

Full Length Research Paper

Determinants of girls' performance in science, mathematics and technology subjects in public secondary schools in Kenya

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There has been incessant low academic performance in Science, Mathematics and Technology (SMT) subjects especially among girls at form four level in Kitui Central District over the years. The aim of this study was to investigate the determinants of girls' performance in SMT subjects in public secondary schools. Using ex-post-facto survey research design, the study population covered all the six girls' secondary schools in the district which also represented sample schools from which data was collected. Semi-structured questionnaires and document analysis sheets were used as instruments of data collection. The primary data collected was analysed by use of Statistical Package for Social Sciences (SPSS) version 17. Descriptive and inferential statistics were derived viz mean scores, percentages, correlation and regression coefficients. The Chi-square and one way ANOVA test statistics was used in hypothesis testing. Correlation and regression analysis were generated at 0.05 (2-tailed) and 0.001(2-tailed) significance levels. The findings from the study explained why form four girls in Kitui County were not doing well in SMT subjects. The outcome of the study is expected to influence policy and decision-making on girls' better performance in the subjects. Different approaches were recommended based on the findings to improve girls' performance in SMT subjects.

Key words: determinants, girls' performance, science, mathematics, technology, public secondary schools, Kenya.

INTRODUCTION

Recent literature shows that there has been a big problem of poor performance in SMT subjects in Kenya as a whole (Changeiywo, 2000; Ndirangu, 2000; Lenga et al., 2001; Aduda, 2003; Ochieng, 2007; Forum for African Women Educationalists, 2008; Duflo et al., 2009). When studying the performance of students in Koibatek District, Baringo County, Mbugua et al. (2012) found that boys performed better than girls in SMT subjects. Same results can be confirmed from other counties in Kenya (Sifuna, 2006; Wambua, 2007).

Research studies indicate that in Kenya women's participation and performance in SMT subjects and courses is worse than that of men at all educational

levels (Agesa and Agesa, 2002). This is supported by the Gender Policy in Education which reports that scarcity of resources and insensitivity to the needs of girls in many schools creates a gender insensitive infrastructure which adversely affects girls' performance more than boys (Republic of Kenya, 2007). The learners' previous knowledge and experiences, expectations interests and beliefs have an impact on the way learning takes place (Ndirangu, 2000). Books and curriculum materials tend to portray girls in inactive and traditional roles (Sinnes, 2004). This fact discourages girls from learning efficaciously and restricts their career choices (Kagume, 2010).

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Table 1. District mean scores in Science and Mathematics at KCSE level in girls public secondary schools.

Subject	2005	2006	2007	2008	2009
Mathematics	2.863	3.448	3.526	3.405	4.29
Chemistry	4.551	4.140	4.263	4.050	4.42
Biology	5.252	5.031	4.835	4.945	5.66
Physics	5.494	5.422	4.852	5.310	5.99
Agriculture	6.106	6.015	5.74	5.96	7.52

Source: Kitui Central District Education Office.

A general overview of performance in Mathematics in Kenya indicates unsatisfactory performance over the years such as the mean scores in 2004, 2005, 2006, 2007, 2008 were 16.25, 16.24 17.24,16.26 and 18.73 % respectively (Kenya National Examinations Council report, 2008).

Changeiywo (2000) opined the following reasons why learners perform poorly in science subjects: inadequate time allowed for learning Science satisfactorily, inadequate instructional materials, low level and inadequate training of teachers and the nature of science curriculum which is highly abstract and seems irrelevant to the learners' immediate environment.

In order to reduce the disparity in performance, different groups have made different efforts. These include women professionals in Forum for African Women Educationists (FAWE) who are supporting girl child education in finances (FAWE, 2008). Provision of free and compulsory basic education strategy targets both boys and girls but it focuses mainly on the girls since it addresses the factor of direct costs, a problem that affects girls most. It has been adopted and practiced in Kenya among other countries (FAWE country profiles, 2003)

The government of Kenya has undertaken a project in conjunction with the government of Japan through the Japanese International Cooperation Agency (JICA) called Strengthening Mathematics and Science in Secondary Education (SMASSE project, 2000). The programme provides in-service refresher training for teachers of Mathematics and Science where they are expected to use teaching aids in the classroom and engage learners in "hands-on" experiences in the course of teaching-learning process.

In Kitui Central District just as in other parts of Kenya, there are large gender gaps in performance in SMT subjects. It is evident from statistics that girls' performance in SMT subjects at form four level in Kitui Central District has been dismal over the years regardless of gender awareness efforts by the government and NGOs. The district's mean scores for Sciences and Mathematics in the girls' secondary schools for the last five years; 2005, 2006, 2007, 2008 and 2009 have been unsatisfactory as shown in Table 1.

The data in Table 1 shows that in all the SMT subjects apart from Agriculture, the scores were below the average mean score of 6.0. This has caused a lot of public outcry and concern about the performance in SMT subjects (KNEC, 2000).

As a result of the gender gaps in performance in SMT subjects, fewer girls as compared to boys qualify to join Science and Technology related courses (Wambua, 2007; Shabaya and Konadu-Agyemang, 2004). Statistics show that in 2003/2004 academic year, only 4% of engineering students enrolled in Kenyan Universities were women (Sifuna, 2006). In national polytechnics only 5% of the women enrolled were in Science/engineering programs in 2004/2005 academic year (Republic of Kenya, 2005; UNESCO, 2006).

Studies focusing on determinants of girls' performance in SMT subjects at secondary school level are not well conceptualized. This lack of sufficient knowledge on these determinants and their influence would militate against the country's aspiration to achieve the 'vision 2030' and the Millennium Development Goals (MDGs). This is because SMT subjects contribute towards Industrialization, environmental conservation, medical research, food management and improved agricultural production. Therefore, there is need for an investigation into the determinants of girl's performance in SMT subjects at form four level in Kitui Central District.

Statement of the problem

- The general trend in Kenya Certificate of Secondary Education (KCSE) as cited in the East African Standard February 16th 2002 has shown poor performance in Mathematics, Physics, Chemistry and Biology among girls as compared to boys. As a result, most of the girls have little stake in professional courses such as Medicine, Engineering, Technology and other technical disciplines which promise better economic rewards.

- In Kitui Central District, the study's concern is that very few girls who sat for SMT subjects at KCSE level in the district in the year 2009 obtained quality grades while majority attained mean grades of D plain and below (Kitui Central District KCSE Analysis, 2009). Therefore, there is

need to explore more on the determinants of girls' performance in SMT subjects at secondary school level with a view of suggesting possible intervention strategies hence the need for such a study.

Purpose of the study

The study was necessitated by the deplorable performance of girls particularly in SMT subjects in Kitui Central District. This leads to their under-representation for courses in the field of science and technology. In Kenya, it has been observed that in spite of the various inputs to education by the government as well as international organizations, girls still lag behind at all levels of education. Present trends of gender inequality are manifested not only in education but also in the labour market, political leadership and socio-economic spheres of life. The choice of girls in this study was influenced by a public outcry in Kitui Central District among parents and teachers, government and other stakeholders who have called for a probe into performance in SMT subjects especially among girls. It was for this reason that the study sought to investigate the determinants of girls' performance in SMT subjects which include school factors like teacher qualification, teaching load, teaching-learning resources and class size and their influence on academic performance in SMT subjects among girls at form four level in the district.

METHODOLOGY

The study employed ex-post-facto research design to determine the degree of relationship between any two or more variables. The independent variables which were investigated included teacher qualification, teaching load, availability of teaching-learning resources and class size while the dependent variable was girls' academic performance in SMT subjects at form four level in Kitui Central District, Kitui County, Eastern Kenya. Education is a major investment that determines the livelihood of many people in Kitui County since it is a semi-arid area where rains are inconsistent and unreliable.

This study was guided by the following research questions:

1. How does teacher qualification contribute to girls' performance in SMT subjects at form four level in Kitui Central District?
2. How does teaching load contribute to girls' academic performance in SMT at form four level in Kitui Central District?
3. Does availability of teaching-learning resources contribute to girls' academic Performance in SMT subjects at form four level?
4. How does class size contribute to girl's academic performance in SMT subjects at form four level?

The study also raised the following hypotheses:

H₀₁: There is no significant relationship between the teaching load and girls' academic performance in SMT subjects at form four level in Kitui Central District.

H₀₂: There is no significant relationship between availability of teaching-learning resources and girls' performance in SMT subjects at form four level in Kitui Central District.

The ex-post-facto design involved selecting three or four groups which differed on independent variable and comparing them on dependent variable. For instance, an aspect of teacher qualification was categorized into Diploma certificate holders, Trained Graduate teachers, Untrained Graduate Teachers and Post-Graduate Degree holders. An aspect of teaching load entailed the number of SMT lessons a teacher taught per week. It was grouped as below twenty-seven, twenty-seven and above twenty-seven. An aspect of availability of teaching-learning resources entailed grouping the resource-student ratio into 1:1, 1:3, 1:>3 and non availability of resources. An aspect of class size entailed grouping into classes with an average student Population of 45, classes with student population of less than 45 and those with student population of above 45.

The four independent variables were compared with KCSE examination results for girls in SMT subjects in the year 2009. The examination results were sampled from all the six girls' secondary schools in the District that presented candidates in SMT subjects for the Kenya Certificate of Secondary Education in 2009 and used as a measure of learners' performance in SMT.

The study used purposive sampling technique where all the six head teachers of the sampled girls' secondary schools and all the thirty SMT teachers who taught form four level in the girls' secondary schools in 2009 were included in the study. From the sampled schools the results of form four girls who sat for KCSE examinations in SMT subjects during the year under study were purposively sampled. For girls' secondary schools with more than one form four stream, only one stream was selected using simple random sampling technique. Kitui Central District had a population of two thousand and eleven (2011) form four students in the public secondary schools in the year 2009 as indicated by the DEO's office records in the year 2010. Therefore a sample of 416 female students was selected.

The information was collected using the questionnaires and document analysis. Two categories of questionnaire were used; a head teachers' questionnaire and a SMT teachers' questionnaire. The questionnaires had both open-ended and closed form items. Document analysis was carried out from published KCSE results in SMT subjects obtained from Kitui Central Education Office to establish and confirm responses given in the questionnaire. The head teachers' questionnaire was designed and administered to the head teachers of the six sampled girls' secondary schools in the district. It was used to collect information that made it possible to understand the relationship between determinants (school factors) and girls' academic performance in SMT subjects. Head teachers' questionnaire covered a wide range of issues concerning details of teaching staff and education or academic performance.

The SMT teachers' questionnaire was designed to elicit responses on the general academic and professional background of the SMT teachers, teaching load, class size, use of available instructional resources in teaching SMT subjects and the teachers' assessment of the students' performance in SMT subjects at KCSE in 2009. Most of the questions in the questionnaire were objective. However, there were few structural questions to elicit for more information on performance in SMT subjects. The study employed document analysis from published K.C.S.E results in SMT subjects. This was obtained from KNEC and Kitui Central District Education Office.

To test the content validity of the instruments, they were pre-tested on a population sample similar to the target population to determine their validity and effectiveness. To ensure reliability of the instruments a test-retest method was used to estimate the degree to which the same results were obtained with a repeated measure of accuracy of the same concept. The data was collected by administering questionnaires to head teachers and teachers of SMT subjects.

This study was conducted using ex-post facto research. The sample selected for the study comprised 30 SMT teachers, 6 head

Table 2. Teacher qualification and girls' performance in SMT.

Teacher qualification	Girls' Performance in SMT subjects							
	Above average (6.1-12.0)		Average (6.0-6.09)		Below average (0.1-5.99)		Total	
	F	P	F	P	F	P	F	P
Trained graduate	8	27.6	1	3.4	6	20.7	15	51.7
Post graduate diploma	3	10.3	0	0.0	1	3.4	4	13.8
Diploma/SI	1	3.4	0	0.0	7	24.1	8	27.6
Untrained graduate	0	0.0	0	0.0	2	6.9	2	6.9
Total	12	41.4	1	3.4	16	55.2	29	100.0

Source: Data obtained from questionnaires administered to SMT teachers in the study sample.
Key: F=Frequency, P=Percentage.

teachers and KCSE examination results for 416 girls in SMT subjects in the year 2009. From the selected sample data was received from 100% of the head teachers and 96.67% of the SMT teachers. One of the SMT teachers could not provide information on Physics as one of the SMT subjects since students did not choose to do the subject at form three and form four level in one of the sampled schools.

The instruments used in the study were head teachers' questionnaire to collect information from head teachers of the six girls' secondary schools and SMT teachers' questionnaire to gather information from SMT subject teachers who taught the form four girls in 2009 in Kitui Central District.

Data was analyzed by using frequencies, percentages and mean scores. Correlation and regression analysis were used with level of significance set at 0.001 (2 tailed) and 0.05 (2 tailed).

RESULTS

Determinants of performance in SMT subjects

The data was analyzed to investigate the effect of the four independent variables namely; teacher qualification, teaching load, SMT resource to student ratio and class size on girls' academic performance in SMT at form four level in Kitui Central District.

Qualification and girls' performance in SMT subjects at form four level in 2009 in Kitui Central District

The performance range was categorized into; above average (6.1 to 12.0), average performance (6.0 to 6.09) and below average (0.1 to 5.99). A cross tabulation between the highest professional qualification of the respondents and the students' performance range was done. It revealed that there was a significant relationship between girls' performance in SMT and qualification of teachers who taught them. The findings were presented in Table 2.

The data in Table 2 indicates that majority of the trained graduate SMT teachers and teachers with post graduate qualifications produced a performance range which was above the average while Majority of the SMT

teachers with Diploma/SI certificate and the untrained graduate teachers produced a performance range which was below the average performance range. This meant that teacher qualification contributed positively to girls' academic performance in SMT subjects at form four level in Kitui Central District although this was not significant $F(1, 27)=0.017, p=0.897$ (Table 3).

Table 4 shows that the Multiple Correlation Coefficient R (0.025) was low. This means that there was a weak linear relationship between observed and model-predicted values of the dependent variable (mean score). R square (the coefficient of determination) shows that the model explains 0.1% of the variations. Therefore 99.9% variations in SMT Performance are explained by other factors other than teacher qualification.

Teaching load and girls' performance in SMT subjects at form four level in 2009 in Kitui Central District

The study sought to establish the relationship between the teaching load of the teachers of SMT and girls' performance in SMT subjects. The girls' mean scores were categorized into performance range of above average (6.1 to 12.0), average (6.0 to 6.09) and below average (0.1 to 5.99). The number of lessons taught by the SMT teacher per week in 2009 was compared with the girls' performance range. The findings were presented in Table 5.

A cross tabulation between the teaching load and students' performance range revealed that a greater percentage of the SMT teachers who taught 27 lessons per week produced a performance range which was above the average performance while the performance range of majority of the SMT teachers who taught more than 27 lessons per week was below the average performance. Therefore there was a significant relationship between teaching load and girls' academic performance in SMT at form four level in Kitui Central District in the year 2009.

The first research hypothesis tested was:

Table 3. ANOVA table (a).

Model	Sum of squares	d f	Mean square	F	Sig.
Regression	0.066	1	0.066	0.017	0.897
Residue	105.775	27	3.918		
Total	105.841	28			

Table 4. Model summary (a).

R	R square	Adjusted R square	Std. error of the estimate
0.025	0.001	-0.036	1.979289

Table 5. SMT number of lessons taught by the respondent per week in 2009 and students' performance

SMT no. of lessons taught by the respondent in 2009	Students' performance range (%)			Total
	Above average (6.1-12.0)	Average (6.0-6.09)	Below average (0.1-5.99)	
Below 27	10.35	3.45	20.70	34.48
Normal 27	27.59	0.00	10.35	37.93
Above 27	3.45	0.00	24.14	27.59
Total	41.38	3.45	55.17	100

Source: Data obtained from questionnaires administered to SMT subject teachers in the study sample.

There is no significant relationship between teaching load and girls' performance in SMT subjects at form four level in Kitui Central District.

A cross tabulation of students' performance range and the teaching load showed that there was a strong relationship between the teaching load and girls' academic performance in SMT subjects (gamma value=0.796, $r=0.67$, $p=0.001$). This implies that the relationship between the teaching load and the girls' performance in SMT subjects is significant at 95% significance level.

Table 6 shows that there was a strong negative correlation between the teaching load and girls' performance in SMT subjects at form four level at 0.01 level of significance (2-tailed) with a variation of 73%.

The ANOVA table was used to test the significance of Regression Coefficients (Table 7). It can be concluded that there is a significant relationship between the independent (predictor) and the dependent (response) variable. Therefore the overall regression model was significant $F(1, 27)=30.892$, $p=0.000$ (Table 8).

Availability of teaching-learning resources and girls' performance in SMT subjects at form four level in 2009 in Kitui Central District

A cross tabulation was done between availability of

teaching-learning resources and girls performance in

SMT subjects at form four level in 2009. The findings were presented in Table 9.

Table 9 reveals that the SMT teachers who used a resource-student ratio of one to one produced a good performance range which was above the average performance while candidates who had no SMT resources performed dismally. When more than three students shared a SMT resource the performance in the SMT subjects was not good either.

The second research hypothesis tested was:

There is no significant relationship between availability of teaching-learning resources and girls' performance in SMT subjects at form four level in Kitui Central District.

The view of teaching-learning resources being a determinant of girls' performance in SMT was highly significant at more than 95% significance level. There was a strong positive relationship between availability of teaching-learning resources and girls' performance in SMT (gamma value=0.968, $r=0.791$, $P=0.001$).

Table 10 shows that there was a very strong negative correlation between the resource ratio and girls' performance in SMT subjects at form four level at 0.01 level of significance (2-tailed) with a variation of 82.6%.

ANOVA table shows that the regression model was

Table 6. Correlation between teaching load and girls' performance in SMT subjects.

		Mean grade	SMT no. of lessons taught by the respondent per week in 2009
Mean Grade	Pearson correlation	1	-.730**
	Sig.(2-tailed)		.000
	N	29	29
SMT no. of lessons taught by the respondent per week in 2009	Pearson correlation	-.730**	1
	Sig.(2-tailed)	.000	
	N	29	29

**Correlation is significant at 0.01 level (2-tailed)

Table 7. ANOVA table (b).

Model	Sum of squares	DF	Mean square	F	Significance
Regression	56.478	1	56.478	30.892	0.000
Residue	49.363	27	1.828		
Total	105.841	28			

Table 8. Model summary (b).

R	R square	Adjusted R square	Std error of the estimate
0.730	0.534	0.516	1.352130

Table 9. Availability of teaching-learning resources and girls' performance in SMT subjects

Students' ratio	Students' performance range (%)			Total
	Above average (6.1-12.0)	Average (6.0-6.09)	Below average (0.1-5.99)	
Each student had an instructional resource	17.24	0.00	0.00	17.24
Three students shared an instructional resource	20.69	3.45	6.90	31.03
More than three students shared an instructional resource	3.45	0.00	44.83	48.28
There were no instructional resources for the students	0.00	0.00	3.45	3.45
Total	41.38	3.45	55.17	100

significant $F(1, 27)=58.010$, $P=0.000$ (Tables 11 and 12).

Class size and girls' performance in SMT subjects at form four level in 2009 in Kitui Central District

The fourth research question tested was:

How does class size contribute to girls' academic performance in SMT subjects at form four level in Kitui Central District?

A cross tabulation between the class size and the

students' performance range was done. The findings were presented in Table 13. Data in Table 13 reveals that a greater percentage of SMT teachers who handled a student population of less than 45 students produced a performance range which was above the average performance while a larger percentage of SMT teachers who handled a student population of more than 45 students produced a performance range which was below the average performance. This meant that a smaller class size produced better performance in SMT subjects compared to the larger class size implying that there is a significant relationship between class size and the students' performance.

Table 10. Correlation between availability of teaching-learning resource and girls' performance in SMT.

		Mean Grade	Resource ratio
Mean grade	Pearson correlation	1	-.826**
	Sig.(2-tailed)		.000
	N	29	29
Resource ratio	Pearson correlation	-.826**	1
	Sig.(2-tailed)	.000	
	N	29	29

**Correlation is significant at 0.01 level (2-tailed)

Table 11. ANOVA table (c).

Model	Sum of squares	DF	Mean square	F	Significance
Regression	72.225	1	72.225	58.010	0.000
Residue	33.616	27	1.245		
Total	105.841	28			

Table 12. Model summary (c).

R	R square	Adjusted R square	Std error of the estimate
0.826	0.682	0.671	1.115814

Table 13. Class size and girls' performance in SMT subjects.

Class size range	Students' performance range-% mean scores			Total
	Above average (6.1-12.0)	Average (6.0-6.09)	Below average (0.1-5.99)	
Below 45 students	24.14	0.00	17.24	41.38
45 students	0.00	0.00	3.45	3.45
Above 45 students	17.24	3.45	34.48	55.17
Total	41.38	3.45	55.17	100

Data in Table 14 indicates that there was a very strong negative correlation between the class size and girls' performance in SMT subjects at form four level at 0.01 level of significance (2-tailed) with a variation of 80.6%. From Tables 15 and 16, the overall regression model was significant $F(1,27)=49.943$, $P=0.000$.

DISCUSSION

The purpose of this study was to determine the effect of teacher qualification, teaching load, availability of teaching-learning resources and class size on academic performance in SMT subjects among girls at form four

level in girls' secondary schools of Kitui Central District.

Summary of research findings

1. The results in this study indicate that the qualification of teachers is a significant determinant of performance in SMT subjects at form four level. This finding concurred with the views of Kang'ethe and Nafukho (2000) who observed that the quality of teachers is dependent on the selection of top quality candidates for teaching, their pre-service education and continuous professional development. The finding further coincided with the views of Njeru and Orodho (2003) who established that for

Table 14. Correlation between class size and girls' performance in SMT subjects at form four level in 2009 in Kitui Central District.

		Mean grade	Class size-no. of students the respondent taught SMT in 2009
Mean grade	Pearson correlation	1	-.806**
	Sig.(2-tailed)		.000
	N	29	29
Class size-no.of students the respondent taught SMT in 2009	Pearson correlation	-.806**	1
	Sig.(2-tailed)	.000	
	N	29	29

**Correlation is significant at 0.01 level (2-tailed)

Table 15. ANOVA table (d).

	Sum of squares	DF	Mean square	F	Significance
Regression	68.700	1	68.700	49.943	0.000
Residue	37.141	27	1.376		
Total	105.841	28			

Table 16. Model summary (d).

R	R square	Adjusted R square	Std error of the estimate
0.806	0.649	0.636	1.172850

effective teaching, the level of a teacher's qualification should be much higher than that of the information he/she is expected to impart.

2. Teaching load and girls' performance in SMT subjects

The findings of the study proved that there was a strong relationship between teaching load and girls' academic performance in SMT subjects. This was indicated by a large multiple correlation coefficient ($R=0.730$, gamma value= 0.796 , $r=0.67$). The Pearson Chi Square value was 9.547 which was greater than the critical value of 9.488 with 4 Degrees of freedom and at $P=0.05$ at 95% significance level. This implied that the the teaching load is a significant determinant of girls' performance in SMT subjects. This echoed the views of Mbilinyi (2003) and Beyani (2011) who opined that teachers' overload results into a low delivery rate.

3. Availability of teaching-learning resources and girls' performance in SMT subjects

The findings of the study suggested that resource-student ratio is a significant determinant of girls' performance in SMT (gamma value= 0.968 , $r=0.791$, $P=0.001$). This finding connotes that girls' performance in classes with adequate SMT teaching-learning resources was better than those with few or no resource materials. This agrees with the opinions of Udousoro (2010) who observed that educational resources and facilities available

in a given school environment influence teaching, learning and achievement. Indeed Udousoro confirmed that students in schools located in urban areas that are properly equipped in terms of classroom, library, laboratory and adequate staffing perform better than those students in schools located in rural areas that are poorly equipped hence making teaching of Science concepts difficult.

4. Class size and girls' performance in SMT subjects

The study found that girls' performance in SMT decreased with class size. This finding concided with the views of Krueger (2003), De Paola et al. (2009), Johnson (2010) and Madsen (2011) who found a significant decrease on student achievement in larger classes and even larger negative effects for low skilled students.

Conclusions and Recommendations

The study found that the more professionally qualified a SMT teacher was, the higher the girls' academic performance in SMT at form four level in Kitui Central District in 2009. This finding was obtained by arranging the qualification of SMT teachers in the following descending order with the students' average mean scores in SMT

subjects shown in brackets: Post Graduate Diploma in Education (7.10), Trained Graduate teachers (6.04), Diploma/SI certificate holders (4.71) and Untrained Graduates (2.29). Therefore, the professionally trained teachers possessed sufficient pedagogical skills that were suitable for the dissemination of SMT subjects contents leading to high academic performance in the subjects.

The study showed that the more the number of lessons a teacher had, the lower the girls' academic performance. This means that the teaching load influenced girls' academic performance in SMT subjects at form four level in Kitui Central District. This is because the teacher was left with less time to assist the students which resulted in low girls' academic performance in SMT subjects at form four level in the district. The study depicted that students with adequate SMT teaching-learning resources at form four level performed better than those with few or no resource materials.

The class size influenced girls' academic performance in SMT subjects at form four level in the district. The results obtained from the study revealed that the larger the class size the lower the girls' academic performance in SMT subjects at form four level. This was due to the minimized interaction between teachers and students. The following recommendations were made based on the observations made from this study.

1. The government should organize for regular in-service and refresher training of SMT subjects' teachers in order to augment the teachers' pedagogical skills so as to produce quality teachers of SMT subjects.
2. The Teachers Service Commission should be encouraged to recruit and post more qualified SMT teachers to girls' secondary schools in Kitui Central District to minimize the problem of understaffing in the field of SMT subjects. This will reduce the teaching load of SMT teachers who teach more than twenty seven lessons per week consequently leading to improvement in the academic performance in SMT subjects in the girls' schools.
3. The management of girls' secondary schools in Kitui Central District should be encouraged to source for sufficient SMT teaching-learning resource materials so that each student has a SMT learning resource in each SMT subject taught. This idea will lead to better performance in SMT subjects at form four level in Kitui Central District.
4. To reduce the problem of overcrowded classrooms, the school management should be encouraged to provide sufficient classrooms so that each classroom accommodates an average population of forty five students. The result will be enhanced interaction between teachers and students which would enable teachers of SMT to give and correct several assignments immediately. The teachers will also be able to control and manage students' behaviour in class more effectively leading to improved girls' performance in SMT subjects

at form four level in Kitui Central District.

REFERENCES

- Aduda D (2003). Kenya Certificate of Secondary Education, Examination Results Released by Minister of Education. Daily Nation, Nairobi: Nation Media Group Ltd.
- Agesa J, Agesa R (2002). Gender differences in public and private enrollment in Kenya: What do they mask? *Rev. Black Political Econ.* 30 (1):29-55.
- Beyani C (2011). Review of Science, Mathematics and Technology Educational provision for Girls in Technical Schools in Zambia. A research report for the Forum of African Women Educationists of Zambia (FAWEZA).
- Changeiywo JM (2000). The Students' Images of Science in Kenya: A comparison by Gender Differences, Levels of schooling and Regional Disparities. Doctoral Thesis. Department of Curriculum and Educational Management, Egerton University.
- De Paola M, Ponzo M, Scoppa V (2009). Effects of class size on achievement of college students: Heterogeneity across abilities and fields. Working Paper n.19-2009. University of Calabria.
- Duflo E, Dupas P, Kremer M (2009). Inputs versus Accountability: Experimental Evidence from Kenya. Mimeo UCLA.
- Forum for African Women Educationalists (2003). FAWE Country Profiles. Prepared for 1st FAWE Donor Consortium Meeting.
- Forum for African Women Educationalists (2008). FAWE: Advancing girls' education in Africa. [Online]. Available: www.cmc.edu/kravisprize/images/fawe/publications/15years_booklet.pdf [2008, December 12].
- Johnson IY (2010). Class Size and Student Performance at a Public Research University: A Cross-Classified Model. *Res. High. Educ.* 51:701-723. DOI 10.1007/s11162-010-9179-y.
- Kagume DW (2010). A Multiple Case Study of Social Cognitive Influences on Career Choice in Science, Mathematics and Technology among Kenyan Women. Doctoral Thesis. Department of Counseling, Oregon State University, United States.
- Kang'ethe S, Nafukho FM (2000). Problems of innovative training of professionals: The experience of Moi College of Health Sciences, Kenya: Paper presented at the Conference of Third World Studies. 17-19 September 2001, Egerton University, Kenya.
- Krueger AB (2003). Economic Considerations and Class Size. *Econ. J.* pp.34-63.
- Lenga FM, Mwanjyky SW, Mutua RW, Koriya WO (2001). Innovative approaches to the teaching of Mathematics and science to girls in secondary schools. FEMSA Kenya. Jomo Kenyatta University of Agriculture and Technology.
- Madsen ES (2011). Class size, type of exam and student achievement. Working paper 11-05. Aarhus University. ISBN 9788778825292 (print); ISBN 9788778825315 (online).
- Mbilinyi AS (2003). Equity in Learning: The Gender Dimension. Working Document Draft. Association for the Development of Education in Africa (ADEA) Biennial meeting. 3-6 December 2003, Grand Baie, Mauritius.
- Mbugua ZK (2012). Factors contributing to students' performance in Mathematics at Kenya Certificate of Secondary Education. A case of Baringo County, Kenya. *Am. J. Contemp. Res.* 2(6):87-91.
- Ndirangu M (2000). A study on the perception of the influence of the teaching practice projects on the teaching of science in selected secondary schools in Kenya. Doctoral Dissertation. Department of Curriculum and Educational Management, Egerton University.
- Njeru EHN, Orodho JA (2003). Access and Participation in Kenya. Nairobi. Kenya Institute of Policy Analysis and Research.
- Sifuna DN (2006). A review of major obstacles to women's participation in higher education in Kenya. *Res. Post-Compulsory Educ.* 11(1):85-105.
- Ochieng FO (2007). Effect of School Factors on Academic Achievement in Biology amongst Form Fours in Bureti District. The case of girls' performance. masters project. Department of Educational Management Policy & Curriculum Studies, Kenyatta University.

- Republic of Kenya (2005). Sessional Paper No. 1 of 2005: A Policy Framework for Education, Training and Research. Nairobi: Government Printers.
- Republic of Kenya (2007). Gender Policy in Education. Nairobi: Government Printers.
- Shabaya J, Konadu-Agyemang K (2004). Unequal Access, Unequal Participation: Some Spatial and Socio-Economic Dimensions of the Gender Gap in Education in Africa with Special Reference to Ghana, Zimbabwe and Kenya. *J. Comparat. Educ.* 34(4):395.
- Sinnes AT (2004). Approaches to Gender Equity in Science Education. Doctoral Dissertation. University of Oslo. Oslo, Norway.
- Udousoro UJ (2010). The Effect of Gender and School Location on Students' achievement in Mathematics. *Int. J. Chem. Environ. Pharm. Res.* 1(3):165-170.
- Wambua R (2007). The Making of an Engineer: Background Characteristics of Female Engineering Students in Kenyan National Polytechnics. *Int. J. Learn.* 14(2):31-39.