

## Factors Contributing to Dismal Performance in Mathematics among Secondary School Girls in Nyamira County, Kenya

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### Abstract

A good mathematics education is salient to scientific and technological development. The Kenya National Examinations Council evaluates the performance of students through the examinations it offers. Evaluation of the Kenya Certificate of Secondary Examinations has revealed that girls do not perform well in mathematics. Girl child education world-wide provides benefits to the family and the society at large. Thus dismal performance in mathematics by the girl child should be addressed for the sake of scientific and technological development of any country and Kenya in particular. The purpose of this study was to explore the factors contributing to dismal performance in mathematics among secondary school girls in Borabu Division, Nyamira District. The investigation employed Ex-post facto research design. The population was 714 (700 girls, 7 teachers and 7 head teachers). Out of this population, a sample of 154 respondents were selected which included 140 girls, 7 mathematics teachers and 7 head teachers. The samples were done purposively which included 1 mathematics teacher from each sampled school. The head teachers of the 7 sampled schools were involved in the study purposively. 5 girls were randomly selected from each form from forms 1-4. Data was collected from the head teachers, mathematics teachers and the secondary school girls by use of questionnaires and interview schedules. The researcher used statistical package for social sciences (S.P.S.S 11.5) in data analysis. Descriptive statistics involving frequencies and percentages were used to analyze the data. The findings of the study indicate that inadequacy of mathematics teachers, societal gender stereotypes, influence from peers, attitudes of girls towards mathematics, girl's low levels of aspiration and inadequate resources for teaching contributed to the dismal performance in mathematics by secondary school girls in Borabu division. Many respondents recommended that the attitudes held by majority of the girls in secondary schools about mathematics needs to be changed. The same study be carried out in the same area or a similar region for the findings are of great significance to the girl child, human development and the nations' scientific and technological development.

**Keywords:** Dismal, Performance, Aspiration, Attitudes, Facilities, Gender, Stereotypes

### CHAPTER ONE INTRODUCTION

Mathematics is a compulsory subject in Kenya for all students in both primary and secondary schools. Ndimbirwe (1995) as quoted by Githua (2002) indicated that the subject is both academically and vocational important for both males and females. The reason for this perceived importance of mathematics is because it is basic for modern scientific development and technology (Cockcroft, 1982). Education stakeholders continue to invest heavily in the education of young Kenyans year by year with the hope that the input will be equivalent to the output if not better. The immediate expected results from education system are good performance in examinations. However, the performance continues to be poor in general. Of great concern is the learner's performance in mathematics, given that this subject is key to the attainment of the national goal of industrialization by the year 2020.

To compound this problem of dismal performance in mathematics, there is overwhelming evidence that the proportion of females passing mathematics in KCSE examination is lower than that of males and that the proportion of males taking mathematics related courses beyond secondary school education also outweighs that of females (Abagi, 1992 & 1994, Kyungu 1988, Makau, 1994, Masiga, 1994.)

Such a dismal performance of females in mathematics and under – representation in mathematics related studies after secondary school education is a source of inequality which closes many educational and career opportunities to women and deprives society of the benefits of their talents. According to Burton (1996), Cockcroft (1982) and Earnest (1993), the reasons currently advanced from research findings in Britain, USA and Australia for the under –achievement and under representation between boys and girls include:- mathematics being culturally viewed as a male domain, lack of female mathematics role models in mathematics classrooms, unconscious sexism among teachers and the modes of teaching being individualistic as opposed to being cooperative, different cognitive styles (Clinn & Ashcroft, (1993) and student's mathematics self concept (Marsh, 1989 & 1991). Gender insensitive instructional methods and learning materials (Kyungu, 1998 & Masiga, 1994) have also been identified as areas that need more research in order to explain the disparity.

Eshiwani (1975 & 1984) in his research studies in Kenya indicated that girls get better scores than boys when they are taught mathematics by the use of Integrated Programmed Instruction (IPI). He concluded that the

method of instruction has an important influence on achievement and retention. His research findings also showed that girls' under-achievement and under-representation in mathematics are attributable to attitudes rather than their ability. Mondoh (1995) investigated the extent of the effects of teaching effectiveness on mathematics achievement. Yearly reports of K.C.S.E examination results posted on school notice boards show a very high proportion of girls as utter failures in mathematics compared to other subjects (FEMSA – 1991). This study sought the views of the teachers, head teachers and learners (girls) in order to establish the reasons behind girls under-achievement in mathematics.

Despite the crucial role of mathematics in the technological development of any county, dismal performance by secondary school girls in mathematics is still a persistent problem in many schools in the country. This has serious implications since the speed or pace of industrialization and adoption of appropriate technologies is a positive indicator, to society's level of mathematical attainment. Despite the importance attached to student's mathematics achievement by the Kenyan society, performance of secondary school girls in the subject continues to deteriorate. In Nyamira District, Borabu Division has many secondary school girls performing dismally in mathematics. Thus, a study to investigate the factors that have contributed to dismal performance in mathematics by secondary school girls is vital. This is crucial because no such a study has been carried in the area yet mathematics achievement contributes to Kenya's technological development and industrialization.

The purpose of this study was to explore the reasons contributing to dismal performance in mathematics among secondary school girls in Borabu division, Nyamira district.

The study sought to accomplish the following objectives:-

- i. To find out how shortage of mathematics teachers contributes to dismal performance in mathematics among secondary school girls in Borabu Division.
- ii. To explore how gender stereotypes in society contribute to dismal performance in mathematics among secondary school girls in Borabu Division.
- iii. To find out how negative attitudes of secondary school girls contributes to their dismal performance in mathematics in Borabu Division.
- iv. To explore whether peer influence contributes to dismal performance in mathematics among secondary school girls in Borabu Division.
- v. To find out whether inadequacy of resources and facilities contributes to dismal performance of secondary school girls in Borabu Division.
- vi. To find out whether low aspiration levels contribute to dismal performance in mathematics amongst secondary school girls in Borabu Division.

As a country, the study is of great importance particularly at this time when countries in the world are intending to achieve equality in education by 2015. The knowledge of various factors contributing to dismal performance in mathematics may help teachers, parent, and education officers and all stake holders to come up with more practical interventions to improve secondary school girl's performance in mathematics. The study findings are expected to not only increase girls' awareness of factors contributing to dismal performance in mathematics but also serve as a useful source of reference for further research.

### **Theoretical Framework**

This study was guided by the following theories: the social learning theory, the rational emotive theory and the Adrelian theory.

According to Bandura (1986) in social situations people often learn more rapidly by observing the behavior of others. Social learning theory is shaped by the learners society, culture, structure and history Merrian and caffare (1999).The theory places emphasis on society as a basic support for construction, acquisition and utilization of knowledge .Therefore what the society does or does not do is crucial to success in teaching and learning relationships. The theory is applicable to the performance of secondary school girls in mathematics. This is because the theory emphasizes that school girls' learning could be affected either positively or negatively by the institutions of their environments.

Teachers, parents and the behavior of the entire society are crucial to the girls' education because they are significant to the child's life. The underperformance of secondary school girls in mathematics is a result of stereotyped behavior from parents and members of the community. By the stereotypes already spelled in some communities especially where this study was carried out, girls believe that mathematics is a subject of the male domain.

Bandura (1967) has shown that children's ability to listen, remember abstract general rules from complex sets of observed behaviour affects their behaviour, imitations and learning. Good T.L (1986) shows how social learning theory can be applied in a classroom situation. He portrayed how modeling is responsible for a great deal of classroom learning. First, simply through their presence and behaviour teachers are role models of their students. In this capacity they are continuously supplying students with information about what and how to think not only about their academic curriculum but also about social, political and life style issues. Since the female teachers for mathematics in secondary schools were few, the girl students did not have sufficient role models to emulate.

Alfred Adler (1911) postulated that human beings have inherent factors that affect their destiny. He considered such factors to be social, cultural and biological. He portrayed that individuals are merely discouraged because of their self defeating inferiority feelings. Adler being a holist thought that a person could be understood only as an indivisible unity. This theory is applicable to this study since the social cultural and biological factors underlie the dismal performance of girls in mathematics. This is because girls harbor self defeating feelings of inferiority. These feelings are nurtured in our societies whereby women and girls are viewed as a weaker sex. Thus difficult tasks are considered masculine or of male domain. Such feelings need to be changed since Adler thought that lifestyle was not synonymous with behaviour, because behaviour can change throughout a person's life. Although girls grow up in a social environment, they need to search for significance by attempting to master their environment. Girls need to be thought by the significant others that human beings can be creative, self - determined decision makers who can choose the goals they wish to pursue. They need to put aside the self defeating feelings of inferiority and embrace creativity, self determination and decision making. This will finally make them achievers in areas considered by society as male sanctuaries.

## RESEARCH METHODOLOGY

### Research Design

The study employed ex-post facto research design. The design involved a systematic empirical investigation in which the research does not directly control the independent variables because they study events that have occurred (Kerlinger, 1993). In the study, girls' dismal performance in mathematics in Borabu Division is an issue which was already prevalent. There was no manipulation of variables.

### Location of the Study

The research was carried out in Borabu Division of Nyamira District, Nyanza province. The area was appropriate for the study because of its convenience to the researcher hence saving time and cost. The schools were chosen according to the educational zones already established in the Division for purposes of homogeneity.

### Target Population

The target population was from form 1-4 girls, their mathematics teachers and the head teachers of seven secondary schools in Borabu Division of Nyamira District. The population studied was 714 (700 girls, 7 mathematics teachers and 7 head teachers). There are 21 secondary schools in Borabu Division. The data is shown in table 2 below.

Table 2: Population of the Study

Zone	Sampled schools	Girls	Teachers	H/Teacher
Nyansiongo	2	200	2	2
Esise	3	300	3	3
Mekenene	2	200	2	2
<b>Total</b>	<b>7</b>	<b>700</b>	<b>7</b>	<b>7</b>

Source: AEO's Office Statistics (2007)

### Sampling Procedures and Sample Size

According to Borg and Cell (2003) a sample of 100 respondents is adequate for survey. Therefore the researcher used a sample of 154 respondents in the study which is appropriate for good results. The 21 schools in Borabu Division have been stratified in to three zones namely Nyansiongo, Esise and Mekenene Zones. From the zones, the researcher purposively selected a sample of 2 schools from each of the three zones, making 6 schools. The researcher also purposely chose one public girls school making it a sample of 7 schools. The samples were done purposively. Five girls were randomly chosen from each form one to four. The samples for teachers and head teachers were purposive full in that 7 mathematics teachers and 7 head teachers of the selected schools were included in the sample. The data is shown in table 3 below.

Table 3: Sampling Procedure

School	Girls	Mathematics Teachers	Head teachers	Total
Menyenya	20	1	1	22
Nyandoche	20	1	1	22
Eronge S.D.A	20	1	1	22
GonzagaGonza	20	1	1	22
Nyaronde	20	1	1	22
Mathias	20	1	1	22
Manga girls	20	1	1	22
<b>Total</b>	<b>140</b>	<b>7</b>	<b>7</b>	<b>154</b>

## FINDINGS

### Demographic characteristics of the respondents of the Study

The sample of the investigations consisted of three groups namely; head teachers, teachers and secondary school girls. This section presents head teachers, teachers and schoolgirls information by age and experience as indicated in table 5 and 6. The sample consists of 154 respondents who include 7 head teachers, 7 mathematics teachers and 140 secondary schoolgirls respectively.

Table 5: Number of Years Served in their Capacities as Head teachers and Mathematic Teachers.

Category	years of service	frequencies	percentage
Head teachers	1-5	2	28.6%
	6-10	5	71.4%
	Over 11 yrs	-	-
Mathematics teachers	1-5	1	14.3%
	6-10	3	42.9%
	Over 11 yrs	3	42.9%

Table :6 Distribution of secondary school girls as per their age and form.

Response	frequencies	percentage
<b>Age</b>		
13 – 14 yrs	30	21.4%
15 – 16 yrs	40	28.6%
18 – 19 yrs	50	35.7%
Over 21 yrs	17	12.1%
<b>Form</b>		
1	35%	25%
2	45%	32.1%
3	35%	25%
4	25%	17.9%
<b>Total</b>	<b>140%</b>	<b>100%</b>

The sample consists of 154 respondents who include 7 head teachers, 7 mathematics teachers and 140 secondary schoolgirls respectively.

### The respondents views on the shortage of mathematics teachers as role models.

The first research question sought to find out whether the inadequacy of mathematics teachers as role models contributed to the dismal performance of girls in mathematics. The teachers' responses indicated that they were few and they had many lessons to teach in the other subjects besides mathematics as shown in the table below. This reduced the frequency at which they gave assignments and evaluated the students work. The data is shown in table 7 below.

Table 7: Shortage of teachers as role models

Statements	Response (percent)									
	SA		A		U		D		SD	
	F	%	F	%	F	%	F	%	F	%
Liking the female teachers way of teaching	43	28.1	24	15.6	26	17.2	36	23.4	24	15.6
Preference of females to teach mathematics	41	26.6	39	25.0	10	6.3	26	17.2	39	25.0

N=15

### Respondents views on societal gender stereotypes.

The second research question sought to find out whether the gender stereotypes in society contributed to girls dismal performance in mathematics. To address this, five statements were given to all respondents. They were supposed to respond to each item by indicating if they strongly agreed, agreed, undecided, disagree or strongly disagree. The table below shows their responses.

Table 9 below records that the gender stereotypes in the society contributed to the dismal performance of girls in mathematics.

Table 9: Societal gender stereotypes

Statements	Response (percent)									
	SA		A		U		D		SD	
	F	%	F	%	F	%	F	%	F	%
Parents encouragement to girls to study maths	7	4.7	12	7.8	-	-	101	65.6	34	21.9
Parents advice to drop mathematics	89	57.8	29	18.8	7	4.7	10	6.3	19	12.5
Parents material support in maths	2	1.6	12	7.8	5	3.1	103	80.0	31	20.3
Support to society in maths achievement	7	4.7	7	4.7	5	3.1	70	45.3	65	42.2
Girls lack time to solve maths problem	10	15.6	60	39.1	5	3.1	36	23.4	29	18.8

N = 154

87.5% disagreed that parents encouraged their girls to study mathematics. 76.6% of the responses indicated that parents actually advised girls to drop the subject since they believed that it is boys who can tackle it. Almost 87.5% of the respondents disagreed that parents give girls financial and material support in their achievement of mathematics. It was also indicative from the responses given that majority of the society / community members around the school did not support girl student's study of mathematics. This was portrayed by the 87.5% disagreement. On considering whether lack of enough time to solve mathematics problems led to dismal performance of girls in mathematics, 55% of the respondents agreed while 40% disagreed. From the five statements, it was indicative that the gender stereotypes in society contributed to dismal performance of girls in mathematics.

**Respondents views on peer influence and how it contributed to dismal performance of girls in mathematics.**

The third research question was seeking to establish whether the influence of peers contributed to dismal performance in the subject. To get appropriate information about the extent of peer influence, respondents were served with four items related to the question to respond to.

According to the respondents views, peer influence contributed to dismal performance of secondary school girls towards mathematics. The table 10 below gives the results.

Table 10 Views on peer influence

Statements	Response (Percent)									
	SA		A		U		D		SD	
	F	%	F	%	F	%	F	%	F	%
We discuss mathematics problems in study groups	2	1.6	7	4.7	5	3.1	94	60.9	46	29.7
My peers and I find mathematics assignments to be easy and useful	2	1.6	12	7.8	5	3.1	103	67.2	31	20.3
My peers and I ask questions in mathematics lessons	17	10.9	29	18.8	2	1.6	84	54.7	22	14.1
Friends discourage me from pursuing mathematics	24	5.6	60	39.1	5	3.1	36	23.4	29	18.8

N=154

90% of the respondents strongly disagreed that they discussed mathematics problems in their study groups. 70% of the responses portrayed that peers did not ask many questions in mathematics while 55% of the responses given indicated that friends discouraged each other from pursuing mathematics.

The responses given portrayed that there was much influence amongst the peers that contributed to dismal performance amongst the secondary school girls. This concurs with Paul et al (1987) who states that in adolescence, allegiance is switched to peers. (Many secondary school girls are undergoing adolescence stage while in high school and thus adopt the morals of their peers). Coleman (1961) raised an equal concern for the apparently negative influence of the adolescent sub-culture on the performance of female high school students. Coleman (1961) found out that clever and status conscious girls learn quickly that they should not compete with males in the latter's traditional intellectual sanctuaries of mathematics and science.

**Responses on the attitudes and interests of girl students towards mathematics.**

The fourth research question was seeking to establish whether the attitudes and interests of girl students contributed to dismal performance in mathematics. To address the research question, five statements were given to the respondents. According to the respondent’s views, the attitudes of the girls towards mathematics contributed to their dismal performance in the subject. The table below shows the findings.

83% of the respondents disagreed that mathematics was their favorite subject. 84% of the responses given portrayed that mathematics was not an interesting subject when learning .58% of the responses given indicated that if mathematics was made optional , the girls will drop it. 87% of the respondents indicated from the responses that they hated mathematics as a subject. On seeking views whether girls practiced solving mathematics problems on their own or during the holidays when they could get extra time, 94% of the responses given disagreed with the statement.

It was indicative from above statements that the girls had formed negative attitudes towards the subject and they therefore did not have any interest for it. Johnson and Rising (1972) indicated that all attitudes are fundamental to the dynamics of behaviour. Thus the attitudes formed greatly influence learning of a subject.

Table 11 Responses on the attitudes and interests of girl students

Statements	Response(Percent)										
	SA		A			U		D		SD	
	F	%	F	%	F	%	F	%	F	%	
Mathematics is my favorite subject	2	1.6	14	9.4	10	6.3	82	53.1	46	29.7	
Mathematics is interesting when learning.	5	3.1	10	6.3	10	6.3	70	45.3	60	39.1	
If mathematics is made optional I will drop it.	58	37.5	31	20.3	24	15.6	31	20.3	10	6.3	
I hate mathematics.	70	45.3	65	42.2	5	3.1	7	4.7	7	4.7	
Girls practice solving mathematics problems on their own	2	1.6	7	4.7	–	–	103	67.2	41	26.6	

N=154

**Respondents views on the level of aspiration of girls and how it contributed to their dismal performance in mathematics.**

The fifth research question sought to find out whether girls aspired to study mathematics beyond high school .To address this, three statements were given to each respondent. The table 12 below shows the findings.

Table 12.

Responses on girls level of aspiration.

Statements	Response (Percent)										
	SA		A			U		D		SD	
	F	%	F	%	F	%	F	%	F	%	
Aspiration to study mathematics after KCSE	22	14.1	19	12.5	22	14.1	55	35.9	36	23.4	
Girls don’t understand that mathematics gives opportunities for personal advancement.	36	23.4	55	35.9	22	14.1	19	12.5	22	14.1	
Girls would hardly like a career that requires mathematics	36	23.4	55	35.9	22	14.1	19	12.5	22	14.1	

N=154

Table 12 portrays that girls did not aspire to study mathematics after high school. This could be because they did not understand that mathematics could give them many opportunities for personal advancement. On responding to whether girls aspired to study mathematics after K.C.S.E, 59% disagreed. It was indicative that majority never aspired to study the subject after high school where it was compulsory. On responding to the statement that girls didn’t understand that mathematics gave them opportunities for personal advancement, 59% agreed but 27% disagreed. On responding to whether girls could hardly take a career that requires mathematics, only 27%

agreed but 59% disagreed and 14% were undecided. It also became clear from the three statements that the level of aspiration was low and this may have contributed to their dismal performance in the subject.

**Respondents views on how learning resources of mathematics contributed to dismal performance in mathematics.**

The sixth research question was seeking to know whether the few learning resources contributed to dismal performance in mathematics. To address this, three statements were given to each respondent. Respondents were to respond to each item by indicating whether they strongly agreed, agreed, undecided, disagreed or strongly disagreed in two of the statements. In the third statement they were supposed to indicate how often they used the given learning resources. Table 13 below gives the findings.

Table 13 Responses on learning resources\_

Statements	Response (percent)									
	SA		A		U		D		SD	
	F	%	F	%	F	%	F	%	F	%
Lack of mathematics text books discourages the study of mathematics .	41	20.3	89	57.8	7	4.7	24	15.6	2	1.6
Mathematics reference books are readily available in school .	12	7.8	7	4.7	-	-	101	65.6	34	21.9
Teachers use charts, films, overhead projectors and mathematical models in mathematics lessons.	7	4.7	12	7.8	-	-	34	21.9	101	65.6

88.1% of the responses reflected that there was insufficient text – books for use. 87.5% of the views given also portrayed that mathematics reference books were not available. 12.5 % of the responses were also indicative that charts, films, mathematical models and overhead projectors were used. The responses therefore portrayed that learning materials for mathematics were insufficient and this contributed to dismal performance in mathematics.

**Conclusions**

From the findings, the study makes the following conclusions:-

Although the mathematics teachers were trained and experienced, they were few in comparison with their workload. These teachers also taught other subjects like Chemistry, Physics or Geography. Thus, they did not have sufficient time with the learners for remedial teaching and continues assessments often. Among the few mathematic teachers, the female teachers who could be role models for the girls were relatively fewer. Hence the students lacked role modules to emulate.

The respondents’ views also indicated that they had negative attitude toward mathematics because some topics were too abstract for them to understand. Thus, they had problems in interpretation of mathematical language.

The cultural gender stereotypes in society contributed to dismal performance in mathematics. From the responses given, it was indicative that many parents and guardians of the respondents gave partial support and only discouraged the girls that the subject was tough.

The resources available for learning mathematics were inadequate. Most of the respondents indicated that lack of teaching materials like charts, models, films, textbooks and enough time for preparation were some of the problems they faced.

Majority of the girls were influenced by their peers against mathematics that it was a male domain subject.

Many girls did not aspire to pursue mathematics to tertiary levels after high school.

**Recommendations.**

There is need for sensitization of girls about the importance and necessity of mathematics intheir day- to day lives. They should therefore be enlightened to disregard the influence of their peers against the subject.

Mathematics involves building of concepts. Therefore it is important for the girl student to have a good background in mathematics in primary schools and this will motivate them to aspire to pursue the subject at tertiary institutions..

The attitudes held by majority of the girls that mathematics is difficult needs to be changed. Teachers are the most important agents that can influence change in students attitudes toward mathematics. Since they are with students often, they can easily guide and motivate the students often.

In order to improve girl’s performance in mathematics, the learning facilities should be available and adequate. There’s need for emphasis on the use of visual aids and other manipulative materials in order to make students actively involved in learning mathematics. These may include models, fractions, charts, dices and e.t.c. Teachers should also use the recommended textbooks in order to cover the syllabus appropriately.

Mathematics teachers need to be motivated and this will enable them to impact it to their students. A motivated mathematics teacher will encourage his/her students to develop self-confidence in themselves and the subject. The government needs to recruit more mathematics teachers so that there can be much interaction between the girls and their teachers for better performance.

There's need to inspire many women who are joining tertiary institutions especially universities to pursue mathematics so that there can be many female teachers teaching mathematics. These will serve as good role models for the girl student.

The parents, guardians and significant others to the girl child need to discard the stereotypes they have towards discouraging girls against mathematics. They need to leave the irrational beliefs because rational thoughts will lead to right actions.

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