooperative learning was used to train teachers in experimental groups on the use of cooperative learning strategy to ensure uniformity in exposure of students to the strategy. Teachers involved in the study also adopted a common scheme of work for the topic of Trigonometry (2) to ensure the content is uniformly covered for all the groups in the study. To control maturation as a threat to internal validity, students in form three, assumed to be of approximately of the same age were used in this study.

The study was conducted in Meru South Sub-County, Tharaka Nithi County, Kenya. Singleton (1993) notes that an ideal reason for the setting for any study should be the existence of a problem that the study hopes to generate solutions for. The study location was chosen because it had been established that students' achievement in Mathematics in national examinations in the Sub-County had been poor.

The target population for the study was 2430 form three students in 44 co-educational secondary schools in Meru South Sub-County (Meru South Sub-County Education Office, 2022). Since the study considered the aspect of gender in performance, co-educational schools were the most suitable for the study. Co-educational schools accounted for 83% of all the secondary schools in the Sub-County enrolling majority of the students in the Sub-County.

ISSN No. 2454-6186 | DOI: 10.47772/IJRISS | Volume IX Issue XI November 2025

Co-educational secondary schools formed the sampling frame for this study. The researcher first prequalified the schools to ensure similarity in their characteristics. Prequalification was done based on number of students, students' entry behaviour, availability of teaching/learning resources and teachers' qualification. Four co-educational schools were then selected randomly from the list of prequalified schools. The assignment of selected schools to either experimental or control group was done by simple random sampling. In cases where the selected school had more than one stream, all the streams were involved in the study, but random sampling was used to select one stream for analysis. Mugenda and Mugenda (2003) hold that for experimental studies, at least 30 cases are required per group. The sample size for this study was 164 students as shown in Table 2.

Table 2 Number of Students per Group in the Study Sample

Groups	Number of Students
Experimental (1)	39
Control (2)	49
Experimental (3)	32
Control (4)	44
Total	164

Instrumentation

The study used Mathematics Achievement Test (MAT) for data collection. The researcher developed the MAT comprising of 6 questions on the topic of Trigonometry (2). MAT was used as a pre-test to measure students' achievement in Mathematics based on gender. It was then adjusted for use as a post-test.

RESULTS

In this study, Mathematics Achievement Test (MAT) pre-test was administered to Group 1 and Group 2. This was done to ascertain whether the students selected for this study had comparable characteristics. The mean scores of pre-test on MAT is shown in Table 3.

Table3 Means of Pre-test scores on MAT

Group	Number of Participants (N)	Mean Score	Maximum Score
Experimental 1	39	3.05	40
Control 2	49	2.97	40

Results in Table 3 show that the MAT pre-test mean score for group 1 (3.05) was higher than that of group 2 (2.97). To ascertain whether the difference in the MAT pre-test mean scores of the two groups was statistically significant, a t-test was conducted. The results are shown in Table 4.

Table 4 Independent Sample T-test on MAT Pre-test Scores

Variable	Group	N	Mean	Max. Score	Std. dev	df	t-value	p-value
MAT	Group 1	39	3.05	40	1.64	86	10.206	0.23
	Group 2	49	2.97	40	2.11			

The results in Table 4 show that the difference in the MAT pre-test mean scores for both groups 1 and 2 was not statistically significant at α=0.05 significance level (t (86) =10.206, p>0.05). This means that the two groups had similar characteristics and were therefore suitable for comparison, hence appropriate for the study.

Further, the study sought to understand the achievement of mathematics based on gender. The study used Mathematics Achievement Test (MAT). The findings were presented in table 5.

Table 5 Mean of pre-test scores on MAT based on gender

Gender	Number of Participants (N)	Mean Score	Maximum Score
Male	33	3.21	40
Female	55	4.52	40

The results in Table 5 show that the MAT mean score for male (3.21) was lower than that of female (4.52). To ascertain whether the difference in the two means was statistically significant, a t-test was conducted on the pre-test scores based on gender and findings presented in table 6.

Table 6 Independent Sample t-test on MAT Pre-test Scores based on Gender

Variable	Gender	N	Mean	Max. Score	Std. dev	df	t-value	p-value
Gender	Male	33	3.21	40	2.10	86	11.87	0.074
	Female	55	4.52	40	3.21			

Table 6 shows that the MAT mean score for female (4.52) was slightly higher than for male (3.21). The t-test analysis established that there was no statistically significant difference between the mean scores for female and male students at α=0.05 significance level (t(86)=11.87, p>0.05). This implies that the entry level of male and female students was similar.

Effectiveness of Convention Learning (CL) on Students' Achievement based on Gender.

Hypothesis of this study sought to determine whether there was any statistically significant difference in Mathematics achievement based on gender among students instructed through CL in secondary schools in Meru South Sub-County. Groups 1 and 3 which were taught through CL had 41 male and 30 female students, respectively. An independent sample t-test was carried out in order to determine whether the difference in the MAT post-test mean scores of male and female students was statistically significant. The results are shown in Table 7.

Table 7 Independent Sample t-test on MAT Post-test Scores based on Gender

Variable	Gender	N	Mean	Max. Score	Std. dev	df	t-value	p-value
Gender	Male	41	18.2	40	3.8	86	9.23	0.68
	Female	30	17.6	40	5.6			

The results in Table 7 show that the mean score for male students (18.2) was higher than that of female students (17.6). It was also established that there was no statistically significant difference between the mean scores for male and female students at α=0.05 significance level (t (86) = 9.23, P > 0.05). Thus, H0 was accepted.

DISCUSSION

The researcher sought to establish whether there was any statistically significant gender difference in Mathematics achievement for students between students exposed to cooperative learning and those exposed to conventional teaching methods. This study established that, there was no statistically significant gender difference in Mathematics achievement for students who were taught through the CL strategy. In Kenya, the achievement of girls in Mathematics at KCSE has been lower than that of boys (KNEC 2013, 2014 & 2016). However in this study, both boys and girls seemed to benefit equally while learning Mathematics cooperatively.

The findings of this study are in agreement with Njoroge and Githua (2013) study that investigated the effects of cooperative learning strategy on learners' Mathematics achievement by gender. No gender differences were found on students' Mathematics achievement. Another study conducted by Qayyum, Liaquat, Asif and Muhammad (2014) found no statistically significant difference in Mathematics achievement based on gender when cooperative learning was used. Similarly, Madhu, Manju and Pooja (2014) established that when cooperative learning was used in the teaching and learning of Mathematics, there were no statistically significant differences in achievement across gender.

Hopkins, McGillicuddy-De Lisi and De Lisi (1997) study showed that girls tend to learn Mathematical concepts better by means of cooperative activities as opposed to individualistic and competitive strategies. The findings of this study however disagree with Eshiwani (1982) study that found that girls achieve lower than boys in Mathematics and science at secondary school level. The results also disagree with Hyde, Fennema and Lamon (1990) studies that revealed that in high school, gender differences in Mathematics achievement emerge, where boys are superior to girls in problem solving tasks.

Cech (2012) argued that although gender is not the primary factor determining students' success in Mathematics, it can affect how students are treated in the classroom, as well as their self-confidence. While there are conflicting views concerning success in Mathematics based on gender, females are closing the gap in Mathematics scores possibly making it more accepted for females to succeed in Mathematics (Cech, 2012).

Based on the aforementioned, CL strategy proved to be more effective in enhancing students' achievement in Mathematics across gender than the CTM. The strategy also proved to be better in eliminating the gender differences in students' achievement in Mathematics. This is probably because of the paradigm shift in Mathematics teachers' role of active teaching to that of supervising, clarifying concepts and organizing the learning process. Gender differences in Mathematics achievement at KCSE can therefore be minimized through the use of cooperative learning strategy in Mathematics teaching and learning in secondary schools. schools.

REFERENCES

1. Adesina, A. O., & Akinbobola, A. O. (2005). The Attitude of Students towards Part Time Degree Programme of the Faculty of Education, Obafemi Awolowo University, Ile-Ife. Journal of Research of Education, 2(1), 1-4.
2. Adunola, O. (2011). The Impact of Teachers' Teaching Methods on the Academic Performance of Primary School Pupils in Ijebu-Ode Local cut Area of Ogun State. Ogun State, Nigeria: Ego Booster Books.
3. Akale, M. A. G. (1997). The Relationship between Attitude and Achievement among Biology Students in Senior Secondary Schools. Journal of Science and Movement Education, 2, 77 – 85.
4. Akinbobola, A. O. (2004). Effects of Co-operative and Competitive Learning Strategies on Academic Performance of Students in Physics. Journal of Research in Education, 1(1), 71-75.
5. Akinsola, M. K., & Olowojaiye, F. B. (2008). Teacher Instructional Methods and Student Attitudes towards Mathematics. International Electronic Journal of Mathematics Education, 3(1), 60-73.
6. Akinsola, M. K. (1994). Comparative Effects of Mastery Learning and Enhanced Mastery Learning Strategies on Students' Achievement and Self-Concept in Mathematics. Unpublished Ph. D. Thesis, U. I. Ibadan.
7. Azuka, F. (2000). Mathematics in Technological Development, Focus on the next Millennium-implications of Secondary Education. Journal of Mathematical Association of Nigeria, 25, (1), 74-82.

8. Balogun, T. A., & Olarewaju, A. O. (1992). Effects of Instructional Objectives and Hierarchically Organized, Learning Tasks on Students Achievement in Integrated Science. Lagos Journal of Science Education, 1, 7-13.
9. Barchok, H. K. (2011). Effect of Collaborative Concept Mapping Strategy on Students' Achievement, Motivation and Attitude towards Chemistry in Selected Secondary Schools in Kenya. Unpublished Doctoral Thesis, Moi University.
10. Bekee, F. (1987). The Effect of Behavioural Objectives and Diagnostic Teaching Strategies on Students' Achievement in Integrated Science. Unpublished Ph.D Thesis, University of Ibadan.
11. Borg, W. R., & Gall, M. D. (1989). Educational Research: An Introduction (5th ed.). New York: Longman.
12. Borich, G. D. (2004). Effective Teaching Methods (5th ed.). New Jersey: Pearson Merrill Prentice Hall.
13. Brush, T. (1997). The Effects on Student Achievement and Attitudes when Using Integrated Learning System with Cooperative Pairs. Education Technology Resource Development, 45, 51-64.
14. Butty, J. L. M. (2001). Teacher Instruction, Student Attitudes, and Mathematics Performance among 10th and 12th Grade Black and Hispanic Students. Howard University, ProQuest Information and Learning Company.
15. Chacko, L. (2000). Mathematics as Seen by Pupils and Teachers: A way forward. Harare: Zimbabwe Africa University.
16. Cook, T. D., & Campbell, D. T. (1979). Quasi-experimentation: Design and Analysis Issues for Field Settings. New York: Rand McNally.
17. Cornell, C. (1999). I Hate Math! I Couldn't Learn it, and I Can't Teach it! Children Education, 75(4), 225-231.
18. Effandi, Z., Chung, L. C., & Yusoff, D. (2010). The Effects of Cooperative Learning on Students' Mathematics Achievement and Attitude towards Mathematics. Journal of Social Sciences, 6(2), 272-275.
19. Elvis, M. G. (2013). Teaching Methods & Students' Academic Performance. International Journal of Humanities and Social Science Invention, 2(9), 29-35.
20. Fasasi, F. M. (2009). Institutional Impediments Associated with Students' Failure in Secondary Schools in Adamawa state. Journal of Educational studies, 14(1), 93-98.
21. Greenwald, A.G. (1989). Why are Attitudes Important? In: Pratkanis, A. R., Breckler, S. J. & Greenwald, A. G. (Eds.). Attitude, Structure and Function. Hillsdale, NJ: Lawrence Erilaum Associates.
22. Hart, L. (1989). Describing the Affective Domain. Saying what we mean. In: McLeod & Adams (Eds.). Affect and Mathematical Problem Solving. New York. Springer Verlay.
23. Jebson, S. R. (2012). Impact of Cooperative Learning Approach on Senior Secondary School Students' Performance in Mathematics. Ife PsychologIA, 20(2).
24. Mugenda, O. M., & Mugenda, A. G. (2003). Research Methods: Quantitative and Qualitative Approaches. Nairobi: Acts Press.
25. Oloo, E. A., Mutsotso, S. N., & Masibo, E. N. (2016). Effect of Peer Teaching Among Students on their Performance in Mathematics. International Journal of Scientific Research and Innovative Technology, 3(12), 10-24.
26. Olowojaiye, F. B. (2000). A Comparative Analysis of Students Interest in and Perception of Teaching/Learning of Mathematics at Senior Secondary Schools Levels. A Paper Presented at MAN Conference "EKO 2000".
27. Petty, R. E., & Cacioppo, J. T. (1986). The Elaboration Likelihood Model of Persuasion. Advances in Experimental Social Psychology, 19, 123-20.
28. Polya, G. (2011). How to Solve it. New Jersey: Princeton University Press.
29. Ronsini, B. A. (2000). The Effect of Cooperative Learning Methods on Achievement, Retention and Attitude of Home Economics Students in Northern Carolina. Education Research, 2, 20-25.
30. Sabita, M., & Mofidul, I. (2001). Attitude of Secondary Students towards Mathematics and its Relationship to Achievement in Mathemetics. International Journal of Computer Technology & Applications, 3(2), 713 -715.
31. Shuttleworth, M. (2009). Solomon Four-Group Design. Retrieved on 4th May 2015 from http.www.experiment-resources.com/Solomon-four-group-design.htm.
32. Singleton, R. (1993). Approaches to Social Research. New York: Oxford University Press.
33. SMASSE (2007). Factors Affecting Performance in Mathematics in Meru South. Unpublished raw data.

34. Tapia, M., & Marsh, G. E. (2004). An Instrument to Measure Mathematics Attitude. In: Muthomi, M. Effectiveness of Differentiated Instruction on Students Attitude and Achievement in Mathematics. Unpublished Doctoral Thesis. Chuka University, Kenya.
35. Tarim, K., & Akdeniz, F. (2008). The Effects of Cooperative Learning on Turkish Elementary Students' Mathematics Achievement and Attitude towards Mathematics using TAI and STAD Methods. Educational Studies in Mathematics, 67, 77-91.
36. Umameh, M. (2011). Survey of Students' Poor Performance in Mathematics. Bristol: University of Bristol.
37. Zakaria, E., Chin, C. L., & Daud, Y. (2010). The Effect of Cooperative Learning on Students Mathematics Achievements and Attitude towards Mathematics. Journal of Social Sciences, 6(2), 272-275.