



# UNIVERSITY OF ZAMBIA

**FACTORS CONTRIBUTING TO GIRLS' POOR PERFORMANCE IN MATHEMATICS IN  
LIGHT OF CORRECTIONAL MEASURES TAKEN AT SESHEKE SECONDARY  
SCHOOL, SESHEKE DISTRICT, WESTERN PROVINCE, ZAMBIA.**

**BY**

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## **Approval**

This research of Hakalo Clifford is approved as fulfilling the partial requirements for the award of the degree of Master of Education in Mathematics Education by the University of Zambia.

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## **ABSTRACT**

It has generally been accepted in Zambia that good performance in mathematics has become a prerequisite for one's entry into tertiary education regardless of one's sex. In a bid to find themselves places in colleges and universities, many more girls than boys who were once pupils at Sesheke secondary school and live in Sesheke, re-write mathematics as GCE candidates than they do in other subjects, an indication that girls do not do well in mathematics at Sesheke Secondary School at grade 12 level.

The purpose of the study was to investigate the factors contributing to poor performance in mathematics among girls in light of correctional measures at Sesheke Secondary School in Sesheke District of the Western Province of Zambia.

The following questions guided the study;

- a) What teaching and learning practices in mathematics are in existence at Sesheke Secondary School?
- b) What role do parents play in girls' mathematics education and to what extent do parents support girls in mathematics education at Sesheke Secondary School?
- c) What is the attitude of girls towards mathematics at Sesheke Secondary School?

The research which was conducted at Sesheke secondary school used a qualitative research approach in which questionnaires were given to selected fifty girls and twenty-five parents who were sampled purposively; while Lesson observations were conducted on four teachers. Focus group discussions were conducted one with eight teachers while the other one with twelve girls. Data was analysed qualitatively.

The results of the study suggest that teachers attended to boys in mathematics classes than they did with girls and that some teachers discouraged girls in mathematics lessons by not recognizing their

efforts in trying to answer questions. Also girls did not comprehend mathematics easily with teacher centred methods teachers used in mathematics lessons. Furthermore, more time was given to boys than to girls to answer question, a situation which discourages girls from being active participants in the learning of mathematics.

With regard to parental support to girls' mathematics education, the study established that many parents believe that girls were poor performers in mathematics and that girls did most household chores.

With regard to girls' attitude towards Mathematics, the study established that most girls at Sesheke secondary school had negative attitude towards mathematics.

In order to improve teaching and learning practices at Sesheke secondary school, the study recommends that the school management sensitize mathematics teachers not to be gender biased in their lessons by involving both boys and girls equally in mathematics lessons.

Sesheke secondary school management organize meetings where parents can be sensitized and educated on the importance of their involvement in their children's mathematics education.

Sesheke Secondary School mathematics teachers need to present to girls scientific theories that suggest that mathematics performance is the result of experience and not genetics as well as guidance teachers' need to work in collaboration with teachers of mathematics and the school head teacher at Sesheke secondary school to provide girls with many efficacy-building experiences in mathematics.

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## ACRONYMS

PISA	Programme for International Student Assessment
NAEP	National Assessment of Education Progress
SCT	Social Cognitive Theory
FAWE	Forum for African Women Education
FAWEZA	Forum for African Women Education in Zambia
UNESCO	United Nations Educational Scientific and Cultural Organization
DIF	Differential Item Functioning
NCES	National Council on Examinations Syndicate
GCE	General School Certificate
UNICEF.	United Nations International Children's Emergency Fund
U.S.A	United States of America
P.E.O	Provincial Education Officer

# CHAPTER 1: INTRODUCTION

The study aimed at investigating factors contributing to girls' poor performance in mathematics in the light of correctional measures at Sesheke secondary school, Sesheke district, western province, Zambia. The first chapter presents the background to the study statement of the problem, purpose of the study, significance of the study, research objectives, research questions, and operational definition of terms, research limitations and theoretical framework of the study.

## **1.1 Background to the Study.**

While there was some progress in Zambia towards greater gender equality in enrolments between 2000 and 2007, policy-makers were concerned about whether this enrolment trend was also accompanied by greater gender equality in terms of learning achievements (Saito, 2010; UNICEF. 2009).

At the national level, the Secondary School overall performance in mathematics showed no noteworthy improvements for both boys and girls. That is, the performance of boys improved by two points, while that of girls was by one point in 2007, thereby maintaining the same direction and size of the gender difference. At the provincial level, the largest increase for boys was seen in Lusaka province, with about a seventeen-point increase, while Luapula province recorded the highest increase for girls, twenty seven points, in 2007. The Southern province registered the largest drops for both boys (about eighteen points) and girls (about twelve points). The provinces of Central and Western showed some level of gender equality in the performances between boys and girls, while all the other provinces showed boys performing better than girls, thereby repeating the same pattern of gender differences as seen in 2000 (UNESCO, 2003).

In spite of progress in recent decades to reduce the gap between males and females in their performance in mathematics (Halpern, 2002), and though western province as a whole was seen to have equality in the performances between boys and girls (UNESCO, 2003), this has not been the case with girls at Sesheke Secondary school. Since 2007, despite the school performing well generally in mathematics, in some years, the Provincial Education office's (P.E.O) grade 12 yearly results analysis done in Mongu, shows that most girls at Sesheke Secondary School have not performed well compared to girls in other government schools in similar geographical locations in the province. Here are some of the schools where girls performed well even better than boys in mathematics in the year 2008

**Table 1: Grade 12 Results Analysis for 2008 from seven selected schools in Western Province of Zambia**

	SEX	St John's sec	Holly Cross sec	Limulunga sec	Nkeyema sec	Lukalanya sec	Sioma sec	Sesheke sec
No. sat	Boys	53	-	80	75	72	140	123
	Girls	31	78	70	62	48	108	112
No. passed	Boys	29	-	11	51	26	35	64
	Girls	18	56	14	49	18	32	29
Pass %	Boys	<b>55%</b>	-	<b>14%</b>	<b>68%</b>	<b>36.1%</b>	<b>25%</b>	<b>52%</b>
	Girls	<b>58%</b>	<b>71%</b>	<b>20%</b>	<b>79%</b>	<b>35.5%</b>	<b>30%</b>	<b>26%</b>

**Source: Ministry of Education (Western Province P.E.O office, 2009; accessed in 2011)**

Table 1 above indicates that girls are capable of passing mathematics. This can be seen from schools such as St John's, Holly Cross and Nkeyema where girls pass percentage recorded in 2008 was above fifty percent.

**Table 2: Grade Twelve Provincial Girls' Results Analysis (2007- 2009)**

Name of school	year	Number that sat	Number that passed	Pass percentage
<b>Sesheke secondary school</b>	<b>2007</b>	<b>137</b>	<b>55</b>	<b>40%</b>
St John's secondary school		38	29	76%
Holly Cross secondary school		66	62	94%
Limulunga secondary school		56	42	75%
Sioma secondary school		74	39	53%
Kambule secondary school		78	51	66%
Senanga secondary school		106	48	45%
Kaoma secondary school		113	47	42%
<b>Sesheke secondary school</b>	<b>2008</b>	<b>112</b>	<b>29</b>	<b>26%</b>
St John's secondary school		31	18	<b>58%</b>
Holly Cross secondary school		78	56	<b>71%</b>
Limulunga secondary school		70	14	<b>20%</b>
Nkeyema secondary school		62	49	<b>79%</b>
Lukalanya secondary school		48	18	<b>35.5%</b>
Sioma secondary school		108	32	<b>30%</b>
Kambule secondary school		107	69	<b>64%</b>
Senanga secondary school	198	104	<b>53%</b>	

Kaoma secondary school		201	174	<b>87%</b>
<b>Sesheke secondary school</b>	<b>2009</b>	<b>133</b>	<b>57</b>	<b>43%</b>
St John's secondary school		43	40	<b>93%</b>
Holly Cross secondary school		84	79	<b>94%</b>
Limulunga secondary school		73	35	<b>48%</b>
Nkeyema secondary school		59	22	<b>38%</b>
Lukalanya secondary school		53	28	<b>53%</b>
Sioma secondary school		97	48	<b>49%</b>
Kambule secondary school		112	67	<b>60%</b>
Senanga secondary school		156	76	<b>49%</b>
Kaoma secondary school		123	61	<b>50%</b>

**Source: Ministry of Education (P.E.O's office Mongu)**

Table 2 above shows the grade twelve results analysis done at the P.E.O's office (Mongu). The results show a few of the sampled schools from 2007 to 2009 where girls did perform better than the girls at Sesheke secondary school. These results prove that indeed girls at Sesheke secondary school have performed better even when compared with the performance of girls in other school within the province.

**Table 3 : Grade Twelve Results Analysis (2007- 2011)**

<b>Year</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
No. That Sat	137	112	133	188	241
No. That Passed	55	29	57	92	61
<b>Pass Percent</b>	<b>40%</b>	<b>26%</b>	<b>43%</b>	<b>49%</b>	<b>25%</b>

**Source: Sesheke Secondary School Guidance Office; accessed in 2012**

At Sesheke secondary school, however, girls have performed poorly in mathematics as the yearly pass percentage in four consecutive years recorded was below fifty percent. In 2008 when girls in most of the highlighted schools scored above fifty percent, the girls at Sesheke secondary school got twenty six percent. Table 2 above highlights the performance of girls from 2007 to 2011 according to the yearly results analysis done by the Career and Guidance Office at Sesheke Secondary School.

## **1.2 Statement of the Problem**

The school management, teaching staff at Sesheke Secondary School and the community through Parents Teachers Association have put in place measures to enhance conditions for improving performance of girls in mathematics such as; the provision of suitable teaching/learning materials; exposing girls to role models of female teachers (though in small numbers); awarding girls who do well in mathematics; monitoring of teachers at departmental level as well as establishing single sex classes as advocated for by the Ministry of Education (Kelly, Msango; Subulwa, 1999). However, much as the school has tried to enhance the conditions for learning and teaching of mathematics, the performance of most of the girls in mathematics at Sesheke Secondary School continues to remain low comparing it to the performance of boys which has continued to remain above fifty percent. Since then, no study has been done to find out as to what could be contributing to this poor performance at Sesheke secondary school. Therefore this study sought to investigate the factors contributing to poor performance in mathematics among girls in light of correctional measures.

## **1.3 The aim of the Study**

The aim of the study was to investigate the factors contributing to girls' poor performance in mathematics in the light of correctional measures at Sesheke secondary school, Sesheke district, western province, Zambia.

## **1.4 Significance of the Study**

The study is important to the teaching of mathematics as teaching of mathematics needs to take into account the factors that contribute to girls' poor performance (Kawakami, Steele, Cifa, Phillips, Dovidio 2008; Wei Wei, Hui Zhao & Hao Lu, 2012).

The study is also important as it might help Sesheke secondary school management sensitise parents through P.T.A meetings on the importance of parental involvement if this does not exist.

The study is furthermore important as it might inform the policy makers to come up with policies that enhance conducive conditions for teaching and learning of mathematics to both boys and girls.

## **1.5 Research Objectives**

The following were the objectives of this study;

- a) To explore teaching and learning practices in mathematics at Sesheke Secondary School.
- b) To establish parental role and support offered to girls in mathematics education at Sesheke Secondary School.
- c) To determine girls' attitudes towards mathematics at Sesheke Secondary School.

## **1.6 Research Questions**

The following questions guided the study;

- a) What teaching and learning practices in mathematics are in existence at Sesheke Secondary School?
- b) What role do parents play in girls' mathematics education and to what extent do parents support girls in mathematics education at Sesheke Secondary School?

c) What is the attitude of girls towards mathematics at Sesheke Secondary School?

## 1.7 Operational Definition of Terms

For terms to carry any meaning within a study, they need to be defined in a clear, non - ambiguous and agreed upon way; Concepts can be defined either in a conceptual or operational manner (Bless and Hughson 1995:36). The process of defining concepts is essential because it allows for specific contexts to be described and explained in a manner that pertains to the study.

1. **Mathematics anxiety** is a phenomenon that is often considered when examining students' problems in mathematics. Ashcraft, defines mathematics anxiety as “a feeling of tension, apprehension, or fear that interferes with mathematics performance” (Ashcraft, 2002, p. 1).
2. **A student** is person who is actively enrolled in a Higher Educational Institution while the word pupil in Zambia is used for the learner who is either at primary or secondary school level. However, in this study, the words student and pupil are used interchangeably. This is because most of the literature from the European countries uses the word student to mean pupil.

## 1.8 Research Limitations.

The school selected as a case study of this research, has a group of students who are in two categories: boarders and day scholars. The major limitation to this study was that day scholars were usually not available even after agreeing that they would take part in the study. Some of the day scholars were later on advised by their parents not to take part in the study. Furthermore, some parents were not willing to talk about the failures of their children.

## **1.9 Theoretical framework of the study.**

The study was located in the Social Cognitive Theory (SCT) framework. SCT refers to a psychological model of behaviour that emerged primarily from the work of Bandura (2001). Initially developed with an emphasis on the acquisition of social behaviours, SCT continues to emphasize that learning occurs in a social context and that much of what is learned is gained through observation. It has been applied extensively by those interested in understanding classroom motivation, learning, and achievement (Ormrod, 2008).

Social Cognitive Theory rests on several basic assumptions about learning and behaviour. One assumption concerns the view that personal behavioural and environmental factors influence one another in a bidirectional, reciprocal fashion. That is, a person's on-going functioning is a product of a continuous interaction between cognitive, behavioural, and contextual factors. For instance, classroom learning is shaped by factors within the academic environment, especially the reinforcements experienced by oneself and by others. At the same time, learning is affected by students' own thoughts and self-beliefs and their interpretation of the classroom context (Bandura, 2001; Zimmerman, 2000).

For this study, Social Cognitive Theory was chosen as the framework for two reasons;

The first reason for choosing Social Cognitive Theory is that it focuses on self-efficacy, outcome expectations and personal goal setting (Zimmerman & Schunk, 2001; Johns, Schmader and Martens 2005). Self-efficacy refers to people's judgment of their ability to organize and carry out certain actions in order to achieve goals (Bandura, 2001). How students think and feel about themselves shapes their behaviour, especially when facing challenging circumstances (Bandura, 2001).

Education systems are successful when they equip students with the ability to influence their own lives (Bandura, 2002). Mathematics self-beliefs have an impact on learning and performance on several levels: cognitive, motivational, affective and decision-making. They determine how well students motivate themselves and persevere in the face of difficulties, they influence students' emotional life, and they affect the choices students make about coursework, additional classes, and even educational and career paths (Wigfield and Eccles, 2000). Outcome expectations refer to beliefs about consequences of choosing to pursue certain courses of action. Personal goals refer to intention to pursue an activity to bring about a specific outcome (Bandura, 2001). According to Social Cognitive Theory, there is a triadic causal influence between the three variables that is multidirectional (Lent, Brown & Hackett, 1994). If girls are not given the necessary mathematics learning experience, they will have low self-efficacy in mathematics (Cates, Gary, Rhymer, Katrina, 2003). These different experiences include feedback from teachers, policy influences on mathematics education and attitudes towards girls' mathematics education (FAWE, 2007). Girls with greater self-efficacy in mathematics are more confident in their abilities to be successful in mathematics when compared to their peers with lower self-efficacy. Self-efficacy has proven useful for understanding girls' motivation and achievement in mathematics. Higher levels of perceived self-efficacy have been associated with greater choice, persistence, and with more effective strategy use (Cates, Gary, Rhymer, Katrina, 2003).

The second reason is that SCT addresses environmental factors that may influence girls' performance in mathematics like the socialisation process and the school environment (Lent, Brown & Hackett, 1994). The theory addresses issues of environmental barriers that girls in this case may encounter and also takes into account how gender and other social constructs impact opportunities and mathematics learning experiences available (Furner, Joseph, Berman, Barbara, 2003).

## **CHAPTER 2: REVIEW OF RELATED LITERATURE**

### **2.1 Introduction**

This chapter reviews related literature on the possible factors contributing to the poor performance in mathematics among girls. It focuses on Performance Differences between Boys and Girls in Mathematics, performance of girls in mathematics in sub-saharan Africa, teaching and learning practices and girls' performance in mathematics, parental support and girls' performance in mathematics and attitude of girls towards mathematics,

### **2.2 Performance Differences between Boys and Girls in Mathematics**

The search for sex differences in Mathematical ability has a long and tenuous history. For, “even when researchers announce that a mathematical performance gap has been closed, some researchers seek sex differences in sub areas of the mathematics in question or in subgroups of the general population” (Ian and Steven 2006). As a result, there is a pervasive belief that it is a “fact” that boys are better at and have more “natural” mathematical ability than girls (Kiefer & Sekaquaptewa, 2007). Perhaps more than that, there is a belief that people are either born with a Math gene, or they are not (Ian and Steven 2006).

Of all the cognitive skills, mathematics performance has been thought to show the largest differences in favour of males. Though these differences are not usually evident in lower grade school, they emerge during adolescence, and most research concluded that boys excel in mathematical ability (Spelke 2005). Recent findings suggest that gender differences in mathematics achievement are either diminishing or practically non-existent; other contemporary researchers have found that gender differences in the mathematics confidence of American students may still be prevalent (Reid, 2003; Fogg, 2005a; Fogg, 2005b). Girls are

less likely than boys to participate in mathematics at the more senior levels of secondary schooling (Xie, Yu, & Shauman, 2003).

### **2.2.2 Girls' Performance in Mathematics in Sub-Saharan Africa.**

Trying to find out what causes gender inequity in mathematics education has been the centre of attention of much gender research (Mulemwa, 1999; Bordo, 2001; UNESCO, 2003a; Reid, 2003). These studies have resulted in an extensive but incoherent body of information suggesting why females in developing world are underperforming in some areas of mathematics education especially in sub-Saharan Africa. Such beliefs as "Females are not good in mathematics" still have their advocates because of long-held assumptions and beliefs. However, there is consistent documentation that the major contributors to the gender gap in mathematics are environmental in nature influenced by society (Jones, Howe, & Rua, 2000). The differential treatment of females in Africa is grounded in beliefs that society has about gender differences. Adding to the problem is that mathematics classes are traditionally competitive and do not make room for a variety of learning styles (Mulemwa, 1999; Graham, 2001).

Gender stereotype is another glaring problem. Widespread acceptance of stereotyping of mathematicians and engineers as predominantly male domain from elementary to university level is still the norm. This refers to the practices of attributing roles, behaviours, and aspirations to individuals or groups solely on the basis of gender. Discriminations based on gender stereotype surface in many ways in the school context. It may occur, for example, through teachers' samples of group placements and activity assignments, the content of compliments and criticism. Examples range from the treatment of females in textbooks and curriculum materials to differential treatment of males and females in the classroom, to mistaken beliefs about attitudes and cognitive abilities (Mulemwa, 1999; Wood, 2000; Martorella et al. 2005; Saitoti, 2005).

The study done in Mauritius by Chinapah (2000b) found that girls outperformed boys in Mathematics in both urban and rural areas. Another study done by Kaino (1996) in Swaziland established that girls can do even better than boys in mathematics.

The above findings on performance of girls in mathematics shows that girls are not generally poor performers in mathematics and that they are capable of getting higher grades.

### **2.3 Teaching and learning practices and Girls' Performance in Mathematics**

The school provides the turning point in the girls' lives. It is at school where girls are moulded to be good and productive citizens and this task depends on availability of capable and well motivated human resource, relevant learning / teaching aids, up to date mathematics library, suitable classrooms and hostel facilities, enrolment levels, etc. (Halpern 2004). One perspective on the primary role of mathematics educators is that they strive to create a safe, consistent and predictable environment with a well defined curriculum that is delivered equitably to all pupils in well ventilated classroom (O'Connor, 2000).

There is overwhelming evidence through research for associations among various aspects of the school environment and girls' achievement scores (Stevenson, & Lee, 1990). A number of studies have shown that many school systems, particularly those in high-poverty areas, are plagued by decaying buildings that threaten the health, safety, and learning opportunities of students (Ryan & Patrick, 2001). Ryan & Patrick, (2001) further add that Good facilities appear to be an important precondition for student learning mathematics, especially girls since girls are particular about cleanliness and the appearance of the school for their motivation, provided that other conditions are present that support a strong academic program in the school.

Under the Teaching and learning practices and Girls' Performance in Mathematics, the literature reviewed includes sub-topics such as Physical Building Conditions and its impact on both learning and teaching, Overcrowding and its impact on learning and teaching of mathematics, mathematics reference books, classroom environment, Mathematics Teachers' Expectation and Influence on Girls' Performance in mathematics, teaching approaches that affect girls' performance in mathematics,

### **2.3.1 Physical Building Conditions.**

A study of the school system found, after controlling for other variables such as a student's socioeconomic status especially girls and that their mathematics standardized achievement scores were lower in schools with poor building conditions. Girls in school buildings in poor condition had achievement that was 6% below girls in schools in fair condition and 11% below schools in excellent condition. (Buckley, Schneider, & Shang, 2004)

Earthman, & Lemasters, (2000) examined the relationship between building condition and student achievement in small, rural Virginia high schools. Student scores on achievement tests, including girls, adjusted for socioeconomic status, was found to be up to 5 percentile points lower in buildings with lower quality ratings. Achievement also appeared to be more directly related to cosmetic factors than to structural ones. Poorer mathematics achievement was associated with specific building condition factors such as air conditioning, locker conditions, classroom furniture, more graffiti, and noisy external environments this was supported by research elsewhere (Schneider, 2002). What this entails is that even in the learning of mathematics girls' performance can be affected.

A study of North Dakota high schools, a state selected in part because of its relatively homogeneous, rural population, also found a positive relationship between school condition and both student achievement and

student behaviour. However the study also established that girls are affected more with the building condition than boys in the learning of mathematics and other subjects (Earthman, 2002; Schneider, 2002)

### **2.3.2 Impact on teaching**

A study of working conditions in urban schools concluded that "physical conditions have direct positive and negative effects on teacher morale, sense of personal safety, feelings of effectiveness in the classroom, and on the general learning environment." Building renovations in one district led teachers to feel "a renewed sense of hope, of commitment, a belief that the district cared about what went on that building." In dilapidated buildings in another district, the atmosphere was punctuated more by despair and frustration, with teachers reporting that leaking roofs and burned out lights, were the typical backdrop for teaching and learning." (Fisher, 2001; Schneider, 2002; Buckley, Schneider, & Shang, 2004).

Schneider, (2002) and Fisher, (2001) also found that where the problems with working conditions are serious enough to impinge on the work of teachers, they result in higher absenteeism, reduced levels of effort, lower effectiveness in the classroom, low morale, and reduced job satisfaction and teachers when in class, tend to concentrate on active participants who in most cases are boys. Where working conditions are good, they result in enthusiasm, high morale, cooperation, and acceptance of responsibility and help the slow learners in classes. This suggests that if teachers of mathematics are not motivated, their focus tends to be on the higher achievers or active participants who in most cases boys are hence leaving the girls which in turn bring about low morale and poor participation leading to poor performance.

### 2.3.3 Overcrowding

Overcrowding has been found to have a deleterious effect on student learning (Earthman, 2004). As well, chronic noise exposure hinders cognitive functioning, which is essential in the learning of mathematics and impairs also pre-reading and reading skills (Haines, 2001).

Maxwell & Evans, (2000) said that overcrowded schools are a serious problem in many school systems, where space for new construction and funding for such construction are limited. As a result, students find themselves trying to learn while jammed into spaces never intended as classrooms, such as laboratories etc. Although research on the relationship between overcrowding and student learning has been limited, there is some evidence, particularly in high-poverty schools, that overcrowding can have an adverse impact on girls' learning of mathematics as chronic noise exposure hinders cognitive functioning, which is essential in the learning of mathematics (Maxwell & Evans, 2000).

A study of overcrowded schools in New York City found that students, especially girls, in such schools scored significantly lower on both mathematics and reading exams than did girls in underutilized schools. In addition, when asked, girls and teachers in overcrowded schools agreed that overcrowding negatively affected both classroom activities and instructional techniques. (Rivera and Marti, 1995)

Jones, Howe, & Rua, (2000) found that overcrowding and heavy teacher workloads created stressful working conditions for teachers and led to higher teacher absenteeism.

Crowded classroom conditions not only make it difficult for both boys and girls to concentrate in their mathematics lessons, but inevitably limit the amount of time teachers can spend on innovative teaching methods such as cooperative learning and group work or, indeed on teaching anything beyond the barest minimum of required material (Shendell, Prill, Fisk, Apte, Blake & Faulkner, 2004). Therefore teachers resort to concentration on the active participants who make teachers' work easy.

### **2.3.4 Mathematics Reference Books and Girls' Performance in Mathematics.**

The importance of mathematics reference books, text books and other reading materials in a school system cannot be overlooked. Sosniak & Perlman (1990) found out that mathematics books provide the learner with extra knowledge and skills which may be difficult to acquire in a classroom situation, by offering continuity of experience (Ball & Bass, 2002).

If girls just like boys, are given chance to explore mathematics books, they will discover that mathematics is not as difficult as they thought (Bassarear 2005). McCrory, (2006) adds that mathematics books help in putting progressive methods of teaching into practice and that they help supplement the knowledge learnt in the classroom by making knowledge complete and comprehensive. It is chiefly through mathematics books Ball & Bass (2003) and Hanna (2000), that we enjoy intercourse with superior minds in mathematics. In the mathematics books, great men and women talk to us, give us their precious thoughts (Yachel & Hanna 2003).

John and Blatchford (2007) also hold that through reading mathematics books, girls will develop their mental faculty that will help them handle the subject. This however may not be the situation in most rural government schools where pupils have little or worse still even have no access to the mathematics text books. They totally depend on what the teacher gives them in class which in most cases is not enough. Though most recent reviews agree that measures of the school resources, such as number of books in the library, and teacher-student ratio, have shown little association with achievement, they can however reduce the rate of syllabus coverage which in turn affects the learning of mathematics (Centra & Potter, 2010; Atweh, Meaney, McMurchy-Pilkington, Neyland, & Trinick, 2008). One possible explanation for these results is that, although specific school characteristics may influence girls' performance in mathematics, each may have only a small effect.

### **2.3.5 Classroom Environment and Girls' Performance in Mathematics.**

The influence of the learning environment upon knowledge development has received relatively little attention in the field of mathematics teaching and learning (Boaler, 2000, 2008).

What happens in the classroom has an impact on girls' opportunity to learn mathematics, for instance, different teaching styles in mathematics can have different impacts on girls' achievement (Samuelsson, 2008) and that the choice of teaching approaches can make an important difference in a girl's learning of mathematics (Wentzel, 2002). The synthesis of meta-analysis and reviews of Teddlie and Reynolds (2000) give evidence for positive relationships between girls' achievement in mathematics and varied classroom settings.

Researchers also have compared single-sex and co-educational classrooms upon students' attitudes towards mathematics (Norton & Rennie, 2008). Students (either females or males) in single sex classrooms were found to have more positive attitudes towards mathematics than students in the co-educational classrooms. Norton and Rennie's (2008) study of grades 8 to 12 in four secondary schools (one private single-sex girls' school, one private single-sex boys' school, one coeducational state Secondary school, and one coeducational private school) in Queensland, Australia, found that boys in the single-sex classrooms had the most positive attitudes towards mathematics education. The attitudes of boys towards mathematics in coeducational classrooms were similar to the girls in the single-sex classroom, and the girls in the coeducational classrooms reported less positive attitude on most scales in mathematics.

All these results suggest that strategies that target teachers' Instructional practices may have an effect on girls' attitudes towards mathematics, and that girls might appreciate the learning of mathematics well in a class where they are able to learn mathematics without interference from boys.

### **2.3.6 Mathematics Teachers' Expectation and Influence on Girls' Performance in Mathematics.**

There is a strong belief among some teachers that mathematics and science subjects are a male preserve. Many teachers, including women teachers, despite much lip service to the equality of girls and boys, just do not believe that girls have the ability to study mathematics (O'Connor, 2000). Female Education in Mathematics and Science in Africa (FEMSA) studies in eight African countries namely, Burkina Faso, Kenya, Mali, Malawi, Mozambique, Senegal, Swaziland, and Zambia, O'Connor, (2000) found teachers' attitudes and approaches to factor greatly in this state of affairs across all the countries. Again, teachers generally tended to accept the situation as being out of their control and inevitable and therefore, saw nothing wrong in terms of their attitudes and instructional styles (O'Connor, 2000).

Furthermore, Female Education in Mathematics and Science in Africa (FEMSA)'s eight countries research project O'Connor, (2000) further revealed that poor expectations of girls' performance on the part of teachers leads to the kind of science and mathematics classroom dynamics, where girls are treated very differently from boys. Their studies revealed that teachers do not encourage girls during mathematics lessons, and in fact, at times, actively discourage them. Furthermore, one of the best documented findings of the past years is that teachers interact more often and in more detail with boys than with girls. This has been observed in students from preschool to college.

Rosenthal and Jacobson (1992) also found that teachers' expectations caused changes in girls' academic achievement in general even when accounting for the girls' past achievement and motivation. Rosenthal and Jacobson (1992) found that teachers view girls as performing more highly than boys, and as trying harder than boys. One way they do this is by directing more challenging, high order thinking questions to males, while only simple recall type of questions to females (Mulemwa, 1999). This kind of treatment can only reinforce and confirm in the minds of both boys and girls what society and literature peddles around 'that mathematics is for boys only.' Boys therefore, over time, develop at this subject which they consider a male domain. Thus teachers' classroom instructional and management practices are not always conducive to learning especially for girls in mathematics classes (FAWE, 2001).

However, teachers view boys as having more mathematics talent than girls (Garrahy, 2001). According to this view, girls who succeed in mathematics do so because they compensate for their lack of mathematics talent by working hard. Such biased views can unintentionally influence the way teachers treat pupils. Teachers may treat pupils

differently based on the pupil's sex, even when they believe they are acting in a gender-blind manner towards their pupils (Garrahy, 2001; Turner, 2010); however, this is not always the case (Helwig, 2001; Bleeker and Jacobs, 2004).

A number of studies also have shown that boys' more interaction with teachers in class than girls tend to influence better development of mathematics concepts among male students (Clarke 2011). Also the pattern of interaction in class tended to make boys appear more competent in mathematics than girls (McMillan, Myran and Workman, 2002; Stiggins, 2002). Boys' greater use of verbal and non-verbal language to dominate more of the teacher's time in terms of attention and classroom control is one of the influencing factors favouring boys in class (Dweck, 2007). For example, boys' attraction to the teacher's time could be attained by boys being more mobile than girls in the classroom. Teachers ask males more questions and give them more feedback (e.g. praise, criticism, correction), and give them more valuable and specific comments (Graham, 2001).

Although many educators agree that teachers' mathematics attitudes can affect their students' mathematics attitudes and achievement, only a few empirical studies have directly tested this relation (Beilock, Gunderson, Ramirez, Levine, 2010; Midgley, Feldlaufer, and Eccles, 1999). One study found that teachers' mathematics teaching self-efficacy was positively related to girls' own mathematics attitudes in late elementary and middle school (Midgley et al. 1999). Compared to girls whose teachers had low mathematics teaching self-efficacy, girls whose teachers had higher mathematics teaching self-efficacy believed mathematics was less difficult, believed they were doing better in mathematics, and expected to do better in mathematics in the future (Swars, Hart, Smith, Smith, and Tolar, 2007, 2009). Further, the impact of teachers' mathematics teaching self-efficacy was most pronounced for girls who were lower-achieving in mathematics (Midgley et al. 1999).

More recent research has investigated the impact of teachers' mathematics anxiety on girls' mathematics attitudes and achievement in early elementary school (Beilock, Gunderson, Ramirez, and Levine, 2010). Since elementary school teachers are more than 90% female, National Education Association (2003), this study asked whether female teachers' mathematics anxiety affected girls' achievement in 1st and 2nd grades. Moreover, the study investigated whether the

relation of teachers' mathematics anxiety to girls' mathematics achievement was mediated by girls' stereotypes about mathematics (Marx and Roman 2002). Specifically, recent researches show that female teachers' mathematics anxiety relates to girls' mathematics gender stereotypes and mathematics achievement (Beilock et al. 2010). While this study begins to address how mathematics anxiety among adults affects girls' development of mathematics attitudes and mathematics competence, there are still many unanswered questions. For example, what specific behaviours mediate the relation between teachers' mathematics anxiety and girls' adoption of mathematics-gender stereotypes?

Since previous research shows that mathematics anxiety leads to on-line decrements in working memory capacity due to worries and ruminations about the task at hand (Beilock 2008), these worries may disrupt teachers' confidence and ability to effectively teach mathematics (Brady and Bowd, 2005), which in turn may affect the amount of time they spend planning mathematics lessons as well as their ability to adequately address children's questions. Furthermore, teachers may also manifest non-verbal behaviours that are indicative of anxiety e.g., frequent self-touching.

Although the studies mentioned above lay the groundwork by establishing that teachers' mathematics attitudes are related to girls' mathematics attitudes and achievement, there is a need for additional research on these effects. Are the impacts of teachers' mathematics anxiety, mathematics teaching self-efficacy, and mathematics self-concept on girls' attitudes and achievement similar or distinct? How do male teachers' mathematics attitudes affect their male and female students?

And, critical for our understanding of these relations, what teaching practices and behaviours occur as a result of teachers' mathematics attitudes, and how do girls interpret and react to these behaviours? Teachers also show gender biases in their attributions of mathematics success (Fennema, Peterson, Carpenter, & Lubinski, 1990; Tiedemann 2000a). Elementary school teachers attribute boys' mathematics successes predominately to ability, while they

attribute girls' mathematics successes equally to ability and effort (Fennema et al. 1990). Conversely, teachers of mathematics are more likely to attribute girls' failures to lack of ability and boys' failures to lack of effort (Fennema et al. 1990; Tiedemann 2000a). Boys and girls are different. One is not better than the other; they are just different. As a result, we can expect that a difference exists in how boys and girls learn. However, in many classrooms, the classroom climate, learning style, instructional style, and experiences offered to boys and girls may not address the needs of either gender. This tunnel-vision view that all students learn in the same way regardless of gender, may be doing a disservice to girls. The problem is that traditional methods of teaching mathematics have a negative impact on both girls and boys (Gurian, Henley, Stevens & Trueman 2010; Kindlon, 2000, 2006).

Mathematics in schools today in many classrooms is mostly based on a traditional skills model (Becker, 2003; Gamoran, 2003). Too often this means memorization and rote recitation rather than active concept based learning. Imagine a classroom climate that acknowledges gender differences while considering individual styles and behaviours (Forgasz, Kloosterman, & Leder, 2004; Gavin and Reis, 2003). This classroom climate would be supportive of the mathematics learning needs of both boys and girls. An essential element in this approach is planning a curriculum that is developmentally appropriate, individualized, and gender responsive.

Many assumptions are made about differing abilities of girls and boys when it comes to mathematics (Bielinski and Davison, 2001; Loveless and Coughlan, 2004; Perie, Grigg, and Dion, 2005). In the classroom, research has also shown that girls tend to feel less confident about their answers on tests and often express doubt about their performance. Boys, however, tend to show more confidence and sometimes overconfidence. This uncertainty on the girls part and over-confidence on the boys part often extends beyond individual problems into their general view of mathematics (Ai, 2002; Leedy, LaLonde, & Runk, 2003; Li, 2001; Tiedemann, 2000, 2002).

### **2.3.7 Teaching Approaches and Girls' Performance in Mathematics.**

There are very few studies focusing on how different teaching methods affect girls' mathematics calculation and conceptual understanding as well as self-regulated learning skills, but there are several studies that focus on closely related areas. For learning in general, Granström (2006) shows that different teaching approaches in classrooms influence the outcomes for students in different ways. Research results, (Oppendekker and Van Damme 2006) show that girls are more sensitive to their mathematics teachers' incentive signals than boys. The teachers' attitude was a primary factor influencing the attitude and performance of the students.

Fisher, Dobbs, Doctoroff, & Arnold, (2012) argued that a variation of teaching methods in mathematics is important because different teaching methods draw attention to different competencies in mathematics as also suggested by (Boaler, 2002; Samuelsson, 2008).

In a review of literature on successful teaching of mathematics, Reynolds and Muijs (1999) discuss American as well as British research which may be applied in the *Zambian* situation. According to research in education, girls' achievement in mathematics is improved when teachers of mathematics create classrooms that include (a) substantial emphasis on mathematics instruction and girls' engagement in mathematics tasks (Cooney, 1994), (b) whole-class instruction (Reynolds & Muijs, 1999), (c) effective question-answer and individual practices (Borich, 1996), (d) minimal disruptive behaviour (Secada, 1992), (e) Secondary teacher expectations (Borich, 1996), and (f) substantial feedback to students (Borich, 1996).

Programmes that have attempted problem-solving in small groups as a teaching method report good results, such as improved conceptual understanding and Higher scores on problem-solving tasks (Boaler, 2013). What do the above findings mean regarding how teachers teach classrooms? It means that teachers have to

be sensitive to the different needs of boys and girls. While their ability and potential to understand higher level mathematics is equal, their brains are different and more importantly, their approach to learning mathematics may be different (Gurian, Henley, Stevens and Trueman, 2010).

### **2.3.8 Summary**

According to review of literature above, girls' achievement in mathematics is improved when teachers of mathematics create classrooms that include ; substantial emphasis on mathematics instruction and girls' engagement in mathematics tasks , whole-class instruction, effective question-answer and individual practices, minimal disruptive behaviour, high teacher expectations and substantial positive feedback to both boys and girls. Furthermore, girls need to learn in classes that are not overcrowded as overcrowded classes tend to make teachers concentrate on higher achievers leaving the rest unattended to. If the above summary is not the case with teaching and learning practices at Sesheke secondary school, then it is possible that teaching and learning practices might be contributing to poor performance of girls in mathematics at Sesheke secondary school.

### **2.4 Parental support and Girls' Performance in Mathematics.**

Any school is situated in a certain social and economic environment. The nature of this man made environment provides a chance for girls to rehearse how they are going to apply their knowledge of mathematics to solve their environmental problems (Floud and Halsey 2008; Reddy, 2003).

Despite the similarity in Mathematical abilities between males and females, research consistently indicates a pervasive implicit perception that mathematics and Science are masculine domains (Nosek, Banaji, and

Greenwald, 2002; Nosek, Greenwald, and Banaji, 2006). These attitudes and stereotypes are fostered in girls (and boys) throughout their lives, passed on, perhaps unconsciously, by parents, teachers (Garrahy, 2001), and the media (Wilgosh & Scorgie, 2008). Hence this part of the study looked at the support that parents render to their daughters in order to enhance girls' performance in mathematics.

#### **2.4.1 Parents' Expectations**

A large body of literature has shown that parents' and teachers' gender stereotypes, beliefs, and expectations regarding girl's mathematics aptitude affect girl's subsequent mathematics attitudes and achievement in a way that perpetuates gender-stereotypical roles (Eccles, Jacobs, & Harold. 1990; Midgley et al. 1999). In middle and Secondary schools, parents of boys tend to believe that their child has higher mathematics ability and expect their child to achieve more in mathematics than parents of girls (Eccles, Jacobs, and Harold. 1990). By sixth grade, parents believe that boys have more natural talent in mathematics, anticipate that boys will have greater future success in careers requiring mathematics skills, and rate the importance of mathematics as greater for boys than for girls, and rate mathematics as more difficult for girls than for boys (Eccles, Jacobs, & Harold. 1990). Mothers of boys also tend to believe that their child has more talent in mathematics and have to try less hard than mothers of girls, and fathers set much higher minimum standards for mathematics grades for average-ability boys than for average-ability girls (there was no difference in fathers' minimum standards for Secondary-ability boys and Secondary-ability girls; (Bhanot, & Jovanovic. 2005). Importantly parents have gender-stereotyped beliefs about their boys' and girls' mathematics abilities even when boys' and girls' mathematics achievement levels do not differ according to objective measures (). These studies of elementary school parents and children, Schmader, Johns, and Barquissau, (2004) suggest that parents' mathematics-gender stereotypes can affect their perceptions of their own

children's mathematics ability even in early elementary school. Moreover, these parental perceptions appear to have an impact on children's achievement expectations.

Parents treat boys and girls differently from birth. They are more physically active with boys than with girls, Reid & Roberts, (2006) and give boys more spatially complex toys and more opportunities to explore their physical worlds (Croizet, Despres, Gauzins, Huguet, Leyens, Moet, 2004; Milburn 2010). These differences may contribute to the well-documented gender differences in spatial ability (Bleeker, & Jacobs, 2004; Halpern, 2007). Spatial ability is an important component of mathematics skills and facilitates comprehension of abstract mathematics concepts used in geometry, trigonometry and calculus. Frenzel, Goetz, Pekrun, and Watt, (2010) found that many parents expect their young sons to develop mathematics skills earlier than parents of young girls expect their daughters to develop these skills.

Parents of boys in a research by Jacobs and Bleeker (2004) indicated that their sons would be able to solve all mathematics tasks sooner than parents of girls indicated that their daughters would be able to solve mathematics tasks. The parents' beliefs about the girls could clearly be detrimental to their daughters' beliefs about mathematics and their performance in mathematics. Parents' primary function is to create a safe environment within which children and girls in particular can realise their full human potential (Spelke, 2005; Spelke and Grace, 2007). This kind of environment is advocated by Sichelwe (2000) when he suggests that the parents and the home environment also play a major role in helping to create a stimulating learning setting for girls.

The current cultural climate in most African countries, Zambia inclusive, is the result of an interaction of pre-colonial, colonial and postcolonial factors. Pre-colonial gender biased division of labour have created a position of women as inferior in mathematics education as well as in the current socio-cultural climate

(Wambua, 2007). In colonial times, gender determined who had access to education and not only education but also to subjects like mathematics (Chimombo, 2000; Shabaya and Konadu-Agyemang, 2004).

#### **2.4.2 Parents' Economic Status' Influence on Girls' Performance in Mathematics.**

In the past four decades, studies in the United States have consistently shown that family income is related to children's cognitive development and academic achievement. Children of lower-class families are more likely to drop out of Secondary school and do poorly on standardized tests than middle and upper-class children (Bradley, Corwyn, McAdoo, and Coll, 2001; Yeung, Linver, and Brooks-Gunn, 2002).

Some parents would rather fight for their recognition in society than spend money educating girls with whom completion of education is uncertain. This in turn affects the girls' performance in mathematics (Aremu 2010). Mathematics education requires an extra expenditure which most parents below the poverty datum level cannot afford (Aremu 2010; Yeung et al., 2002).

#### **2.4.3 Summary**

Review of related literature on parental support to girls' mathematics education consistently indicates a pervasive implicit perception that mathematics is of the masculine domains (Nosek, Banaji, and Greenwald, 2002; Nosek, Greenwald, and Banaji, 2006). These attitudes and stereotypes are fostered in girls (and boys) throughout their lives, passed on, perhaps unconsciously, by parents and teachers. Parents' gender stereotypes, beliefs, and expectations regarding girl's mathematics aptitude affect girl's subsequent mathematics attitudes and achievement in a way that perpetuates gender-stereotypical roles

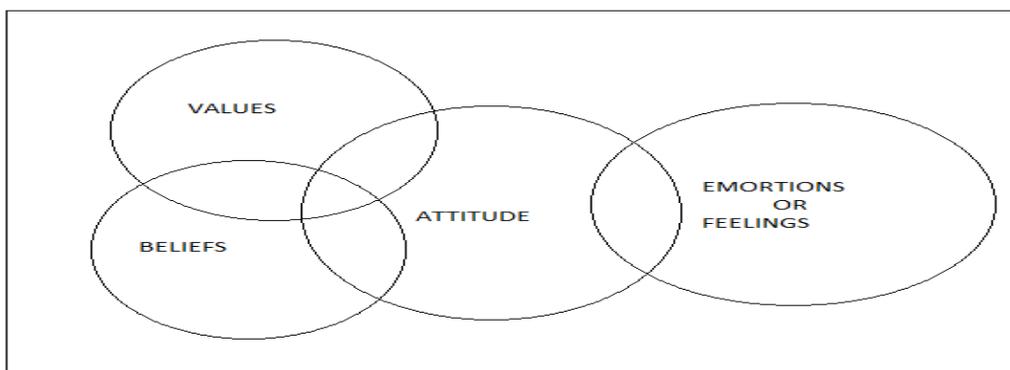
## 2.5 Attitude of Girls towards Mathematics

Many more girls re-write mathematics as GCE candidates after they leave school than they do in other subjects, an indication that poor performance in the subject affects highly the girls. This poor performance may be due to a lot of factors one of which might be the girls' attitude towards mathematics at Sesheke Secondary School. This section of the literature review focussed on girls' attitudes towards mathematics in the following sub-headings; affective factors, Young girls' Susceptibility to Gendered mathematics attitudes, girls' self-efficacy in mathematics and why girls see themselves as mathematically inferior.

### 2.5.1 Affective factors

In the last decade or so there has been increased interest in the role of affective factors in the learning of mathematics (Schuck and Grootenboer, 2004). This has been elaborated in the table below.

FIGURE 2 :



#### A model of conceptions of the affective domain

Source : (Grootenboer, 2003).

Figure 2 above shows that values, beliefs, attitudes and feelings are related in the learning of mathematics.

There is an assumption that positive Mathematical beliefs, attitudes, and feelings will lead to increased Mathematical achievement and while this seems like a reasonable proposition, it does warrant further investigation (Grootenboer, 2003a). Grootenboer, (2003a) suggested that learning in mathematics is more than just the acquisition of skills and knowledge, and, “it is not sufficient to focus exclusively on the ideas and skills that we want students to learn” (p. 55). The significance of Mathematical beliefs and attitudes was highlighted by Wilkins and Ma (2003):

*A person’s Mathematical disposition related to her or his beliefs about and attitude toward mathematics may be as important as content knowledge for making informed decisions in terms of willingness to use this knowledge in everyday life. (Wilkins and Ma (2003):p. 52).*

Furthermore, affect is a significant and critical dimension of learning (Zembylas, 2004). With this in mind, it seems important to pay close attention to the Mathematical classroom experiences of girls, as these are critical in the development of affective dispositions and views towards mathematics (Zembylas, 2004).

### **2.5.2 Mathematical Beliefs and Values.**

In terms of Mathematical beliefs, Ambrose, (2004) identified three conceptual groupings:

- (1) Mathematics as an expanding field of human invention which is dynamic and problem-driven (Problem-solving view);
- (2) Mathematics as a structured, unchanging body of knowledge (Platonist view); and
- (3) Mathematics as a collection of procedures, facts and skills (Instrumentalist view).

The Platonist view is akin to a traditional view of mathematics and there are numerous studies that report a prevalence of this perspective amongst girls and teachers (Loveridge, Taylor, Sharma, and Hawera, 2006).

Grootenboer (2003) suggested that this perspective is problematic as it is not consistent with the nature of mathematics that is fallible and developing, like any form of human knowledge. Loveridge et al. (2006) all report from New Zealand studies that there is evidence of a utilitarian or instrumental view of mathematics amongst students, but there appeared to be few findings that noted a problem-solving perspective of mathematics amongst school students.

Values are often seen as similar to beliefs, but Grootenboer, (2003b) made the distinction that “values are demonstrated in the actions carried out by a person, whereas beliefs can be verbally assented to, but do not necessarily lead to observable behaviour in public” (p. 3).

Attitudes are seen as more affective and less cognitive than beliefs or values McLeod, (2002). In general, attitudes are directed towards something (in this case, mathematics), are seen as either positive or negative, and are grounded in experience (McLeod, 2002). It is important to note that attitudes do not reflect the real experience of a student, but rather the understanding and perception of his or her previous educational experiences (Martin, Berenbaum and Ruble, 2006).

### **2.5.3 Young girls’ Susceptibility to Gendered Mathematics Attitudes.**

Much of the research on adults’ influences on students’ gendered mathematics attitudes has focused on late elementary school through Secondary school grade levels (Midgley et al. 1999; Simpkins, 2011). However, developmental research suggests that girls in early elementary school already have the ability to infer broadly held stereotypes, and that this is particularly true of girls from academically stigmatized groups (Ambady, Shih, Kim, & Pittinsky. 2001). Hence, it should come as no surprise that studies of preschool and early elementary school children have shown that mathematics attitudes are already gender-differentiated at this age ( Beilock et al. 2010; Cimpian, Arce, Markman, & Dweck. 2010; Cvencek, Meltzoff, Greenwald. 2011; Gunderson, Gripshover, Romero, Dweck, Goldin-Meadow, and Levine. 2011).

As early as second grade, girls endorse the societal stereotype that mathematics is for boys and not girls on both implicit and explicit measures (Cvencek et al. 2011). Girls not only endorse these stereotypes, but their performance can be affected by making these stereotypes more salient (Ambady et al. 2001) and (Cimpian 2010). Young girls are influenced even by subtle introductions of mathematics-gender stereotypes (Ambady et al. 2001). Five- to seven-year-old girls whose female identity was activated by colouring a picture of a girl holding a doll performed worse on a subsequent mathematics test than girls who coloured a picture of a landscape, while boys whose male identity was activated performed better on a mathematics test than boys in the control condition (Ambady et al. 2001).

#### **2.5.4 Girls' Self-Efficacy in Mathematics.**

Self-efficacy is positively related to mathematics achievement in a variety of settings across school and across countries (Dermitzaki, Leondari, & Goudas, 2009). In other studies researchers have found strong relations between self-efficacy and achievement in mathematics established within two years of starting school (Ireson & Hallam, 2009). When Törnroos (2006) used hierarchical linear models in the Nordic countries in PISA they found that self-efficacy was a stronger predictor to girls' achievement in mathematics than internal motivation, instrumental motivation and anxiety in mathematics. Intellectual growth is partially determined by individual belief in personal ability to master various subjects and regulate self-learning (Chilekwa, 2013). Efficacy beliefs influence academic motivation and aspirations, level of interest in intellectual pursuits, scholastic achievements, and academic goal persistence (Bandura, 2001; Schunk and Pajares, 2004). Positive mathematics efficacy beliefs elevate mathematics expectations that lead to mathematics success (Bandura, 2001). A strong sense of personal efficacy creates self-directed lifetime mathematics learners who are valued and economically rewarded in today's society (Ryan & Deci, 2000; Lapointe, Legault & Batiste, 2005).

Researchers have studied the motivational orientations and girls mathematics self-perception from a variety of theoretical perspectives (Ryan and Deci, 2000; Ryan & Patrick, 2001; Schommer-Aikens, Brookhart, Hutter & Mau, 2000). A summary of the findings suggests a positive relationship between girls' motivation, self-esteem, academic engagement and academic achievement (Singh, Granville, & Dika, 2002). Further, the literature shows that underlying motivation is the individual's beliefs – self theories (Lepper & Henderlong, 2000). It is this belief in one's ability and its relation to achievement that drives persistence. Therefore, with regard to this study, girls who believe in their mathematics ability, and further believe that their ability is linked to their effort in learning mathematics are motivated to work harder and as a result achieve at a higher academic level (Ireson & Hallam, 2009).

Additionally, girls' attitude toward mathematics is highly correlated with achievement in mathematics (Ryan & Patrick, 2001). Their belief that mathematics is important to achieving their future goals results in greater effort to succeed in mathematics and as a result, higher achievement scores (Bouchey & Harter, 2005).

## **2.6 Conclusion**

The views provided in the above cited studies indicate that there were still some mixed feelings on the magnitude of girls' performance in mathematics. These results show that girls can perform better in mathematics if they can receive the necessary support from all stake holders as they learn mathematics.

Granström (2006) showed that different teaching and learning practices in any learning institution influence the outcomes for students in different ways. Research results, (Oppendekker and Van Damme 2006) showed that girls were more sensitive to their mathematics teachers' insensitive signals than boys. The teachers' attitude was a primary factor influencing the attitude and performance of the students. Also a large body of

literature has shown that parents' gender stereotypes, beliefs, and expectations regarding girl's mathematics aptitude affect girl's subsequent mathematics attitudes and achievement in a way that perpetuates gender-stereotypical roles (Eccles et al. 1990; Midgley et al. 1999).

In general, attitudes were directed towards something (in this case, mathematics), were seen as either positive or negative, and were grounded in experience (McLeod, 2002). It is important to note that attitudes did not reflect the real experience of a student, but rather the understanding and perception of his or her previous educational experiences (Martin and Ruble, 2004). In this study, attitudes may not necessarily reflect the real experience of a student, but rather the understanding and perception of his or her previous mathematics experiences

From the literature review, it is evident that poor performance in mathematics among girls has been identified both in developed and developing countries and that this poor performance is as a result of lack of or inadequate parental support to girls, poor teaching and learning practices and girls' negative attitude towards mathematics, which might also be contributing factors at Sesheke secondary school among others if their presence will be established. No study has been carried out at Sesheke secondary to establish the factors as at the moment and it is not known what contributes to such poor performance (comparatively) in mathematics among girls. These three propositions are inter related in a sense that the school may have good teaching and learning practices, but if girls will have negative attitudes towards mathematics and parents fail to support the girls in their mathematics education, poor performance in mathematics by girls will continue. Attitude can either be fostered by parents, teacher or even peers themselves. The next chapter presents the methodology of the study.

## **CHAPTER 3: RESEARCH METHODOLOGY**

### **3.1 Introduction**

This chapter includes a rationale for choosing a case study research design as well as the technical aspects of the research including the methodology of the research and this is done under the sub-headings: research design, population, sampling and sampling procedures, data collection instruments, data collection techniques, process and lastly data analysis.

### **3.2 Research Design.**

A single case study methodology was adopted because of its applicability to this study. This research methodology is appropriate for the purpose of describing, explaining or evaluating social constructs (Gall, Gall, & Borg, 2005; Zucker, 2001). This methodology was selected for this particular study because the research questions were aimed at explaining why and how Sesheke Secondary School girls perform poorly in mathematics.

### **3.3 Population**

Sesheke Secondary School had a girls' population of seven hundred eighty six and seventy-five teachers of which only eight were teachers of mathematics.

### **3.4 Sample**

Four teachers of mathematics took part in the study while twenty five parents took part in the study. From the population of seven hundred eighty six girls at Sesheke secondary school, fifty girls took part in the

study. As for the group discussions, out of the teacher population of seventy-five, twelve teachers (four from mathematics and eight others from others departments) took part in the study.

### **3.5 Sampling and Sampling procedures.**

Sampling is a method of obtaining representative data or observations from a group (lot, batch, population or universe) (Lisa, 2008).

Four teachers of mathematics were asked to take part in the study since they were the only teachers of mathematics present at the time of the study. Purposive sampling could not apply in this case.

Purposive sampling was used to select both parents and the girls (Subjects in purposive sampling are selected because of some characteristic, (Patton 1990; Lisa, 2008). In line with sampling of parents, two villages namely Nalisa and Ilyangu were selected due to their accessibility. In each village, a village headman, also called an Induna, was approached to give names of subordinates in his territory that he knew could read and write and also who could cooperate in the research. From the selected girls' responses too, some parents to the girls who were within reach were sampled and asked to take part in the research. Furthermore from the church where the researcher congregated, church leaders were asked to give names of parents within the church that could read and write and these were also sampled out (Patton1990). Using the above sampling methods, 25 purposively selected members of the community were asked to provide the study with data. The first priority was given to parents who had both daughters and sons at Sesheke secondary school because it was easy for them to compare the performance of their children. However, in the event that parents of both sons and daughters were not found, parents who previously had both sons and daughters at the school were also given chance to take part in the research.

The school Career Guidance and Counselling teachers together with the available teachers of mathematics identified classes from grades 10, 11 and 12 because they were aware of girls who could express themselves and asked them to take part in the study voluntarily. This method of sampling represents the most clear cut instance of a phenomenon interested in and helps to achieve the intended objectives as compared to random sampling where may be the respondents chosen are unable to give the required data (Lisa, 2008). Using this method, fifty girls were selected.

### **3.6 Methods of Data Collection**

This study involved getting data on teaching and learning practices in mathematics, parental support and attitudes of girls towards mathematics at Sesheke Secondary School through questionnaire guide, Focus group discussion guide, semi- structured interview guide as well as lesson observation check list.

### **3.7 Data collection procedures.**

In order to explore teaching and learning practices at Sesheke secondary school, four teachers of mathematics were observed during their mathematics lessons. Lesson observations were done first so that data collected from observations would not be influenced by focussed group discussions (Marshall and Rossman, 2006; DeWalt & DeWalt, 2002).

The focus group discussion was then held at Sesheke Secondary School, in the staff room with not only teachers of mathematics but other subject teachers too. An invitation was made to all teachers through an internal memorandum and eight teachers (3 females and 5 males), responded/attended. It was worth engaging the non- mathematics teachers in order to find out what they thought of mathematics and what help they could render if the subject was to be liked by both boys and girls.

In order to establish parental support to girls in their mathematics education, questionnaires were given to twenty five selected parents upon accepting to take part in the study voluntarily. Short, semi- structured interviews were also conducted on each of the selected parents in order to collect data that might not have been captured through the questionnaire (Patton, 2002).

In order to determine girls' attitudes towards the learning of mathematics, firstly, questionnaires were distributed to the selected girls and collected at the agreed time after the girls had completed filling them in. This helped collect data without influence from the group discussions. Data collection through questionnaires was followed by a focussed group discussion with twelve girls, (four from each grade from grades 10 -12, from among the fifty who were given questionnaires) in one of the classrooms.

### **3.8 Data Analysis.**

Data was analysed qualitatively. However, since there were numbers involved, quantitative methods were also employed in such cases. The first step in data analysis was to transcribe the interviews, questionnaires and focus group discussions findings.( Morrill, LeGrande, Renssen, Bakker, and Otto-Bliesner, 2013; Ratchcliff, 2002; Phillips, & Jorgensen, 2009). These processes emerge from reading the notes and continue while editing the notes and deciding how to organize them, in an ongoing cycle (Morrill, LeGrande, Renssen, Bakker, and Otto-Bliesner, 2013).

### **3.9 Ethical Issues**

The purpose of the research was explained to the respondents before they were allowed to give any piece of information. Great efforts were made to protect the participants' privacy. Prior to conducting any observations or interviews, all participants were asked to sign a letter of informed consent. Girls, who were enrolled at School, were required to obtain parental permission. The form clearly outlined what would be happening in the study, and informed them that they had the right to refuse to participate.

In order to investigate whether or not teaching practices at Sesheke Secondary School contribute to girls' poor performance in mathematics, firstly permission was sought from the head teacher to carry out a study in the school. After permission was granted by the head teacher, permission also was sought from each individual teacher of mathematics to be observed as well as to have a structured interview with each one.

## **CHAPTER 4: FINDINGS OF THE STUDY**

### **4.1 Introduction**

This chapter is organised into four areas namely; findings from teacher observations at Sesheke secondary school, findings on parental support to girls, findings on girls' attitude towards mathematics and summary of the findings.

### **4.2 Teaching and Learning Practices at Sesheke Secondary School**

#### **4.2.1 Physical environment**

With regards to physical infrastructure, that is the classrooms and furniture in them was dilapidated.

Figure 3



Figure 4



Figures 3 and 4 shows the state of desks in some of the classrooms to an extent that in some classrooms, pupils use benches which are not comfortable enough to sustain comfortability for long hours of learning. This suggests that since boys are able to cope with hard situations, they are not highly affected with poor furniture in the classrooms.

#### 4.2.2 Teachers /pupil

The minimum class enrolment on average was seventy eight and of all the teachers at the school, only eight were teachers of mathematics who had to share the thirty one classes.

Figure 5



Figure 5 above shows pupils in one of the classes at the school with an enrolment of one hundred twenty seven pupils. This kind of a scenerio does not enable teachers help pupils individually more also girls who were seen not to be as active as boys. Also mathematics teachers may direct questions to active pupils who in most cases are boys, hence disadvantaging girls.

#### 4.2.3 Lesson observations

In order to further explore teaching and learning practices at Sesheke secondary school, four teachers identified as teacher A, teacher B, teacher C and teacher D, were observed during their mathematics lessons and the following were the findings.

Though the school management has tried to put up some measure to try and enhance conditions for improving girls' performance in mathematics, such as awarding girls who do well, the study established from the lesson observations that there were trends by most mathematics teachers in class that discourage

girls from performing to the best of their ability. Such trends include more positive feedback being given to boys than to girls. Though in most cases questions were given to both participants, feedback such as praises, encouragement and corrective feedback were given more to boys who dominated than they were given to girls. The study also established that there was more time given to boys to answer any given question than there was for girls. Each time girls failed to give the correct answer to the question, most teachers shifted the question immediately to the boys. But if a boy failed to give the correct answer, most teachers waited for some time and encouraged other boys to help.

Furthermore, the study also established that more individual attention during mathematics lessons were given to boys than to girls. Most teachers spent less time with girls than they did with boys and that half of the teachers observed were biased in their questioning techniques towards boys. Each time a question was asked, the two teachers would wait until a boy raised his hand and point at him when there were girls who raised their hands first.

### **4.3 Findings from Group Discussions**

Two group discussion sessions were held at Sesheke secondary school and the following were the findings

A grade ten girl, in reflecting her inabilities and a need to be helped indicated, during the group discussion, “my problem is that the teacher is too fast, I do not understand mathematics. I want someone who is patient and does not get angry with me”. On the same sentiments, another grade ten girl, said: “you find that you tell the teacher that you don't understand he ends up shouting and asking how come you don't understand such an easy sum? You girls just don't use your brains.”

Regarding content, majority of the girls during the group discussion indicated that they battled with mathematics. For example, in many instances, most girls insisted “We are memorizing. We don't understand. When we ask the teacher he does not know. What can we do?” Teachers, on the other hand, admitted partially to shortcomings they had with respect to certain topics in the mathematics content they

were teaching. An example here was one teacher who said "truly speaking with linear programming, when I touch that area I'm dead because there are some parts of the topic which I do not understand.

#### **4.3.1 Syllabus Coverage**

Since most of the girls at Sesheke secondary school were day- scholars, they could not afford to attend evening preparations where they could share ideas in many areas of mathematics with colleagues. Though the mathematics syllabus might not have been completed in time those that were affected most were girls because they could not find extra time in the evening to mingle with other pupils who might have covered certain topics from the syllabus. Most of the boys were able to walk long distances even at night, a thing which most girls could not do and even when they were able, their parents in most cases would not allow them as expressed by some of the girls interviewed.

#### **4.3.2 Discipline**

Sesheke Secondary School as a school close to the border has its own problems such as most girls involving themselves in pre-mature marriages both in Namibia (Katima Mulilo) and Zambia (Sesheke). One thing which came out during the teachers' group discussion was that girls were disturbed not only in mathematics but other subjects inclusive when they fall pregnant and miss classes. To support this assertion, it was discovered that most of the girls were renting houses in the nearby compounds so as to avoid boarding fees and rules. This renting of houses by girls in the nearby compound, and involving themselves in relationships with those of the opposite sex in turn has resulted in a good number of girls falling pregnant and hence disturbed in their learning.

Still on discipline, some female teachers who attended the focus group discussion observed that girls sometimes do perform poor in some subjects, mathematics inclusive because male teachers propose love to the young girls and as a result girls lose concentration in class. This allegation however could not be proven. However, if such things do happen, then it is true that such behaviour can bring about poor performance in mathematics among girls as girls really would lose concentration.

### **4.3.3 Parental support to girls' mathematics education**

With regards to parental support, twenty five parents took part in the study and the following were the findings;

From the information obtained from the questionnaires and structured interviews with the parents, the study established that most of the parents had mixed feelings as to whether girls were capable of performing well in mathematics with most of the parents showing that girls were poor performers. Most parents did not encourage girls to take mathematics seriously by not helping their daughters or even guiding them.

From the girls' and parents' responses in the questionnaire, both parents and girls agreed that girls did more household chores than boys (day- scholars). This affects girls since mathematics needs concentration, the time which most girls might not have after doing a lot of work.

### **4.3.4 Girls' attitude towards the learning of mathematics**

With regard to girls' attitude towards mathematics, fifty girls took part in the study and the following were the findings.

Thirty five girls said they had interest in mathematics while fifteen did not. Their lack of interest in this case was attributed to many factors one of which was lack of mathematics text books, for instance grade 11 where only teachers had copies of books. Eighteen attended mathematics lessons regularly; twelve attended lessons sometimes while twenty did not attend regularly. Twenty girls said that mathematics was a difficult subject for them; eighteen girls said that mathematics was difficult sometimes while twelve said that mathematics was just like any other subject which could be solved and passed. Only four girls had interest of pursuing mathematics career after secondary school education while the remaining forty six had no interest of pursuing mathematics career.

Twelve girls said that they understood mathematics when their teachers taught while the rest had challenges in understanding mathematics, though thirty eight, claimed to understand mathematics sometimes. When it came to teacher assistance in mathematics classes, thirty seven girls questioned showed that they were not attended to adequately, ten were assisted sometimes and three received assistance. It was also found that thirty two girls said that boys were attended to more than girls were, while nine said girls were assisted while nine said both boys and girls were assisted during the mathematics lessons.

During the group discussion, girls justified their lack of interest in mathematics. Here a grade eleven girl, during a group discussion, pointed out "I do not see how I can be motivated, there are few textbooks at school especially grade eleven mathematics text books where only teachers have their own copies ....".

From the above findings, this study established that most girls had negative attitude towards the learning of mathematics as this could be seen from their response as to whether they intend to pursue mathematics related career. Most of the girls indicated that they had no interest of getting into any career related to mathematics. Most of the girls did not attend mathematics lessons regularly, a situation which enhanced girls' performance in mathematics.

## **CHAPTER 5: DISCUSSION**

### **5.1 Introduction**

This chapter discusses the findings under the sub-headings; teaching and learning practices, parental support to girls and finally girls' attitude towards the learning of mathematics. The chapter ends with a summary.

### **5.2 Teaching and learning practices**

The school had no library at the time of the study. Lance, Hamilton-Pennell, Rodney, with Peterson and Sitter (2000) demonstrated a positive relationship between school libraries and student achievement, regardless of educational need (school, district or student poverty) or the financial resources. This state of affairs suggests that the absence of mathematics library might have a negative impact on both boys' and girls' performance in mathematics. The school infrastructure and furniture were dilapidated and the minimum class enrolment on average was 78. This state of affairs does not encourage both the learners and the teachers to learn and teach effectively. Of all the teachers at the school, only 8 were teachers of mathematics who had to share the 32 classes. Since each mathematics class has seven contact periods in a five-day week, it implies that each teacher had 4 classes resulting into 28 contact periods.

A study by Addiba, (2004) established that if classes were overcrowded, then delivery by teachers, mathematics inclusive, is affected as the quote says, "Every child has the right to the attention and support which they need in a mathematics class. This is difficult to attain under all circumstances and creates a tension for the teacher, which increases as class size grows." "Failure to achieve the ideal of meeting every pupil's needs mathematically produces negative feelings towards their own work," "The

size of the class contributes to the severe criticism which some teachers express about their own teaching. In a sense, once the class size passes a certain point, the teachers are bound to 'fail' because the demands on their time cannot be met." (Addiba, 2004) P.78. Teachers might tend to concentrate on the active participants who in most cases are boys.

The pupil- mathematics book ratio stood at 1: 50. Most recent literature by Centra & Potter, (2010), agree that measures of the school resources, such as number of books in the library, and teacher-student ratio, have shown little association with achievement, they can, however, reduce the rate of syllabus coverage which in turn affects the learning of mathematics. Only those pupils who are resourceful and have the ability to research are able to pass well and in most cases these are boys.

Research by Lester & Charles, (2003) and Schoen & Charles, (2003) recommend that students should be exposed to truly problematic tasks so that mathematical sense making is practiced. In teaching through problem solving, learning takes place during the process of attempting to solve problems in which relevant mathematics concepts and skills are embedded. According to Marcus & Fey, (2003) and Van De Walle, (2003), mathematical problems that are truly problematic and involve significant mathematics have the potential to provide the intellectual contexts for students' mathematical development.

The classic orientation on mathematics classroom influence has focussed on the issue of differential treatment within the classroom. Typically, these studies have looked at three types of issues and these are; differential instructional time or opportunities to acquire skills Renold and Muijs, (1999) who said that there seems to exist an ongoing pattern of male dominance in classroom interaction, where in a classroom situation boys are given more positive attention than girls, in differential teacher response (Nassaji and Wells. 2000), teachers tend to give more positive responses to boys than to girls and differential treatment

linked to praise and criticism. Differential treatment if not controlled and done in favour of boys can bring about poor performance in mathematics among girls (Inzlicht, & Ben-Zeev, 2000).

Four teachers of mathematics were observed during their lessons. The study did consider the questioning techniques by teachers of mathematics, the length of time allowed to girls to answer questions in comparison with the length of time given to boys, feedback such as praise, encouragement and corrective feedback and also individual contact rendered to girls by teachers of mathematics. A study by Baysen, & Baysen, (2010) revealed that if girls have less interaction and waiting time during the mathematics lesson, then the quality of their work might be compromised. For the majority of contacts, especially those initiated by teachers, boys interacted more frequently with their teachers than girls, more questions were directed to boys than they were to girls and that girls were given less time to think about the answer to the questions. Most of the teachers observed gave more praise, encouragement and corrective feedback to boys than they did to girls. Of course this was so because boys in most cases dominated in the learning process. This kind of situation if not controlled, does not enhance performance among girls in mathematics.

Three of the teachers observed, never stated their objectives at the beginning of each lesson. This suggests that the teaching of Mathematics might have become a routine and not something done according to the Mathematical needs of the pupils since the usefulness of objectives is that they describe the outcome of learning, student oriented and are observable (or describe an observable product) Hyson, Copple and Jones (2006) without introducing objective to the learners would mean learners learn without any direction.

From the questionnaires, it was established that most girls might have problems in comprehending mathematics using the teacher centred teaching strategy most teachers use because out of the fifty girls selected, only twelve understood using this teacher centred methods of teaching. Though out of the thirty-

eight, eighteen claimed to understand mathematics sometimes; it is evident that there are times when they also join the colleagues who fail to grasp anything in the mathematics lessons. When it comes to teacher assistance in mathematics classes, almost thirty- seven out of fifty girls questioned showed that they were not attended to adequately because even the ten who claimed to be assisted sometimes might just have been covering their teachers. It was also found that boys were attended to more than girls were, meaning that may be the ten were among those that were rarely assisted during the mathematics lessons.

Regarding content, majority of the girls indicated that they had challenges with the comprehension of mathematics concepts. For example, on several occasions, most girls insisted “We are memorizing. We don't understand. When we ask the teacher he does not explain to our understanding”. Teachers, on the other hand, admitted to shortcomings they had with respect to certain topics in the mathematics content they were teaching. An example here was one teacher who confessed "truly speaking with linear programming, when I touch that area I'm dead because there are some parts of the topic which I do not understand. This was confirmed when another teacher at Sesheke Secondary School was not sure of the answer where pupils gave two contradictory answers. The girls' explanation was actually the correct one and not what the boys had given which was accepted by the teacher.

### **5.3 Parental Support to Girls' Mathematics Education**

With regard to indirect influence, parental involvement was cited as studies by Else-Quest, Hyde, Linn, (2010) have reported positive relations between perceived parental involvement and girls' mathematics achievement. The positive relationship was unfortunately not replicated among the girls in this study. Twenty two parents agreed that boys are doing better in mathematics than girls and that most parents admitted that they would rather spend time with a son than with a daughter, solving mathematics problems.

Also parents and girls agreed that girls do more household chores than boys, a situation which deprives girls of precious time which could be used to improve their mathematical knowledge.

Teachers on the other hand agreed that girls were not performing better than boys in mathematics and this was also confirmed with twenty girls who said mathematics was a difficult subject. This may imply that parents, teachers and girls themselves agreed that girls were not competent in mathematics. Eighteen (18) parents admitted that they rarely found time to help their daughters with mathematics problems while 4 parents did not go through their daughters' books, a situation that could make girls think mathematics was not important for them but boys. This was also in line with the teachers' comments that parents did not find time even to visit the school to find out how their children were doing. Twenty Girls also said the same thing that parents did not help them, however some said that parent did not help in mathematics because they did not know the subject. May be this was the reason why some parents did not find time to help their daughters in solving mathematics problems.

Parents had the distinct advantage over anyone else in that they could provide a more stable and continuously positive influence that could enhance and complement what the school fosters on their daughters. In this regard, parental involvement was undeniably critical. Also, involvement with respect to participating in school functions, buying necessary school equipment (books, uniforms) was important. From the above results, it was true that parental support alone might not be the cause for girls' poor performance in mathematics. However, it was clear from literature review (Sichalwe, 2000; Eccles, Jacobs, & Harold. 1990) that lack of parental support to girls' mathematics education in this case at Sesheke Secondary School might be contributing to their not performing well in mathematics.

#### **5.4 Attitude of Girls towards the Learning of Mathematics**

Most of the girls did not seem to identify shortcomings from their side. Blame was for example apportioned to parents, who according to Bandura, (2009), their perceptions of girls' competence predict girls' own mathematics self-concept and performance. According to Schunk, (2009) if teachers attend to boys more than they do with girls in mathematics classes, then girls are likely to have negative attitude towards the learning of mathematics. May be girls were right to say whatever they said because, for example, in one class observed, the teacher was unable to see and recognize the presence of girls in his class. Even when a girl raised her hand first, the teacher would wait until there was a boy whose hand was up so that he could point at him for an answer. Three teachers never talked about the importance of mathematics in one's life and surely why should girls have interest in such a subject.

Most of the teachers teaching mathematics were male, a situation in which the learning of mathematics may seem to be for boys rather than for girls. So with this state of affairs, it may be challenging for a girl child to have a positive attitude towards mathematics. For example Ireson & Hallam, (2005) said that a popular stereotype that boys are better at mathematics than girls undermines girls' mathematics performance because it causes worrying that erodes the mental resources needed for problem solving. These findings are also supported by Ryan & Patrick, (2001). The results from this study suggests that girls negative attitude towards the learning of mathematics is among others contributing to their poor performance in the subject in question and is in line with the reviewed literature.

## **5.5 Summary**

### **5.5.1 Teaching and learning practices**

The school had no library at the time of the study. The school infrastructure and furniture were dilapidated and the minimum class enrolment on average was 78.

The pupil-mathematics book ratio stood at 1: 50. Most recent reviews of related literature, however, agreed that measures of the school resources, such as number of books in the library, and teacher-student ratio, had shown little association with achievement, they could, however, reduce the rate of syllabus coverage which in turn might affect the learning of mathematics.

For the majority of contacts, especially those initiated by teachers, boys interacted more frequently with their teachers than girls, more questions were directed to boys than they were to girls and that girls were given less time to think about the answer to the questions.

Most of the teachers observed gave more praise, encouragement and corrective feedback to boys than they did to girls. Of course this was so because boys in most cases boys dominated in the learning process.

Most girls might have problems in comprehending mathematics using the teacher centred teaching strategy most teachers use and also the study established that during the questioning, most of the teachers directed questions more to boys than to girls. When girls failed to give the correct answer in most instances, most of the teachers shifted the question to the boys without or even giving a second chance to the girls to reflect on their answer.

The renting of cheaper rooms in the nearby compound by most girls might lead girls to behave in a way that might not support and enhance effective learning of subjects such as mathematics which requires extra time.

The study all in all established that though teaching and learning took place at the school under study and that the school management put in place measures to enhance conditions for improving pass percentage of girls in mathematics, there were, however, some lapses which might contribute to the poor performance of girls in mathematics.

### **5.5.2 Parental support**

Ginsburg, Durbin, García-España, Kalicka, and Winston. (2009) found out that parents had the distinct advantage over anyone else in that they could provide a more stable and continuously positive influence that could enhance and complement what the school fostered on their daughters.

This scenario however was not replicated in Sesheke District because of all the twenty- five parents, Twenty two parents agreed that boys were doing better in mathematics than girls and that most parents admitted that they would rather spend time with a son than with a daughter, solving mathematics problems. Parents can increase the potential development of girls' mathematical knowledge by setting high expectations and providing stimulating environments (Cross, Woods & Schweingruber 2009). Parents' behaviours are crucial for girls' attitudes towards mathematics (Hyde, Quest, Alibali, Knuth, & Romberg, 2006). Research by Hong, You, & Wu, (2010) revealed that a significant relationship was found between the parents' mathematical values and girls' mathematics achievement. If parents thought mathematics was important, they could transfer this importance to daughters' mathematics success; thus they have more positive attitudes towards mathematics. Also parents and girls agreed that girls did more household chores than boys, a situation which deprived girls of precious time which could be used to improve their mathematical knowledge.

Though parental support alone might not be the cause for girls' poor performance in mathematics, however, it was clear from literature review (Eccles, Jacobs, & Harold. 1990) that lack of parental support to girls' mathematics education be contributes to their not performing well in mathematics.

### **5.5.3 Attitude of Girls towards the Learning of Mathematics**

Teachers on the other hand agreed that girls were not performing better than boys in mathematics and this was also confirmed with twenty girls who said mathematics was a difficult subject. This may imply that they (parents, teachers and girls themselves) agree that girls were not competent in mathematics.

Though the school awarded girls who did well in mathematics and exposed girls to a few role models of mathematics female teachers, the results from this study suggests that most girls' negative attitude towards the learning of mathematics and harbouring the belief that mathematics was a difficult subject might be contributing to their poor performance in the subject in question

# **CHAPTER 6: CONCLUSION AND RECOMMENDATIONS**

## **6.1 Introduction**

This chapter is organised into four areas namely; summary of the study, conclusion, recommendations and implications for future research.

## **6.2 Summary of study**

The purpose of the study was to investigate the factors contributing to girls' poor performance in mathematics in the light of correctional measures at Sesheke Secondary School.

The following questions guided the study;

- a) What teaching and learning practices in mathematics are in existence at Sesheke Secondary School?
- b) What support do parents render to girls' mathematics education at Sesheke Secondary School?
- c) What is the attitude of girls towards mathematics at Sesheke Secondary School?

The study was located in the Social Cognitive Theory framework because it focuses on self-efficacy, outcome expectations and personal goal setting. Furthermore, it addresses environmental factors that might impact on girls' mathematics performance.

The research used a qualitative research and partly quantitative approaches in which questionnaires were given to selected girls and parents who were sampled purposely; while Lesson observations were conducted on four teachers. Focus group discussions were conducted one for teachers while the other one for the girls. Data was analysed qualitatively. The first step in data analysis was to transcribe the interviews, questionnaires and

focus group discussions findings (Morrill et al. 2013; Ratchcliff, 2002). These processes emerge from reading the notes and continue while editing the notes and deciding how to organize them, in an ongoing cycle (Morrill et al. 2000).

### **6.3 Conclusion**

(a) What teaching and learning practices in mathematics are in existence at Sesheke Secondary School?

With regards to teaching and learning practices, the study established that most of the classes were overcrowded and delivery by mathematics teachers in classes was affected as there was reduced individual pupil attention. Teachers in most cases concentrated in the active participants who in most cases were boys because they could not manage to reach all the pupils.

Furthermore, most girls whose parents lived far way from Sesheke secondary school preferred renting houses in the nearby compound, a situation which was not conducive for girls' mathematics education. As a result of this renting of houses/ rooms, a good number of girls fell pregnant and hence disturbed during their education.

Teacher centred method (question and answer) was commonly used, a method which was not favourable to all the pupils especially girls seemingly to have negative attitude towards the subject. This method favoured active participants who in most of the classes were boys.

Most of the teachers of mathematics interacted with most of the pupils generally during their mathematics lessons. However, for the majority of contacts, especially those initiated by teachers, boys interacted more frequently with their teachers than girls, a situation which suggests that mathematics is of the masculine domain and hence arousing negative attitude towards the subject in question.

Most of the teachers observed gave more praise, encouragement and corrective feedback to boys than they did to girls. Even examples in classes were mostly given more to boys than to girls. Of course this was so because boys in most cases dominated in the learning process. However, this scenario discourages girls from taking mathematics seriously and later on develop negative attitude towards the subject.

The study also established that during the questioning, most of the teachers directed questions more to boys than to girls. When a girl failed to give the correct answer in most instances, most of the teachers shifted the question to the boys without even giving a second chance to the other girls to reflect on their answer. When a boy failed to give the correct answer to the question, in most cases boys were given a second chance and most teachers would wait for the boys to reflect on the answer. This leads to girls not participating at all because they know that the teacher might not waste time on them.

(b) What support do parents render to girls' mathematics education at Sesheke Secondary School?

With respect to parental support, the study established that most parents in sesheke believed that girls were not better performers in mathematics than boys and that girls did more household chores than boys, a situation which arouses stereotype threats that girls cannot perform in mathematics and deprived girls of precious time which could have been used to improve their mathematical knowledge respectively.

The study also established that not many parents in sesheke had time to help their daughters with mathematics problems. This state of affairs encourages girls to relax when they at home know that their parents do not check the books and what they do at school.

(c) What is the attitude of girls towards mathematics at Sesheke Secondary School?

With respect to the attitude of girls towards the learning of mathematics, most of the girls did not seem to identify shortcomings from their side. Blame was for example apportioned to teachers who attended to boys more than they did with girls in mathematics classes, a lack of textbooks and even the dilapidated school infrastructure.

Though the school awarded girls who did well in mathematics and exposed girls to a few role models of mathematics female teachers, however, the study established also that girls had negative attitude towards the learning of mathematics and believed that mathematics was a difficult subject. Most of the girls admitted that they did not attend mathematics lessons regularly according to class period attendance register. It was also established that most of the mathematics teachers were male; a situation which suggested that mathematics was masculine.

Furthermore , the study established that, though single sex classes were formed Sesheke Secondary School, the performance of most girls in single sex classes especially in mathematics did not improve while that of the boys did improve. This implies that girls' learning in single sex classes alone might not improve their performance in mathematics but other factors too if considered at Sesheke Secondary School. This implies that girls' negative attitude towards the learning of mathematics contributes to their poor performance in mathematics at Sesheke secondary school despite the school's interventional measures.

#### **6.4 Recommendations.**

In order to try and improve teaching and learning practices at Sesheke secondary school, the study recommends that,

1. Mathematics teachers at Sesheke secondary school should ensure that equal contact time between the teacher and the pupils without favouring any sex and also that girls participation in mathematics lessons

should be encouraged by all because it is through participation that girls will gain confidence in mathematics and enhance pass percentage.

2. Teachers of mathematics at Sesheke secondary school should ensure that a variety of teaching or instructional methods are at their disposal so as to reach all pupils in class unlike a situation where only question and answer method is widely used only to the advantage of the teacher of mathematics.
3. Teachers of mathematics at Sesheke secondary school should ensure that feedback such as praise, encouragement and corrective feedback are given to pupils of both sexes. If more of this feedback is given to boys, this scenario discourages girls from taking mathematics seriously and later on develop negative attitude towards the subject.

With regard to parental support to girls' mathematics education, the following recommendations are advanced

1. That Sesheke secondary school management organize meetings where parents can be sensitized and educated on the importance of their involvement in their children's mathematics education. Suggestions here included parents checking whether school work including homework was done. Parents could also see to it that time was allocated for homework and ensured that any school work was at least done. Also another suggestion is that parents should try to balance the distribution of household chores so as to accord every child regardless of their sex, enough time for school work especially mathematics.
2. The school management should sensitize parents on the importance of their children being in the boarding where they can be monitored so that girls do not miss classes anyhow. Since most of the girls who rent rooms in the nearby compound claimed that they had no money to pay for boarding facilities, the school management at Sesheke secondary school should such girls to find sponsors such as NGOs, government bursaries so that they learn and stay in a conducive environment.

With regard to girls' attitudes towards mathematics, the following are the recommendations;

1. Girls' negative attitude towards mathematics could be as a result of classroom environment and parental. Teachers of mathematics at Sesheke secondary school should improve in their teaching

methods and expectations of girls' performance in mathematics, direct feedback such as praise, encouragement and corrective feedback are given to pupils of both sexes while parents should work as second teachers in the homes.

2. School management at Sesheke secondary school should continue awarding girls who perform well in mathematics.

## **6.5 Implications for Future Research**

The findings from this exploratory study form a starting point in the conceptualization of why Sesheke girls perform poorly in mathematics and will in turn fail to choose mathematics related careers. More research is needed to investigate how diverse populations of girls transcend most of the barriers in mathematics education and make mathematics related career decisions. In addition, the Social Cognitive Theoretical constructs (self-efficacy, goals, contextual supports, outcome expectations, and coping efficacy) that seem to strongly predict an SMT career choice need to be more specifically defined within the Sesheke context and instruments to measure them developed for use in the Sesheke Secondary School guidance programs through which parents will also be sensitised on how and why the need to support girls' mathematics education.

Girls' coping efficacy and strategies in mathematics education need to be measured so teachers, parents and any other relevant stakeholders know how to effectively intervene to equip girls with more coping tools to enable them overcome environmental barriers as they learn mathematics.

A future project should, also investigate the effect of dating on implicit and explicit mathematics attitudes among young girls.

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# APPENDICES

## Appendix I: Girls' Questionnaire

Respondent no.....

The aim of this questionnaire is to obtain information on the attitudes of girls towards Mathematics at Sesheke Secondary school.

Please do not include your name. All information will be treated with utmost confidentiality.

Please complete the following questionnaire to the best of your ability by placing a tick (✓) on the appropriate answer or writing the requested information in the spaces provided.

Age..... Grade.....

1. Do you have interest in learning Mathematics?

- a) Yes
- b) Sometimes
- c) No

If the answer to question 1 is b or c, explain your answer

.....

.....

.....

2. Do you attend Mathematics lessons?

- a) Yes
- b) Sometimes
- c) No

If your answer in question 2 is either b or c, give reasons

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.....  
.....

3. Is Mathematics a naturally difficulty subject for girls than it is for boys?

- a) Yes
- b) Sometimes
- c) No

If your answer in question 3 is either a or b, give reasons

.....  
.....  
.....

4. Do you intend to pursue a Mathematics related career after your completion of hig school education?

- a) Yes
- b) May be
- c) No

If your answer in question 4 is either b or c, give reasons

.....  
.....  
.....

5. Do your parents supportive you in your education.

- a) Yes
- b) Sometimes
- c) No

6. Do your parents check on your Mathematics work or help you in your Mathematics homework, project, etc?

- a) Yes
- b) Sometimes
- c) No

If your answer in question 4 is either b or c, give reasons

.....

.....

.....

7. Do boys receive more attention in class than girls?

- a) Yes
- b) Sometimes
- c) No

If your answer in question 4 is b , give reasons

.....

.....

.....

8. Do girls do more work at home than boys?

- a) Yes
- b) Sometimes
- c) No

9. Does your Mathematics teacher attend to your class regularly?

- a) Yes
- b) Sometimes
- c) No

10. Does your Mathematics teacher attend to your individual needs in Mathematics (individual assistance)?

- a) Yes
- b) Sometimes
- c) No

If your answer in question 4 is b , give reasons

.....

.....

.....

11. Do you have good relationship with your Mathematics teacher?

- a) Yes
- b) Sometimes
- c) No

If your answer in question 4 is either b or c, give reasons

.....

.....

.....

12. Do you understand Mathematics with the teaching methods used in Mathematics lessons?

- a) Yes
- b) Sometimes
- c) No

## Appendix II : Parents' Questionnaire

Respondent no.....

The aim of this questionnaire is to obtain information on the attitudes of parents towards girls' Mathematics education at Sesheke Secondary school.

Please do not include your name. All information will be treated with utmost confidentiality.

### Instructions

Please complete the following questions to the best of your ability. Place a tick on the appropriate answer of your choice.

What is your level of education?

- 1) 1 - 9
- 2) Secondary school leaving certificate.
- 3) Tertiary education

1. Which of your children are doing better in Mathematics?

- 1) Boys
- 2) Girls
- 3) Both boys and girls

2. Given chance to choose, which of your children would you spend time with in solving Mathematics problems?

- 1) Boys
- 2) Girls
- 3) Both boys and girls

If your answer in question 2 is either 1 or 2, give reasons

.....  
.....  
.....

3. Do you go through your daughters' books?

- 1) Yes
- 2) No
- 3) Sometimes

If your answer in question 3 is either 2 or 3, give reasons

.....  
.....  
.....

4. Do you help your daughter(s) with their Mathematics assignments?

- 1) Yes
- 2) Sometimes
- 3) No

If your answer in question 4 is either 2 or 3, give reasons

.....  
.....  
.....

**Appendix III : Sesheke Secondary School Careers'- Day (6<sup>th</sup> July, 2012)**



Invited Guests



Pupils Pause as Nurses



Pupils Pause with Teachers



A Pupil Pauses as a Z.E.S.CO Worker



**Appendix IV: Senior Education Standards Officers' (S.E.S.Os) Educational Talk at Sesheke**

**Secondary School with Emphasis on Girls' Performance Mathematics (10/07/2012)**



S.E.S.O. Social Sciences (W/ Province)

S.E.S.O. Distance Education (W/Province)



Sesheke Secondary School Grade 12 Pupils Listening to the Female Senior Educational Standards Officers' (S.E.S.O.S') Educational Talk, Putting Emphasis on Girls' Performance in Mathematics

## Appendix V: Consent Letter

I. \_\_\_\_\_, understand that my parents have given permission for me to participate in a study concerning an investigation on factors contributing to poor performance in Mathematics among girls at Sesheke Secondary School, under the direction of Hakalo Clifford.

My participation in this project is voluntary, and I have been told that I may stop my participation in this study at any time. If I choose not to participate, it will not affect my grade in any way.

Signature \_\_\_\_\_ Date \_\_\_\_\_

## Appendix vi : Lesson Observation Findings

### 4.2.3.1 Teacher A

**Lesson observations.** The teacher was observed in three different classes. This was done in order to ascertain whether the same teaching methods were used in different classes where there were pupils of different calibre.

**Table 4 : Attendance by Gender for Class 1**

Day	GIRLS		BOYS		TOTAL	
	Present	Absent	Present	Absent	Present	Absent
1	45	9	44	5	89	14

The following observations were made during teacher A's lesson;

CLASS 1

Date: 12/6/11

Class: 10M5

**Topic:** Solving Simultaneous Equation by Elimination Method

**Teaching Method:** Question and Answer

**Introduction:** The teacher introduced the lesson by revising through the previous work. This according to him was to ensure that pupils' attention was captured as the teacher moved onto the next level.

**Lesson Development:** The teacher stated his objectives before getting into the lesson telling the pupils verbally what he wanted them to know by the end of the lesson. This, according to teacher A, could help the pupils know what is expected of them in a particular lesson. Question and answer method was generally used during teacher A's lesson while these questions were spread across the class. "This helps both participants and non- participants to get involved in the mathematics learning process", said teacher A when asked. One thing noted in the lesson observation was that though teacher A used both participants and non-

participants, boys dominated in the learning of mathematics while girls were in the background. There was however more time given to boys to answer any given question than there was for girls. Each time a girls failed to give the correct answer a question, the teacher shifted the question immediately to the boys. This difference in time allocation to the pupils might not enhance effective learning of mathematics among girls whilst it enables boys to reflect on their answer and make corrections.

Examples given; use elimination method to solve the following, (a)  $4x + 16y = 32$  and  $4x + y = 17$  (b)  $p + q = 13$  and  $3p - q = 11$  (c)  $5x + 4y = 7$  and  $y - 5x = 2$  (d)  $\frac{3}{4}x + \frac{1}{2}y = 2$  and  $3x - y = 5$

Exercise ; solve the following by elimination method. (a)  $x + 2y = 7$  and  $x - 3y = 3$  (b)  $3x + 4y = 29$  and  $y - 1 = -2x$  (c)  $2m + 5n = 4$  and  $\frac{1}{2}(n+1) - \frac{1}{3}(m-2) = -1$  (d)  $\frac{2x+y}{3} = \frac{5}{2}$  and  $\frac{3x-y}{5} = \frac{1}{2}$

**Individual girls' attention.** The teacher marked the exercise within the class period and during the marking process, there was more contact time for boys than there was for girls during the mathematics lesson especially during the marking session. This suggests that girls might not see themselves as equal participants in the learning of mathematics.

**Feedback.** Though questions were given to both participants, feedback such as praises, encouragement and corrective feedback were given more to boys who dominated than they given to girls.

**Use of teaching and learning aids.** The teacher used the available teaching aids (text book and chalk board) appropriately and some wall charts where the class exercise and two examples were written were pinned on the notice board so as to allow the pupils use the teaching aids any time one wanted to refer to them.

CLASS 2

Date: 13/6/11

Class: 11E6

**Table 5 : Attendance by Gender for Class 2**

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
2	38	14	47	2	85	16

**Topic:** Rotational Symmetry

**Teaching Method:** Question and Answer

**Introduction:** The teacher introduced the lesson by asking pupils what they knew about the words rotation and symmetry. He thereafter explained the relationship between rotation and the symmetry of any regular object.

**Lesson Development:** He stated his objective by writing on the board the questions he expected that his pupils would answer after a few examples.

Question and answer method was generally used during teacher A’s lesson and while these questions were spread across the class, there was more time given to boys to answer any given question than there was for girls. Just like in the first class for teacher A, each time a girls failed to give the correct answer a question, the teacher shifted the question immediately to the boys. This difference in time allocation to the pupils might not enhance effective learning of mathematics among girls whilst it enables boys to reflect on their answer and make corrections.

Due to teacher A’s uncertainty in some areas of the topic, the teacher was easily misdirected by the pupils who had different opinion .e.g. “the rotational symmetry of a regular polygon with 72 sides is 5”, said a boy. Teacher A accepted and was convinced by the fact that the pupil divided 360 by 72 the number of sides in order to find 5, which was not correct. Another pupil, a girl said, “Rotational symmetry of a regular polygon is determined by the number of sides, so the answer to the example is 72”. Teacher A neither accepted nor rejected the second answer. These two answers seemed to be correct as this could be seen from teacher A’s

reaction to both answers. He seemed to panic and later on gave the question to the pupils to go and research so they could come up with answers on the next day. He however changed the example and used the ones he was sure of after which he gave an exercise which he marked during class period. During the marking session, the teacher went round to attend to individual pupil.

**Individual girls’ attention.** More time for individual assistance was given to boys than was given to girls

**Feedback.** More feedback was given to boys than to girls. However, the teacher encouraged verbally both boys and girls.

**Use of teaching and learning aids.** The teacher used the available teaching aids (grade 11 text book and chalk board) appropriately and a wall chart where there was a summary of rotational symmetry was pinned on the notice board so as to allow the pupils use the teaching aids any time one wants to refer to them.

CLASS 3

Date: 13/6/11

Class: 11E4

**Table 6 : Attendance by Gender for Class 3**

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
3	46	8	40	9	86	17

**Topic:** similar figures

**Teaching Method:** Question and Answer. There was more time given to boys to answer any given question than there was for girls. Each time a girl failed to give the correct answer a question, the teacher shifted the question immediately to the boys. This difference in time allocation to the pupils might not enhance effective learning of mathematics among girls whilst it enables boys to reflect on their answer and make corrections.

**Introduction:** The teacher introduced the lesson by asking pupils what they knew about similar figures. He asked them about identical twins whether they were equal or similar. He later on explained to the pupils that similar figures are not necessarily equal but corresponding vertices and angles are equal.

**Lesson Development:** He stated his objective by writing on the board the questions he expected that his pupils would answer after a few examples. He also told the pupils verbally as to what he wanted them to know by the end of the lesson.

**Individual girls' attention.** More time for individual assistance was given to boys than was given to girls

**Feedback.** More feedback was given to boys than to girls. However, the teacher encouraged verbally both boys and girls.

**Applicability to life.** The teacher did not show the pupils in the class how the topic taught could be of importance to the community's day to day challenges.

**Use of teaching and learning aids.** The teacher used the available teaching aids (grade 11 text book and chalk board) appropriately and two flip charts where there were examples and class exercise were used as a teaching aid

#### 4.2.3.2 Teacher B

**Lesson observations.** Teacher B was observed in two different classes and during the lesson observations, the following were noted;

**Table 7 : Attendance by Gender for Class 1**

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
1	57	0	22	12	79	12

CLASS 1

Date: 16/06/11

Class: 10E3

Topic: Angles and Polygons

**Teaching Method:** Generally, teacher B used question and answer method of instruction. Though the question and answer method was used, teacher B did not spread his questions evenly. The teacher in question, in most cases focussed on those that raised their hands faster and in most cases were boys. There was more time given to boys to answer any given question than there was for girls.

**Introduction:** the teacher introduced the lesson by revising the previous work which was a good thing because it helped the pupils have an idea of the previous topic as they enter into the new work.

**Lesson Development:** the teacher wrote two examples on the board and with the help of the pupils, he solved the questions. The teacher then gave an exercise which he marked within class period. In doing this, the teacher moved from one desk to another.

**Individual girls' attention.** Boys were attended to in mathematics lessons by teacher B more than girls were as the teacher spent more time with boys than with girls. In his questioning techniques, the teacher pointed at boys more than he did with girls. In the lesson observed, teacher B did not state his objectives at the beginning of the lesson.

**Feedback.** More praises and encouragement were given to boys than to girls.

**Applicability of the topic to life.** At the beginning of the lesson, Teacher B did not show or explain to the pupils how this topic on angles and polygons could be used to solve life's challenges.

*Use of teaching and learning aids.* Teacher B only used the available teaching aids such as chalk board and text books. He did not create his own teaching aids that could probably help pupil (boys and girls) understand that mathematics can be used to solve life's problems and it is part of one's life

CLASS 2

Date: 17/06/11

Class: 10E3

**Table 8 : Attendance by Gender for Class 2**

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
2	56	1	28	6	84	7

Topic: Relation and Functions

**Teaching Method:** Teacher B used peer teaching and question and answer methods of instruction. Though the question and answer method was used, teacher B did not spread his questions evenly. He was biased towards the three boys who seemed to answer question quickly. So each time he asked a question, he would look in the direction where the three boys were seated in order to get answers. There was more time given to boys to answer any given question than there was for girls. Each time a girls failed to give the correct answer a question, teacher B also like teacher A and like in the previous class, shifted the question immediately to the boys. This difference in time allocation to the pupils might not enhance effective learning of mathematics among girls whilst it enables boys to reflect on their answer and make corrections.

**Introduction:** The teacher introduced the lesson by revising the previous work which was a good thing because it helped the pupils have an idea of the previous topic as they enter into the new work.

**Lesson Development:** The teacher asked the two pupils to give their family relations. e.g. 1. Mwaka “is a sister of” Purity, Joseph, Bremen and Hansen. Mr. Situmbeko is the father of Joe, Mushaukwa, Membe and Ndui. He then used these examples to explain about types of relations. He gave a class exercise which he did mark part of it. The remaining unmarked work was to be marked as pupils were told to submit their books for marking.

**Individual girls’ attention.** More time for individual assistance was given to boys than was given to girls the time teacher C marked some of the books.

**Feedback.** More feedback such as praises, encouragement and corrective feedback were given to boys than to girls. However, the teacher encouraged verbally both boys and girls.

**Applicability of the topic to life.** Teacher B did show or explain to the pupils how this topic on relations is related to families. He further explained how the topic could help explain the extended family system.

**Use of teaching and learning aids.** Teacher B used pupils as teaching aids hence making them feel that mathematics is part of their lives.

#### 4.2.3.3 Teacher C

**Lesson observations.** Teacher C was observed for one day in two different classes and the following were the observations made.

Table 9 : Attendance by Gender for Class 1

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
1	31	2	50	2	81	4

CLASS 1

Date: 17/06/11

Class: 12M3

Topic: Earth Geometry

**Teaching Method:** Teacher C used question and answer teaching method in which he used both participants and non- participants (boys and Girls). His question distribution was quite good because he gave chances to almost all the pupils to give answers. However, there was more time given to boys to answer any given question than there was for girls. Each time a girls failed to give the correct answer a

question, teacher C also like teacher B, shifted the question immediately to the boys. But if a boy failed to give the correct answer, teacher C waited for some time and encouraged other boys to help.

**Introduction:** the teacher introduced the lesson by revising the previous work. This method seemed to be widely used by even other teachers who were observed. When asked as to why he revised through the previous work, he said, “Learning starts from the known to the unknown” which in my opinion was a good thing because it helped the pupils have an idea of the previous topic as they enter into the new work. He however, did not state his objectives at the beginning of the lesson which would result in both boys and girls guessing as to what the teacher expected them to do.

**Lesson Development:** teacher C gave two examples on the board on distance along the latitude. Pupils were asked to go to the board to try and solve after the teacher had given them an idea on how to solve such questions. Where pupils failed, he helped them. After the examples, the teacher gave an exercise which he did not mark in class because there was not enough time left for marking. He told the pupils to take the books to his office for marking.

**Individual girls’ attention.** There was no time for individual assistance because the teacher did not mark the class exercise in which he should have helped those with challenges.

**Feedback.** More feedback such as given to boys than to girls at the time the teacher in question gave examples. However, the teacher encouraged verbally both boys and girls.

**Applicability of the topic to life:** Through the teaching method the teacher was unable to show the pupils how this topic applies to real life situation. He only explained it as if it was just a lesson in class.

**Use of teaching and learning aids.** Teacher C used his own made teaching aids such as a wire model which he made specifically for the earth geometry. Sometimes pupils (girls) were used as teaching aids. e.g. He drew lines in class on the floor representing latitudes and longitudes. He positioned pupils to represent two towns on different longitudes but same latitude.

CLASS 2

Date: 20/06/11

Class: 10E1

Topic: Functions

Table 10 : **Attendance by Gender for Class 2**

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
2	30	3	50	2	80	5

**Teaching Method:** Teacher C used question and answer teaching method in which he used both participants and non- participants (boys and Girls). He also used peer teaching method.

**Introduction:** the teacher introduced the lesson by revising the previous work. This method seemed to be widely used by even other teachers who were observed.

**Lesson Development:** teacher C gave three examples on the board on the topic functions. He solved one of the three examples and allowed volunteers to go to the board to solve the examples. e.g.  $f(x) = 3x+1$ , find  $f(2)$ ; if  $f(x) = 2x-5$  find  $x$  for which  $f(5) = 10$  and  $f(x) = \frac{3x-5}{x}$ , find  $x$  for which  $f(x)$  is not a function. The

teacher gave a class exercise which was marked within class period by moving from one desk to another.

**Individual girls' attention.** The teacher tried to render equal help to both boys and girls as they needed it.

**Feedback.** More praises were given to boys than girls because though equal chances were given to both boys and girls to answer questions, boys dominated and as such, praises were given to more.

**Use of teaching and learning aids.** The teacher used the chalk board and the grade ten text books as the teaching aids.

#### 4.2.3.4 Teacher D

**Teacher D’s Lesson observations.** The teacher was observed for two days as it was with other teachers from the same school and the following were the observations made.

Table 11 : **Attendance by Gender for Class 1**

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
1	54	5	42	4	96	9
2	59	0	43	3	102	3

CLASS 1

Date: 21/6/11

Class: 12m2

Topic: Earth Geometry

**Teaching Method:** From the lesson observed, teacher D frequently used question and answer method in her lesson. Apart from the question and answer method, she also used peer teaching method where pupils were allowed to teach fellow pupils in areas of the topic where they were conversant. In this method of peer teaching, she divided the class into small groups of about five per group and in each group there was a group leader and most of the group leaders in her class were girls. This she said she did to encourage girls’ participation in her Mathematics lesson.

**Introduction:** she introduced the topic by revising through the previous work after which she wrote the sub heading for the new topic “Time Calculation”. She asked the pupils whether or not they listen to the weather news forecast on the television where they talk about sunrise in one town being different from sunrise in

another town but in the same country. One pupil said, “Yesterday they said sunrise in Chipata today would be 0645hours where as in Mongu it would be 07:00hours”. She applied the time difference between two towns to the topic of study “Time calculation”.

**Lesson Development:** teacher D wrote two examples on the board and using the wire model that she had made, she explained those examples to the pupils. Pupils were then divided into ten groups of not less than nine pupils each to discuss the further two group discussion questions. The teacher went round to check on any progress and assist any group that seemed to be behind. A class exercise was finally given and marked within class time.

**Individual girls’ attention.** The teacher went round as she marked the exercise and helped individual pupils with challenges.

**Feedback.** Praises, encouragement and corrective feedback were given to both boys and girls as they deserved.

**Applicability of the topic to life:** From the introduction it was seen that the teacher applied the topic to real life situation. She showed the pupils how earth geometry is attached to weather forecast.

**Use of teaching and learning aids.** The teacher used teaching aids both already and own made. She also used the teaching aids at the right time. In addition to that, she gave homework to the pupils on the topic yet to be covered the following day.

CLASS 2

Date: 21/6/11

Class: 11C1

Table 12 : **Attendance by Gender for Class 2**

	GIRLS		BOYS		TOTAL	
Day	Present	Absent	Present	Absent	Present	Absent
2	59	0	43	3	102	3

Topic: locus and constructions

**Teaching Method:** From this lesson, teacher D frequently used question and answer method in her lesson. Apart from the question and answer method, she also used peer teaching method where pupils were allowed to teach fellow pupils. In this method of peer teaching, she divided the class into small groups of about five per group and in each group there was a group leader and most of the group leaders in her class were girls. The teacher seemed to be interested in empowering girls in mathematics education because this she did also in the other class observed. Equal time to answer questions was given to both boys and girls.

**Introduction:** She revised on the grade 10 work on construction and went on to introduce locus. She explained what locus was all about.

**Lesson Development:** She explained on the three loci namely, locus of points equidistant from a given point, locus of points equidistant from a given line, locus of points equidistant from a two points and locus of points equidistant from a intersecting lines. She then gave four questions one on each and told the pupils to discuss the questions in groups. In this class she formed six groups of eight pupils per group. The teacher moved from one group to another in order to help those that had difficulties. After ensuring that most of the pupils had understood the examples, she gave a class exercise and had it marked within class period. As was seen from the other class observed, she gave homework which was based on the next day's work.

**Individual girls' attention.** The teacher went round as she marked the exercise and helped individual pupils with challenges. More time was allocated to help those that had challenges in understanding part of the topic taught.

**Feedback.** Praises, encouragement and correctional feedback were given to both boys and girls as they deserved.

**Applicability of the topic to life:** During her lesson, she used examples of how those in the building industry use this area of mathematics. In trying to explain the relationship between locus and real life, she used an example of the bridge constructed in Sesheke a few years ago which is curved.

**Use of teaching and learning aids:** She used apart from the text book and chalk board, teaching aids such as charts where there were pictures of bridges and dams.

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