FACTORS INFLUENCING GIRLS' NEGATIVE MATHEMATICS SELF-CONCEPT AT CHIPEMBI GIRLS' SECONDARY SCHOOL IN CHISAMBA DISTRICT OF CENTRAL PROVINCE, ZAMBIA

By

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A dissertation submitted to the University of Zambia in partial fulfilment of the requirement for the degree of Masters of Education in Educational Psychology

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Declaration

I, Nachivula Chongo, hereby do declare that the works contained in this dissertation are my own, except where acknowledgements have been duly made through citations and references. I further declare that this work has not previously been submitted for the award of any degree at the University of Zambia or any other university.

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Abstract

This study was centred on establishing factors which influence the development of girls' negative Mathematics self-concept at Chipembi Girls' Secondary School. The study aimed at ascertaining the individual factors, family and community factors, as well as school factors, which influence the development of negative Mathematics self-concept in the girls.

The research was based on a single case study and utilized mainly the qualitative research approach. In-depth interviews were conducted with selected girls in grade eleven, parents to the girls as well as teachers of Mathematics. A focus group discussion was held with pupils and a document review to understand pupils' status and their past academic performance was employed. Data was analysed with the use of the Interpretative Phenomenological Analysis (IPA) Method.

The results of this study suggests a number of indicators that revealed a number of factors influencing low Mathematics self-concept in girls. These factors were categorized into three themes namely: Individual factors; Family and Community factors; and school factors. Each of these themes had sub-themes. Individual factors included: Girls' negative perceptions about the subject and poor Mathematics background. Family and Community factors included the following subthemes: culturally motivated practices of family and community; parents' Mathematics related gender stereotypes; uneducated family and community; parents' low socioeconomic status; and bad influence from peers. School factors comprised the following subthemes: bad personality qualities of teachers of Mathematics; lack of consistent support from teachers; teachers' Mathematics related gender stereotypes; few females in the field of Mathematics; lack of adequate and consistent guidance and counselling programs in the school; and poor organisation of the Mathematics club in the school. In a nutshell, these findings show that to understand the low self-concept girls have in Mathematics one had to understand the whole environment in which the child is raised and hence a holistic approach rather than an atomistic one is more appropriate for such a study.

Among other recommendations, the report suggests that chores, toys and games should not be assigned to children on gender lines as this encourages the erroneous belief that relatively harder things are for boys and much simpler ones are for girls. As such, Mathematics is one of the things they take to be difficult and thus it is for boys only. Teacher-training institutions should have in their curriculum gender issues so as to sensitize would-be teachers about Mathematics gender stereotypes and the dangers thereof before they are deployed. The Ministry of Education, Science, Vocational Training and Early Education also should train more female teachers in Mathematics and Science subjects who will act as role models to the girls in these male dominated subjects. Lastly, but not the least the Guidance and Counselling department should devise more consistent and proactive programs to meet the needs of the girls with low Mathematics self-concept as most of them were found to have come from poor socioeconomic backgrounds and broken homes as well as not knowing the importance of Mathematics in their future careers!

Dedication

Dedicated to my late beloved father and mother, Joshua and Racheal Sichivula for helping me realize my full potential and to my love Wiza and our two beautiful tots, Taonga and Zangini.

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Since no research is ever written in a vacuum, I have to thank many people for their time, contributions, patience, understanding, friendship and assistance in completing this research.

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I am also thankful to the head teacher *Chisamba* Boarding School for allowing me to conduct a pilot study at the school. I salute teachers of Mathematics and the girls at the school who took part in the pilot study.

I will not forget the head teacher *Chipembi* Girls Secondary School, the grade 11 girls at the school, the parents to the girls and the teachers of Mathematics and other participants where this empirical research was conducted for their wonderful co-operation.

May the good Lord who never fails continue to bless you all!

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List of Acronyms

BFLPE	Big Fish Little Pond-effect
CGSS	*Chipembi* Girls' Secondary School
Civ/Ed	Civic Education
EBP	Evidence Based Planning
FAWEZA	Forum for African Women Educationalist of Zambia
H M	Home Management
IPA	Interpretative Phenomenological Analysis
Math	Mathematics
MOESTVEE	Ministry of Education, Science, Vocational Training and Early Education
MSC	Mathematics self-concept
PTA	Parents Teachers Association
RE	Religious Education
SES	Socioeconomic status
SFP	Self-fulfilling Prophecy
STEM	Science, Technology, Engineering and Mathematics
TFR	Teacher frame of reference
UCZ	United Church of Zambia
UNZA	University of Zambia

CHAPTER ONE
INTRODUCTION

1.1 Overview

The purpose of this study was to establish individual factors; family and community factors; and school factors that reinforce the development of low Mathematics self-concept in selected grade eleven girls at *Chipembi* Girls' Secondary School in *Chisamba* District of the Central Province of Zambia. This chapter presents the background that generated the need to conduct this research. The statement of the problem, the purpose, the research objectives, research questions and the significance of the study. Operational definitions as well as theoretical and conceptual framework are also presented.

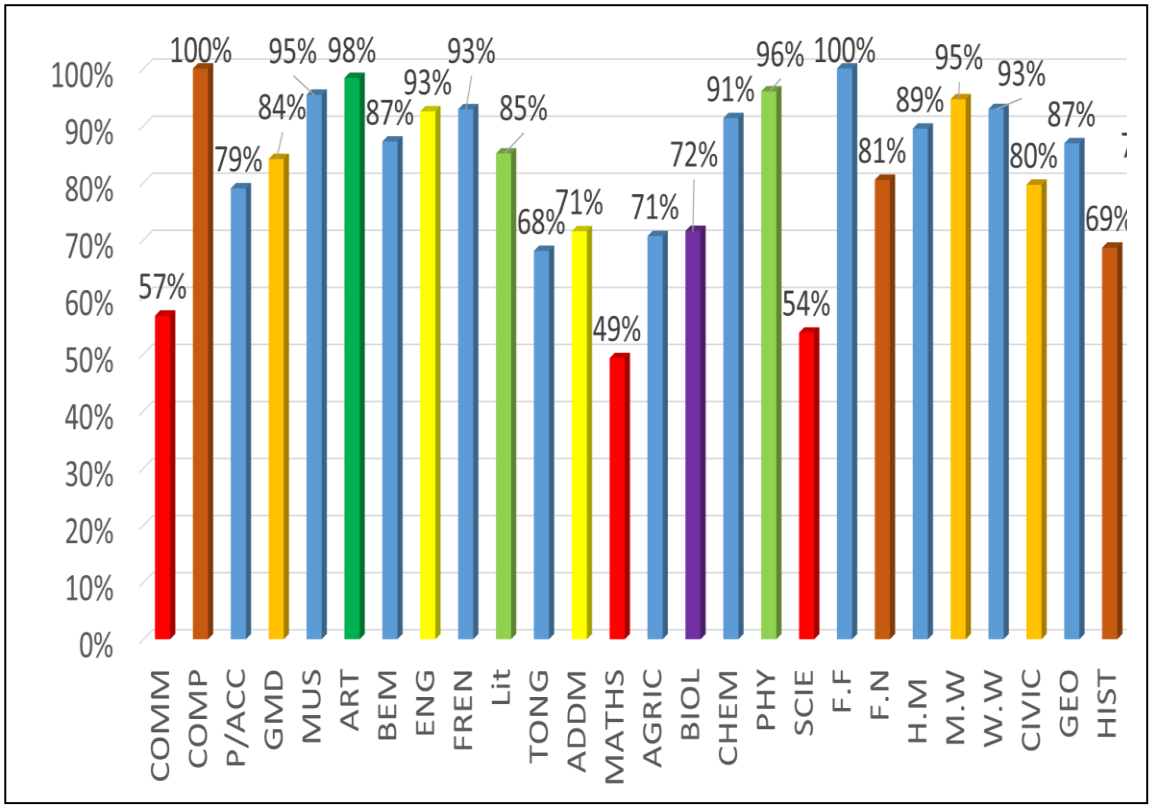
1.2 Background

The 21st century has seen a growing role of Mathematics, Science and Technology that is unprecedented. Tembon and Fort (2008) indicate that the performance of a country's best students in Mathematics and related subjects may have implications for the role that the country will play in tomorrow's advanced technology sector for its overall international competitiveness. Wolf (2002) indicated that there has been a positive change in students' attitudes towards Mathematics over the past decade and that a qualification in Mathematics is associated with greater success in gaining entrance to university, future employment or increased earnings. However, there are wide disparities in student performance in Mathematics and Science subjects between boys and girls in countries, which suggests that excellence throughout education systems remains a remote goal.

The performance of pupils at School Certificate level is generally poor in Zambia. This poor performance is more pronounced in Mathematics and Science subjects as exemplified in the Ministry of Education, Science, Vocational Training and Early Education (MOESTVEE)-Central Province 2014 Grade Twelve Examination Analysis Report (see figure 1). From the thirty-four secondary schools in Central Province for example, and from the twenty seven subjects that were examined, Mathematics had the lowest percentage, which was 49%. This finding is alarming especially that Mathematics is a key entry requirement to almost all the important

careers. Figure 1 below is a statistical presentation of the performance of grade 12 pupils in Central Province in all the subjects for the year 2014.

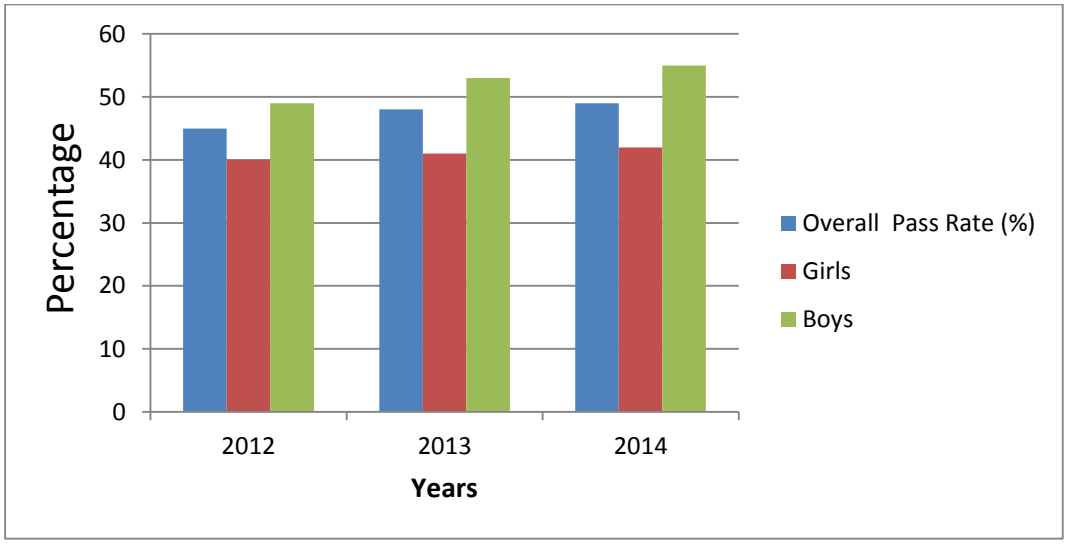
Figure 1: **School Certificate (Grade 12) Results by Subject in Central Province-2014**



Source: **Statistician-Provincial Education Office (PEO), Central Province-2015.**

Overall, from the results above it can be seen that in as much as in other subjects the pupils had performed relatively well, in Mathematics the situation is not pleasing as only 49% managed to pass. The statistics in figure 2 below, further present the summary of performance in Mathematics from 2012 to 2014 in Central Province with special reference to the performance of girls and boys in this subject.

Figure 2: **Summary of Performance in Mathematics at school Certificate level from 2012-2014 in Central Province**



Source: ***Statistician-Provincial Education Office (Central Province) - 2015***

These results indicate that while the overall performance of both girls and boys in Mathematics is low that is 45, 48, 49 for the years 2012, 2013 and 2014 respectively, girls' performance in Mathematics is much lower than that of boys. For instance, for the year 2014, while the pass rate for the boys was 55% the girls were lagging behind with 42% pass rate.

Chipembi Girls' Secondary School, one of the girls boarding schools in Central Province has a scenario not very different from what is obtaining in many secondary schools in the country and in Central Province in particular with regard to performance in Mathematics and Science subjects on one hand compared to the performance in other subjects on the other (see figure 1). Though the school management together with the teachers have employed strategies to change the situation, the school has continued to register lower percentages of those who get distinctions and merits in Mathematics, Science and Biology as compared to percentages in subjects such as Food and Nutrition, Home Management, English, Literature in English and all the Social Sciences. Note that the school does not only aim at a 100% pass in individual subjects, but at producing quality results i.e. grades 1-3 (Chituka, 2013). Notably, while at Provincial level quality results mean grades from 1-6 (as shown in the MOESTVEE-Central Province 2014 Grade Twelve Examination Analysis Report) at *Chipembi* it is grades 1-3.This attitude has been

fuelled by the School's motto which reads in *Lenje* as follows; *'Atuume Luteeta'* meaning *'Let us lead the way'* as highlighted in the *Chipembi* Girls' Secondary School Strategic Plan 2011-2015.

Management at *Chipembi* Girls' Secondary School is ultimately responsible for creating an environment and culture that is conducive to the attainment of the school's vision to be the leading provider of holistic girl-child education in Zambia. Part of this responsibility lies in determining the mission, values, goals, objectives, strategies and policies that will safeguard and promote this vision (*http://Chipembigirls.com/index.php/governance-and-management*). Consequently, the school is in a hurry to preserve the deep-rooted rich Zambian culture as it adapts quickly to the fast-paced education environment of the 21st century.

It is against this background that the *Chipembi* Girls' Secondary School Strategic Plan was devised for the period 2011 to 2015 which was the first of its kind at *Chipembi*. In the strategic plan, eight (8) specific strategic objectives were prioritised of which the general objective has been anchored around qualitative and quantitative measures to raise the quality of education to be delivered by the school (*Chipembi* Girls' Secondary School Strategic Plan 2011-2015). In the light of the general objective and indeed the specific objective number one (1) which reads in part *'to improve the quality of education,'* the current study had partly endeavoured to highlight in a qualitative and holistic way some of the reasons why girls have a low Mathematics self-concept which consequently results in poor performance in Mathematics.

In the same line as shown in the Minutes of the School Management Meeting held on 19th February 2015, out of 14 subjects offered in school, only two subjects, that is, Mathematics and Science, had not recorded 100% overall pass rate in 2013 and 2014 national examination results. Put simply, 86% of the subjects offered in School excluding Mathematics and Science, recorded 100% pass rate in 2013 and 2014 national grade 12 examination results. This result is remarkable and yet it is in this same light that the current study was conducted to uncover the reasons as to why girls' performance in Mathematics is still lagging behind other subjects.

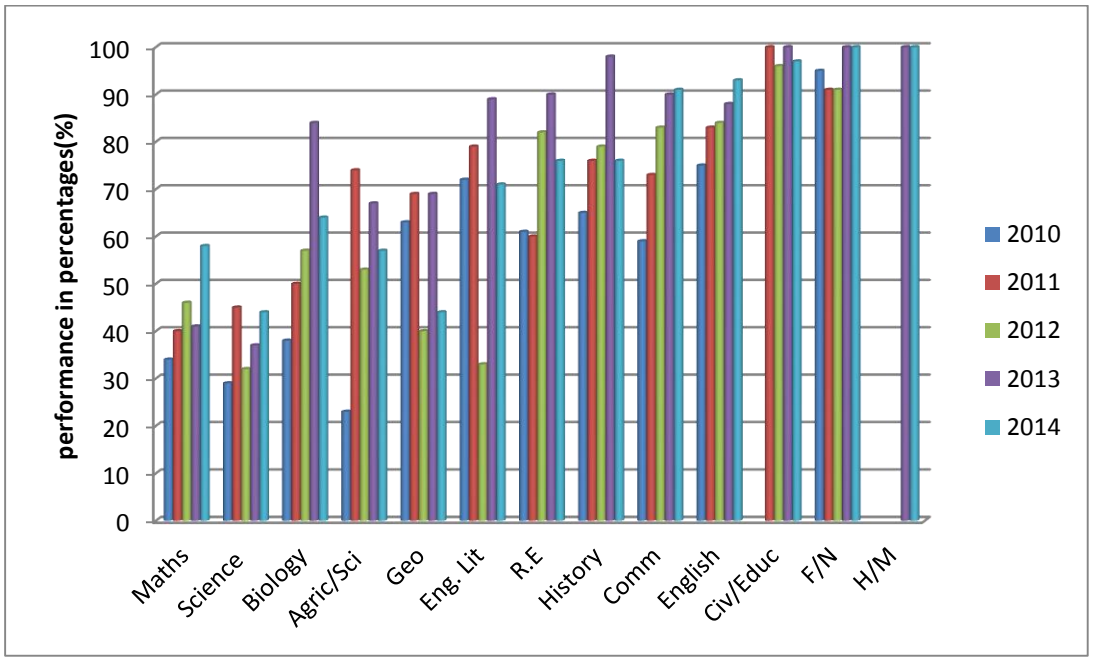
At *Chipembi* Girls Secondary School, in the quest to live by the standard of producing quality results, the school in the recent years has embarked on various strategic interventions, including high level analytical skills, Evidence Based Planning (EBP), tried and tested pedagogies and teacher motivation (Chituka, 2013). In spite of these and many other strategies employed to try and reverse the situation, the performance in Science, Biology and Mathematics, has continued to lag behind the other subjects.

As the 5-year School Strategic Plan which was drawn in 2011 would come to an end in December 2015 the new benchmark is to attain 100% quality pass, that is, Grades 1-3 for all the six Departments in the School as opposed to just a 100% pass (*Chipembi* Girls Secondary School Minutes of the Management Meeting held on 19 February 2015). Interestingly, Food and Nutrition (F.N) and Home Management (H.M) which are commonly known as feminine subjects have set the standard for this new benchmark as both subjects had attained not just 100% pass but 100% quality pass! (see figure 3).

As I indicated earlier, the problem here is that while other subjects such as Food and Nutrition, Home Management, English language and all the Social sciences subjects have most of the pupils getting distinctions and merits, in Mathematics, Science and Biology, percentages are lower. Thus questions necessarily follow: Why is it that in spite of the school having worked hard to improve the quality of results in Mathematics the scenario continues to be the same and though there could be some improvements, Mathematics results are still lagging behind the other commonly known feminine subjects? Where is the problem? Could it be with teachers or indeed schools where girls' learning takes place? Could it be with families and/ or communities where these young girls were brought up? Or could the problem be with the girls themselves? All these are critical questions which I have attempted to address in this study.

In figure 3 below, I present statistics showing the performance of girls in various subjects offered at *Chipembi* Girls Secondary school from 2010 to 2014. Note that the results here have been presented in relation to quality results (grades 1-3), put simply, distinction and upper merit, as this is what the school has been aiming at and currently it has taken this to be the new benchmark for all the subjects in the school.

Figure 3: **Chipembi Girls' Secondary School Grade 12 Quality Results (grades 1-3) Analysis from 2010-2014)**



Source: **Chipembi Girls Secondary School Headteacher's Office Data Base-2015**

As can be seen from the above statistics, more than 60% of the girls in each year of the period between 2010 and 2014 in the subjects commonly referred to as feminine subjects namely Food and Nutrition, Home Management, Civic Education, English Language, Commerce, History, Religious Education, Literature in English and Geography, had quality results meaning they had distinctions and upper merit. On the contrary, Mathematics and Science subjects commonly referred to as masculine subjects on average had less than 50% of the girls in each year of the period shown. Indeed, while the performance of the girls in Mathematics and Science might be seen to be fair the quality of the results in these subjects cannot be compared with the quality in the feminine subjects as shown in the figure above. This finding ties well with Swainson (1995) who reports that girls perform worse in all examined subjects in Zambia except in local languages and English.

An abundance of research has found that there exists a strong relationship between a student's Mathematics self-concept and achievement levels, (Chiu and Klassen, 2008; Hamachek, 1995; Kiamanesh & Kheirieh 2001; Marsh, 1992; Mujtaba, Hodgson & Reiss, 2013; Munsaka, 2001; Wilkins, 2004). Thus, a positive Mathematics self-concept means a high achievement in Mathematics and a negative

Mathematics self-concept means a high achievement in Mathematics. Consequently, research has shown that girls have a low or negative Mathematics self-concept contributing to their poor performance in Mathematics while boys have been found to have a higher or positive Mathematics self-concept (Mujtaba, Hodgson & Reiss, 2013; Munsaka, 2001; Suliman, 2004). What is not clear however, is how this low Mathematics self-concept among girls is developed. It was the purpose of this study therefore, to carry out an in-depth understanding of how an individual (girl), the family and the community in which the girls are raised as well as the school where learning occurs, influenced the development of low Mathematics self-concept in girls at *Chipembi* Girls' Secondary School situated in *Chisamba* rural area of Central Province. Below I present the statement of the problem.

1.3 Statement of the problem

It has been established that girls have a lower self-concept in Mathematics than boys resulting in poorer academic performance in Mathematics (Mujtaba, Hodgson & Reiss, 2013; Munsaka, 2001; Suliman, 2004). At *Chipembi* Girls' Secondary School, the school management, the teaching staff and the Parents Teachers' Association (PTA) have worked tirelessly to make sure the school performs up to its motto *'Atuume Luteeta'* which is translated as *'Let's Lead The Way'* that is in providing quality grade 12 results among other things. Though the school has succeeded in producing outstanding quality results in Food and Nutrition, Home Management, English language and Social Sciences subjects such as Religious Education, History, Geography and Civic Education, quality results (grades 1-3) in Mathematics, Sciences and Biology have continued to be lower than that of the aforementioned commonly known feminine subjects. Various strategic interventions have been employed including high level analytical skills, Evidence Based Planning (EBP), tried and tested pedagogies and teacher motivation (Chituka, 2013) to try and reverse the situation in the aforementioned commonly known masculine subjects. Although there has been remarkable change in these three subjects after the interventions, performance in these subjects has continued to be lower. It appears that poor quality results particularly in Mathematics at *Chipembi* are influenced by girls' low Mathematics self-concept. Though factors that influence positive Mathematics self-concept have generally been established quantitatively in Mujtaba,

Hodgson and Reiss (2013), no in-depth study seems to have been conducted to look at this study qualitatively and holistically. Since the environment in which the child is raised is key to its development and indeed development of the self-concept, this study sought to establish an in-depth understanding of individual factors as well as social factors namely: family, community and school factors which might have reinforced the development of low Mathematics self-concept in selected grade eleven girls at *Chipembi* Girls' Secondary School in *Chisamba* District of Central Province.

1.4 Purpose of the Study

The purpose of the study was to establish individual factors, family and community factors as well as school factors that reinforce the development of low Mathematics self-concept in girls.

1.5 Research Objectives

The objectives of the study were to:

1. Explore individual factors of girls which influence the development of negative Mathematics self-concept.
2. Establish family factors which reinforce the development of negative Mathematics self-concept in girls.
3. Ascertain community factors which contribute to the development of girls' low Mathematics self-concept and
4. Establish school factors which reinforce the development of low Mathematics self- concept in girls.

1.6 Research questions

On the basis of the stated objectives, the following were the research questions of the study:

1. What individual factors of girls influence the development of low Mathematics self-concept
2. How do families in which girls are raised influence the development of low Mathematics self-concept?

3. How do communities in which girls live influence the development of low Mathematics self-concept?
4. What school factors reinforce the development of low Mathematics self-concept in girls?

1.7 Significance of the study

The information on factors influencing negative self-concept in Mathematics among girls is paramount to policy makers, educators, school managers, teachers, parents and indeed the pupils themselves in particular the girl child. It is anticipated that the study may inform these key stakeholders in the development of a child and indeed the development of self-concept on some of the practices which should be avoided in the quest to improve girls' Mathematics self-concept and indeed their performance in the subject.

In particular, teachers may benefit as it will inform them about girls' perceptions and beliefs held about the subject and thus making the whole process of teaching and learning more effective and meaningful. Further, many girls may access not only tertiary education but also better jobs as a good result in Mathematics is being used in many institutions of learning as a pre-requisite for entry.

Further, Non-Governmental Organizations that deal with girls' advancement for example, Forum for African Women Educationist in Zambia (FAWEZA) might use the information to devise strategies to curb gender disparities in Mathematics and indeed other related subjects. The study will also add to the scholarly research and literature.

1.8 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. 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. The following are some of the key terms in my study and their operational meanings.

Self-concept: - Self-concept refers to self-evaluation or self-perception, and it represents the sum of an individual's beliefs about his or her own attributes [(Alena, Hadley, Elizabeth, Hair & Moore, (2008) in Deku, Amponsah and Opoku (2013, p. 627)]. It can also be one's beliefs about oneself. It is the way one thinks of oneself in different specific domains, for instance, in academic area and physical appearance just to mention a few. Generally, it is the image we create of ourselves and the self-value or esteem generated from this image that affects our level of performance.

Mathematics self-concept: - A person's perceptions in the area of Mathematics which can either be positive or negative that are formed through experiences with others and one's own interpretations of their experiences with the subject.

Positive Mathematics self-concept: - A person's positive perceptions about their ability in Mathematics that are formed through experience with others and one's own interpretations of their experiences with the subject.

Negative Mathematics self-concept: - A person's evaluation of their lack of ability in Mathematics formed through experience with others and one's own interpretations of their experiences with the subject.

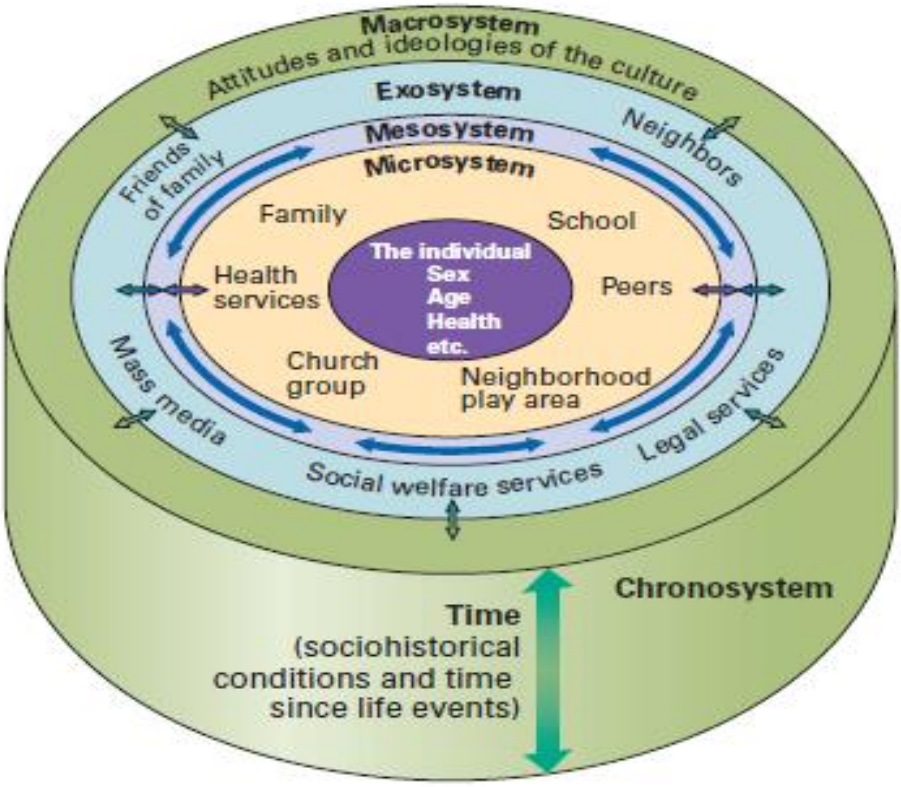
1.9 Theoretical framework

The study was mainly guided by two theories namely; the Ecological System theory and the Self-fulfilling Prophecy (SFP).

1.9.1 The Ecological Systems Theory

Bronfenbrenner (1994) argues that to understand human development, one must consider the entire ecological system in which growth occurs. Bronfenbrenner's ecosystem model is divided into five socially organised and interlocking sub-systems that shape individual development, namely: microsystem, mesosystem, exosystem, macrosystem and chronosystem. This theory has recently been renamed "*bioecological* systems theory" to emphasize that a child's own biology is a primary environment fueling her development. Below is figure 4, which shows a basic and simplified model of the ecological theory. Each individual system is discussed briefly below.

***Figure 4*: Model of the Ecological Systems theory**



Source: **www.mhhe.com/santedu3e**

The microsystem is the layer closest to the child and contains the structures with which the child has direct contact. The microsystem encompasses the relationships and interactions a child has with her immediate surroundings (Berk, 2000). Structures in the microsystem include family, school, peers, neighbourhood, or childcare environments. At this level, relationships have impact in two directions - both away from the child and toward the child. For example, a child's parents may affect his beliefs and behaviour; however, the child also affects the behaviour and beliefs of the parent. Bronfenbrenner calls these *bi-directional influences,* and he shows how they occur among all levels of environment. Accordingly, Louw (1991) points out that the teacher's role is to shape the adolescent's self-concept and serves as a catalyst and protector against the remarks of the peer group. Thus, in this study the parents and teachers' practices are seen to build or destroy girls' self- concept in Mathematics. Similarly, the peers during adolescence become more differentiated, influential and provide powerful social rewards in terms of status, prestige, friendship, popularity and acceptance. However, the peer system also can assert a

powerful negative influence by encouraging or rewarding detrimental behaviour such as negative attitude towards some subjects and in this case Mathematics.

The mesosystem is the second system. Bronfenbrenner (2005) describes the mesosystem as the set of microsystems constituting the individual's developmental niche within a given period of development that is the interrelations among major settings containing the developing person at a particular point in his or her life. For examples: the connection between the child's teacher and his parents, between his church and his neighbourhood. The mesosystem in a nutshell is the relationship between different neighbourhoods and how this impacts on the development of the child and indeed on the development of girls' negative Mathematics self-concept.

The exosystem which is the third layer is defined as the larger social system in which the child does not function directly. The structures in this layer impact the child's development by interacting with some structure in her microsystem (Berk, 2000). Additionally, Bronfenbrenner (1994) reports that the exosystem is composed of contexts while not directly involving the developing person. For example, the workplace of a child's parent has an influence on the person's behaviour and development or may occur when the parent has had a stressful day at work and as a result is less able to provide quality care giving to the child. The child may not be directly involved at this level, but he/she does feel the positive or negative force involved with the interaction with his/her own system.

The fourth system is the the **macrosystem.** Bronfenbrenner (2005) asserts that macrosystems are blueprints for interlocking social forces at the macro-level and their interrelationships in shaping human development. Macrosystem describes the culture in which individuals live. Cultural contexts include developing and industrialized countries, socioeconomic status, poverty and ethnicity. Macrosystems are not static, but might change through evolution and revolution. For example, economic recession, war and technological changes may produce such changes. Haralambos and Holborn (2004) argue that culture determines how members of society think and feel. The culture in which the parents, teachers and peers live will influence their beliefs which later influence their practices and consequently impact on the child. In this study the individual factors, family and community factors as well as school factors all seem to be influenced by the cultures in which they leave.

In Zambia, the cultures especially in rural areas have socialized societies in a way that girls are secondary when it comes to education. This has consequently resulted in families, communities and schools not to give full support to the girls' learning especially in the area of Mathematics and Sciences and thus the need for the study at hand.

The chronosystem is the last system in Bronfenbrenner,s ecological theory. This system encompasses the dimension of time as it relates to a child's environments. Elements within this system can be either external, such as the timing of a parent's death, or internal, such as the physiological changes that occur with the aging of a child. As children get older, they may react differently to environmental changes and may be more able to determine more how that change will influence them.

A key proposition of this theory is that a child's development takes place within the context of the system of relationships that form his or her environment. Bronfenbrenner's theory defines complex "layers" of the environment, each having an effect on a child's development. The interaction between factors in the child's maturing biology, his/her immediate family, community and school environment fuels and steers his/her development. Changes or conflict in any one layer will ripple throughout other layers. To study a child's development then, we must look not only at the child and his/her immediate environment, but also at the interaction of the larger environment as well.

According to Bronfenbrenner (1994) adolescents do not develop in a vacuum but rather develop within the multiple contexts of their families, communities and countries. Every biological organism develops within the context of ecological systems that support or stifle its growth. Significantly, Bronfenbrenner's approach to understanding families is helpful because it is inclusive of all of the systems in which families are enmeshed and because it reflects the dynamic nature of actual family relations. Bronfenbrenner saw the individual's experience as a set of nested structures, each inside the next, like a set of Russian dolls (Bronfenbrenner, 2005). In studying human development, one has to see within, beyond and across how the several systems interact (family and others).

By and large, this theory seems relevant to this study on factors influencing girls' negative mathematics self-concept. The individual factors, family, community and school factors all may tend to influence a Mathematics self-concept that is either positive or negative. Parents, teachers, peers and role models are some of the figures that can help in the building of the negative or positive self-concept in Mathematics. These figures are all part of the ecosystem as shown in Bronfenbrenner's theory. The study therefore will attempt to show how the ecological theory is applicable in indicating factors that influence the girls' negative self-concept in Mathematics. Basing on this theory recommendations will be suggested as part of the contribution to improve girls' Mathematics self-concept. In a nutshell, it can be concluded that self-concept is an aspect of human development. The nature of development is that it is interconnected. Bronfenbrenner's theory offers an intergrated or holistic approach to a study of human development and thus the development of self-concept as well.

1.9.2 The self-fulfilling prophecy

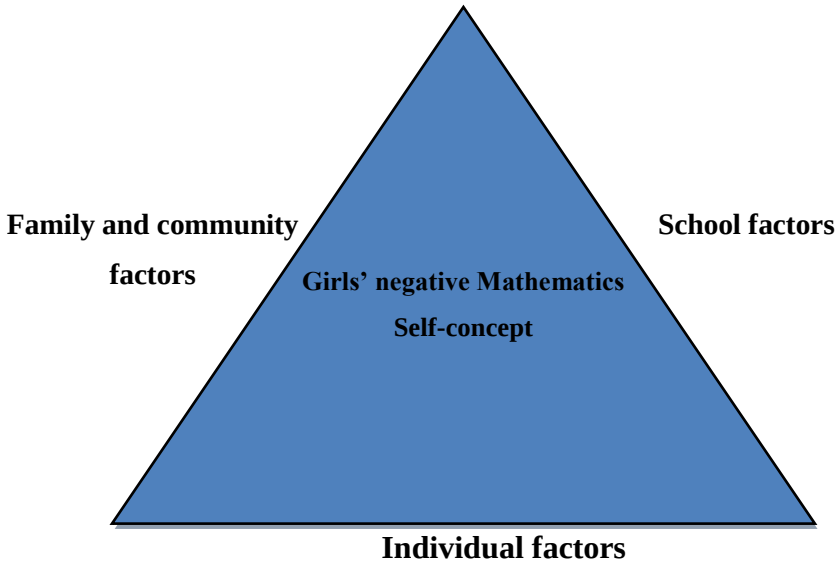
The term "self-fulfilling prophecy" was coined in 1948 by Robert Merton to describe a false definition of the situation evoking a new behaviour which makes the originally false conception come true (Merton 1968). It is a cultural belief that becomes true because people act as though it is true. Largely, it is a process by which one's expectations about another person eventually lead the other person to behave in ways that confirm these expectations.

Parents, brothers and sisters in families, significant others, peers and models in communities as well as teachers in schools have a profound role in guiding pupils into success or failure, and this is partly affected by their own mindset about the pupil. When the teacher for instance, sees a student as an achiever, the teacher might use more complimentary language, offer after-school help, call on him or her more often, or even smile more. All this positive feedback is bound to help the student flourish. If, however, the teacher does not believe this student will be a success, the teacher might discipline the student more frequently, tell him or her she cannot attempt a task, or approach the student with suspicion after an absence. These negative responses can easily promote low self-concept in Mathematics and thus underachievement.

1.10 Conceptual framework

Negative Mathematics self-concept in girls is seen to emanate from individual factors of girls, family and community factors, as well as school factors. Figure 5, below illustrates the triadic factors aforementioned which may influence negative Mathematics self-concept among girls.

Figure 5: **Conceptual Framework on the Factors influencing girls' negative Mathematics self-concept**



The factors that influence girls' negative Mathematics self-concept seem to be holistic in nature rather than atomistic.

1.11 Summary

It has been established in this chapter that positive Mathematics self-concept is paramount in reinforcing high Mathematics performance. In the background of the study it has been shown that while boys have positive Mathematics self-concept girls have a negative Mathematics self-concept. Notably, it has been further shown that factors that influence girls' negative Mathematics self-concept have not received much attention both in Zambia and elsewhere in the world hence the need for the current study. In the following chapter (chapter 2) a review of literature on the topic of self-concept is undertaken.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

Having discussed the rationale for this study this chapter intends to give an overview on the topic of self-concept and particularly Mathematics self-concept. The chapter is composed of four parts. Firstly, the meaning of self-concept and how it is related to self-esteem and self-efficacy is given. Secondly, studies showing the relationship between self-concept and academic performance will be given. Thirdly, the theme on Mathematics self-concept, performance in Mathematics and gender is presented. Fourthly, literature related to the development of Mathematics self-concept is discussed and thereafter a brief summary of the literature review chapter will be given.

2.2 Meaning of self-concept

Self-concept is among various psychological terms that have been coined to investigate different aspects of the self. Thoughts and feelings about self have been a topic of interest in Psychology as it relates to how we act, especially when faced with challenging circumstances (Bandura, 1977). Despite the profusion of studies devoted to psychological research on self-concept, it is difficult to find a unanimous, accepted definition of the term self-concept given that it has been approached from different theoretical perspectives. Marsh and Seeshing, (1997) define self-concept as a set of perceptions or reference points that the individual has about himself; the set of characteristics, attributes, qualities and deficiencies, capacities and limits, values and relationships that the individual knows to be descriptive of himself and which he perceives as data concerning his identity. It refers to a complex system of learned beliefs, attitudes, and opinions that each person holds (Purkey, 1988) and is perhaps the basis for all motivated behaviour. On the whole, self-concept can be defined as a multidimensional construct that refers to a person's perception of self in terms of both academic and non-academic aspects.

Researchers have shown that self-concept has characteristics which distinguish it from other self-constructs. Munsaka and Matafwali (2013) posit that self-concept is organized, evaluative, developmental, stable and multifaceted. The multifacetedness

of self-concept entails that it should not be regarded as a single entity. For example, Marsh (1990a) demonstrated that students could distinguish self-concepts in a wide variety of different academic subjects, ranging from Mathematics to Biology and English. For this reason, Marsh advised that specific self-concepts should be studied using scales purposely devised to measure that self-concept. Thus, self-concept can be an important indicator of educational choice and achievement.

The term self-concept is usually confused with the term self-esteem. The terms are sometimes used interchangeably or not defined in a precise way. However, Santrock (2008) has defined both constructs to try and give a clear distinction between the two. He has defined self-esteem as the "global evaluative dimension of the self," and self-concept as a "domain specific self- evaluation" (Santrock 2008, p. 329). He further argues that self-esteem is also referred to as self-worth or self-image. Self-esteem is referred to in more general terms while self-concept is referred to in more specific terms. For instance, one can talk of Mathematics self-concept, physical appearance self-concept, to mention just a few. Generally, self-esteem is self-concept evaluated.

The term self-concept also differs from self-efficacy. Ferla, Valcke, Cai (2009) point out that Mathematics self-concept and Mathematics self-efficacy are conceptually and empirically different constructs, even when studied within the same domain. Bong and Skaalvik (2003) argue that academic self-concept refers to past-oriented perceptions of the self, whereas self-efficacy indicates relatively future-oriented perceptions. Conversely, Self-concept and self-efficacy are related in that individuals will have more self-efficacy for tasks they consider central to their self-concept and for tasks that they enjoy. For instance, Taonga will be more confident in her ability to solve algebra problems if she enjoys Mathematics, and thinks of herself as someone who is good at Mathematics.

Going by the explanations given above on self-concept it can be concluded that self-concept can determine who you are; what you are; what you think you can do; and indeed what you can become. Ultimately, the significance of the meaning of self-concept to this study is that it helps to differentiate it from other self-constructs and thus makes the current study more meaningful. With this said we can now consider

reviewing literature on the relationship between Self-concept and indeed Mathematics self-concept and academic performance.

2.3 Self-concept and academic performance

In this part of the review I will endeavour to give some of the related researches and studies to the relationship between self-concept and academic performance. Many educators believe that self-concept is positively related to academic performance. Pupils who are confident of their learning abilities and feel self-worthy display greater interest and motivation in school which in turn enhances achievement (Schunk, 2009).

In his study Wilkins (2004), provides an international comparison of Mathematics and Science self-concepts and their relationship with Mathematics and Science achievement. Generally, though there were global variations in self-concept, it was found that within most countries there is an overall positive relationship between self-concept and achievement. Similarly, in their study Chiu and Klassen (2008) found that students with higher Mathematics self-concept (MSC) or MSC calibration had higher Mathematics scores. Students' MSC was more strongly linked to Mathematics achievement in countries that were wealthier, more egalitarian, more tolerant of uncertainty, or more flexible regarding gender roles. Such characteristics refer to western countries and one explanation to such a finding is that within western culture, emphasis is on individual characteristics and achievement, promoting an individualistic self-concept. In contrast people from non-western culture think about themselves in collectivist terms rather than as an individual (Markhus and Kitayama, 1991 in Suliman, 2004).

Kiamanesh and Kheirieh (2001) also found that the relation between the index of Mathematics self-concept and Mathematics achievement was positive and significant. Further, he showed the Mathematics score of Iranian students who benefited from high self-concept was much higher than that of those who had medium or low self-concept. This study similar to other research carried out in this field revealed a significant effect of Mathematics self-concept on Mathematics achievement (Hamachek, 1995; Marsh, 1992). It is interesting to note that in as much as there are a number of studies on self-concept and Mathematics

achievement, there are also studies on self-concept and other subjects. One such example is the study done by Ghazvini, (2011), which showed like many others that academic self-concept powerfully predicts general performance in literature and Mathematics.

Like self-concept, self-esteem is another self-construct which has an influence on academic performance. Notably, Rosli (2011) carried out a cross sectional study to examine the relationship between self–esteem and students' academic performance among the second year undergraduates of Faculty of Health Sciences and Faculty of Medicine. The results showed that students with higher self-esteem perform better in their academics.

In Zambia, studies done by both Munsaka (2001) and Suliman (2004) have shown that there is a relationship between self-concept and academic performance. In particular, Munsaka's study revealed that there was a positive correlation between self-concept and performance in Mathematics, Physics and Chemistry. While Suliman's study revealed particularly that self-concept was stronger related to academic performance more among girls than among boys, Munsaka found that boys had a high or positive self-concept in areas such as Mathematics, Physics and Chemistry. Girls on the other hand had a low or negative self-concept in those areas.

So far, the aforementioned studies have shown how self-concept influences academic performance. Other studies though have also shown that the two, self-concept and academic performance have reciprocal effect. Seaton, et al (2014) hypothesized that a reciprocal relation would exist between Mathematics self-concept and Mathematics achievement. This hypothesis was upheld and was consistent across all time lags, even when controlling for achievement and goal orientations. The results imply that no teacher is wasting his or her time in enhancing Mathematics self-concept as in doing so this is likely to enhance Mathematics achievement. Equally, Marsh et al. (2002)'s study of Hong Kong high school students suggested that academic achievement and self-concept mutually influence each other. Similarly, in Chen et al (2013)'s study, which is one of the few cross-cultural research studies on causal relationships between the academic achievements and self-concept for an East Asian student sample, provided important

new evidence regarding the generalizability of reciprocal effects in high school students.

The studies reviewed above support the idea that self-concept is positively related to academic performance. Other researchers however, have shown that there are only moderate correlations between school performance and self-esteem and these correlations do not suggest that high self-esteem produces better school performance (Baumeister et al., 2003 in Santrock 2006). It is argued that, efforts to increase students 'self-esteem have not always led to improved school performance.

Notably, other researchers also do not completely support the assertions that there are correlations between self-concept and academic performance. Wylie (1979) in Schunk (2009, p.497) was said to have reviewed many research studies and in these studies he had found that "correlation does not employ causality, so it cannot be determined whether self-concept influences achievement, achievement influences self-concept, each influences the other or each is influenced by other variables." He however, interestingly pointed out that the highest correlations with achievement have been found with domain-specific self-concept for instance in areas such as English or Mathematics. Regarding this, Munsaka and Matafwali (2013) point out that though there is lack of clarity in the causal relationship between the two, which has been likened to the famous chicken-egg relationship, it seems clear that there is a positive correlation between the two-a boost in one, is likely to result in a boost in the other.

Ultimately, it can be concluded that though studies have been conducted to show that correlations between self-concept and academic performance do not exist the studies in favour seem to outweigh those against and that those against agree to some extent when these correlations are done with domain-specific self-concept as indicated in the later study above. By and large, the relationship between Mathematics self-concept and academic performance discussed in this section is significant to this current research in that a low Mathematics self-concept can lead to poor Mathematics performance, for example. But how this low Mathematics self-concept is developed is what the current study has attempted to address. Having reviewed literature on self-concept and academic performance it is imperative that

we now turn to boys and girls, males and females' self-concept in Mathematics and how this relates to performance in Mathematics.

2.4 Mathematics self-concept, performance in Mathematics and gender

Gender differences in Mathematics performance have been a great controversial issue in educational domain and research documents show great discrepancies among girls and boys performance in school Mathematics (Sprigler & Alsup 2003). Long research history in this area has shown that male advantage in Mathematics achievement is a universal phenomenon (Mullis et al., 2000; Janson, 1996). Gallagher and kaufman (2006) recognized that the Mathematics achievement and interest of boys are better than the girls. However they explained that they don't know the main cause of these differences. O'Connor-Petruso, Schiering, Hayes & Serrano(2004) have shown that gender differences in Mathematics achievement become apparent at the secondary level when female students begin to exhibit less confidence in their Mathematics ability and perform lower than males on problem solving and higher level Mathematics tasks.

Equally, Gerstenberg, Imhoff and Schmitt (2012) in their study, found that individuals with a fragile self-concept in the domain of performance are particularly vulnerable to stereotype threat effects. According to the Stereotype Threat (ST) model (Steele & Aronson, 1995), individuals who perform a difficult task in an area in which their group is considered weak feel at risk of confirming the stereotype, and this psychological pressure leads them to underperform, thus, girls' underperformance in Mathematics. Similarly, research also shows that there are gender differences in Science, Technology, Engineering and Mathematics (STEM) self-concept. Boys show greater self-concept and interest in STEM domains relative to girls (Achter, Lubinski, Benbow, & Eftekhari- Sanjani, 1999; Ackerman et al., 2001). Within STEM fields, there are also gender differences in self-concept. Girls and women are more likely to have self-concepts aligned with Biology and the study of medicine, and boys and men are more likely to have self-concepts aligned with engineering, Mathematics, and physics (Ackerman et al., 2001). These differences fall along gender stereotypic lines: boys and men express interest for physical and computer sciences, and girls and women express interest in more "people oriented" STEM fields, such as Biology and medicine.

Further, Munsaka (2001) in his study found that girls had a low self-concept than boys in Mathematics, Physics and Chemistry. Similarly, Suliman's (2004) study though it did not look at Mathematics in particular it established that boys had a higher self-concept than girls. Surprisingly, his research also showed that self-concept seems to be stronger related to academic performance more among girls than among boys. Equally, in Mujtaba Hodgson and Reiss (2013)'s study it was shown that the students' gender was a significant predictor of the self-concept, girls had a lower self-concept in Mathematics than boys. It is these and many other studies on self-concept and academic performance mentioned earlier which are a torchstone to this current study.

In this section, studies have been presented that show that girls have a lower Mathematics self-concept than boys. Little however, has been done in research to ascertain the factors that influence the development of negative Mathematics self-concept in girls and hence this study. In the next section, I look at the development of Mathematics self-concept.

2.5 Development of Mathematics self-concept

This section will look at different aspects which contribute to the development of Mathematics self-concept namely: gender stereotypes of Mathematics; attitudes of girls towards Mathematics; and the role of family and community in the development of Mathematics self-concept. Others include: the role of the teacher and the school in the development of Mathematics self-concept; the role of peers in the development of Mathematics self-concept; and other factors to the development of Mathematics self-concept.

2.5.1 Gender stereotypes of Mathematics and the development of Mathematics self-Concept

There is a general belief in most societies that Mathematics is a masculine subject and careers related to Mathematics are male domains. Many studies on gender stereotypes about Mathematics have consistently documented that girls as well as boys perceive Mathematics as a male domain. This gender-biased view may be influenced by a society showing a strongly gendered workforce [(Brandell & Staberg, 2008; Steinthorsdottir & Sriraman, 2008) in Lee and Sriraman, 2012].

Mendick (2005) showed that more problematic situations are that these gendered views can be found among gifted female students despite their Mathematical talent and older students, who may be on the career decision-making process, tend to have these views more strongly than younger students. The belief that Mathematics is a male domain make gifted girls overly concerned and feel the burden of harder work than gifted males and, consequently, may lead the girls to avoid studying Mathematics continuously and choosing math-related careers. These gendered views may not only negatively affect girls choosing Mathematics careers but also inhibit the girls who perform poorly in Mathematics to develop a positive Mathematics self-concept and later improve performance in Mathematics. Over and above, in this section, it has been shown that negative Mathematics self-concept can develop from Mathematics gender stereotypes. The next section is on attitudes of girls towards Mathematics and development of Mathematics self- concept.

2.5.2 Attitudes of girls towards Mathematics and development of Mathematics self- concept

There are quite a number of studies that have been done on the attitudes of girls towards Mathematics. The findings from these studies show a lot of similarities than differences. Sayers (1991) in his study found that girls as compared to boys were less confident, more nervous, enjoyed Mathematics less and saw less use of their Mathematics than boys. Similarly, Cope at al (1988) in Nherera, (1999) suggests that females have greater anxiety toward Mathematics than males and that women and girls tend to view Mathematics more negatively than men.

Nherera (1999) in the study about attitudes of girls towards Mathematics in selected secondary schools in Lusaka and Mazabuka, suggested that girls view Mathematics as a difficult and masculine subject. Factors such as, lack of successful experiences in the subject, poor teaching in some cases and other indicators which appear to stem from the traditional notions of roles of men and women were found to influence these attitudes.

Similarly, the study of the gifted Korean girls (Kim and Lee) by Lee and Sriraman (2012) showed that the attitudes of the girls were such as the one mentioned in the study above. Lee reveals as follows in trying to explain how she feels about

Mathematics, *"I feel really happy when teaching Mathematics problems to my friends. I liked studying Mathematics more than other subjects but I'm not gifted so it's ok".* In the exceeding excerpt, Lee shows that she really had no big problem with Mathematics but it seems there is something telling her that Mathematics is not just for girls and so she feels she is not gifted. To further reveal how Lee feels about the subject I quote her as she narrated:

> I think that while men are gifted with logical skills, women are gifted with sensibility. I think that Math has been developed by logical skills and sociology has been developed by sensibility. I liked Mathematics, but I don't think Mathematics is suitable for women. (Lee and Sriraman p.10).

Lee as shown in the preceding excerpt, seem to suggest that men are naturally good in Mathematics related fields and women are natually good in social sciences. The reason to such thinking came as a result of her experiences while participating in gifted programs. In these programs she experienced frustration due to her perceived lack of ability compared with her male counterparts but experienced outstanding achievements in humanities subjects such as social studies and English. It is worth noting from the Korean's study that these girls were found to be gifted when they were in their primary school but as they grew up and when choosing majors, they judged themselves as lacking in Mathematics talent due to their Mathematics learning experiences. Their experiences made them believe that while male students had more talent in Mathematics, they had more talent in humanities, so they tended to deny their potential Mathematical abilities due to relatively lower Mathematics self-concept (Mendick, 2005). What is really of concern is that even when Lee and Kim were now in college they could still reason like this. To me this suggest that the factors that influence negative Mathematics self-concept in girls are interrelated and cannot be localised to one specific area.

In this section, it has been argued that Mathematics self-concept can develop from attitudes of girls towards Mathematics. Thus, positive attitudes can lead to positive Mathematics self-concept while negative attitudes can lead to negative Mathematics self-concept. The next section is on the role of family and community in the development of Mathematics self-concept.

2.5.3 The role of family and community in the development of Mathematics self-concept

The home or the family is the primary social structure in which human development takes place and thus development of Mathematics self-concept in particular. Similarly, the family as a component of the microsystem in Bronfenbrenner's model is important in influencing an adolescent's self-concept. Further, Munsaka and Matafwali (2013, p. 131) point out that "while self-concept is private and personal its formation emanates from social interactions." The key people in these interactions are the parents not forgetting the siblings, other extended family members, peers and teachers.

Gunderson et al. (2012) in their study titled "the role of parents and teachers in the development of gender-related Mathematics attitudes" showed that adults' own Mathematics anxieties and adults' beliefs and behaviours related to trait stability can impact children's gendered Mathematics attitudes. In addition to their expectancies and attributions about their children's Mathematics abilities, parents' own personal feelings, attitudes, anxieties and Mathematics self-concept are likely to influence the messages they convey about Mathematics to their children. Consistent with these research findings Robertson and Symons (2003) found among others that educational attainment is a function of parental input.

Similarly, when parents endorse the gender stereotype that Mathematics and Science are male domains, they are more likely to underestimate their daughters' abilities in these domains and to overestimate their son's abilities [(Eccles and Jacobs, 1986; Tiedemann, 2000) in Bhanot and Jovanovic (2005)]. In contrast when parents endorse the gender stereotype that English and Social science are female domains, they tend to overestimate their daughters' abilities in these subjects and to underestimate their sons' abilities Frome and Eccles (1998). Additionally, in a sample of six graders Frome and Eccles found that even when girls received higher Mathematics grades than their male class mates, they tended to underestimate their ability in Mathematics-consistent with their mothers' reports of their daughters' Mathematics skill and aptitude.

With regard to gender differences in Mathematics achievement, in a study of middle-school children's Mathematics successes and failures, it was found that mothers are more likely to attribute boys' Mathematics success to natural talent and girls' Mathematics success to effort (Yee and Eccles 1988). This is to say that, parents believe that girls have to work harder to succeed in Mathematics than boys. Parents believe that boys' Mathematics success comes to them more naturally than girls' Mathematics success. Additionally, Mathematics ability is often viewed as something you either have or you don't (Tobias, 1978 in Hakalo, 2014). Many parents and teachers count girls among those who don't have it.

Generally, as it is shown in Lee and Sriraman (2012)'s study, parental advice is one of the key factors that led to girls' choice of a nonmathematical area of specialization. Though this research was not on self-concept it communicates to us about how parents are key in the development of Mathematics self-concept of girls. In this study it is shown that when Kim was in grade 6, her mother said that she was not yet convinced of her daughter's mathematical talent. This is how she put it:

> Isn't so hard to enter fields related to natural science or engineering?...if women in our country are to succeed, they should be supported by their family. I think it may be hard to compete with men because there are few women in natural science and engineering fields (Lee and Sriraman 2012 p.7).

Kim's mother here sounds as if she really has a problem with Mathematics herself. She is very sceptical of her daughter going ahead to take up Mathematics related courses. Similarly, check the response of Kim's father in this excerpt:

> I don't know yet whether my daughter is good at Mathematics or likes it. She seems to like Mathematics, but I should wait more and watch her carefully. If she wants to do natural science or engineering I won't stop her, but I should check if she really likes those subjects. Otherwise she might be in trouble and regret it in the future (Lee and Sriraman 2012 p. 8).

The sentiment by Kim's father, like her mother's, are suggestive of the fact that parents are really not for the idea that their girl children should take up Mathematics related courses. In this study it is further shown that, when Kim was in Grade 10, her mother stated that it might be better to get her daughter to major in humanities and social studies rather than suffer from solving Mathematics problems. This is how she explains:

> Yes she is good at Mathematics…Her teacher says she is superior at social studies as well. I don't yet discuss this with my daughter but I just think that becoming a diplomat or a sociologist…or a counsellor with a major in Psychology may be suitable for her (Lee and Sriraman 2012, p.8).

In the same line Lee's father in the study, recognised her daughter's Mathematical abilities when she was in Grade 5. However he did not want his daughter to choose fields in natural science and engineering. I quote how he explains:

> It's obvious she is good at Mathematics. But if she chooses natural science and engineering it may be very hard. To continue to study Mathematics may be okay, but if she majors in science, she has to be in the labs late nights. I guess in the future her husband or family won't allow her to do so, so I want to persuade her not to choose those majors. Lee has a young brother and he is also good in Mathematics so I definitely want him to be in natural science and engineering fields, but it's hard because Lee is a daughter (Lee and Sriraman 2012 p.9).

The concern of Lee's father is not only that Mathematics is difficult but that girls should not take up Mathematics related courses because of their roles at home of taking care of their husband and indeed children. Such thinking exhibited in Lee's father is common in many cultures and it seems this contributes to most of our girls developing a negative attitude toward Mathematics. To further show that what parents say and advise their children really carry weight check how Lee puts it in solidarity of her father's advice as shown in Lee and Sriraman (2012, p.9)'s study, *"My dad is one of the most respected persons to me. So I may obey my dad. I like Mathematics, but I also like English, Social studies and fine arts. So, maybe I won't major in natural science and engineering as my dad said"*. From the abovementioned excerpt it is observed that parents' position in children's lives is paramount and cannot be overemphasized.

Also in gifted Korean girls' study, Lee and Sriraman found that the absence of role models in the families as well as the community influenced the non-Mathematical aspirations. Lee one of the girls studied stated as follows to exemplify this finding:

> There is no family member who worked in natural science or engineering fields. My aunt was studying in administrative studies, but she transferred to a dental college and became a dentist. But she said she isn't happy. It is said a job that can allow much free time is good for women, but I think that studying Math or science means to spend a lot of time. Many people said that natural science and engineering should be hard for women (p.10).

What is being revealed here is a fact that natural science and engineering take a lot of time and culturally it seems jobs that do not allow for free time are not for women. This is true not only to this particular culture but to many cultures even in Africa and zambia in particular. Like many societies in Africa in the Korean study at the end of 8th grade, Lee recogized that Korean society is very traditional and has gender stereotyping. This is how she reveals, *"many things are unfair for women. My parents are more interested in my younger brother than me and my relatives are more concerned about my brother's future than mine"* (Lee and Sriraman 2012, p.10). Like in many societies in Africa, in the gifted Korean girls' study girls and women are not a priority when it comes to education. They are considered to be second class citizens and so they are treated unfairly in almost all aspects of life.

In general, this section is important as it informs the current study that family and community has the role to play in the development of Mathematics self-concept. The next, is a section on the role of the teacher in the development of Mathematics self-concept.

2.5.4 The role of the teacher in the development of Mathematics self-concept

Teachers' own Mathematics anxieties, stereotypes, beliefs and behaviours can influence children's Mathematics attitudes and thus development of positive or negative Mathematics self-concept (Gunderson et al. 2012). A study in the United States of America showed that first-grade teachers perceive their best male students as being more logical, more competitive, more independent in Mathematics, and liking Mathematics more than their best female students (Fennema et al. 1990). Similarly, 3rd through 5th grade teachers in Germany believe that boys have greater Mathematics ability than girls, that boys are more capable of logical thought than girls, and that Mathematics is a more difficult subject for girls than for boys (Tiedemann 2000a). Notably, teachers also show gender biases in their attributions of Mathematics success (Fennema et al. 1990; Tiedemann 2000a). For instance, elementary school teachers attribute boys' Mathematics successes predominately to ability, while they attribute girls' Mathematics successes equally to ability and effort. Conversely, teachers are more likely to attribute girls' failures to lack of ability and boys' failures to lack of effort (Fennema et al. 1990; Tiedemann 2000a). Generally, teachers' own personal feelings about Mathematics are likely to influence

the messages they convey about Mathematics to their pupils and this in return may influence the development of Mathematics self-concept.

Teachers' attitudes toward the subject matter have been shown to influence their instructional techniques, the way they organize the content to be taught, and eventually, their students' attitudes toward the subject (Fennema et al. 1990; Nespor 1987; Pajares 1992 in Gunderson et al., 2011). For example, using a case study approach involving in-depth interviews with Austrian teachers who were high and low in Mathematics self-concept (which is related to anxiety about Mathematics), Relich (1996) found that teachers with low Mathematics self-concepts were more likely to report using traditional approaches to teaching, such as lecturing and use of textbooks, and to express a lack of time, interest or motivation to try new teaching strategies in Mathematics.

Owing to the topical issue of Social comparison versus individualized orientations in teaching and learning, Rheinberg (1980) in Relich (1996) distinguished teachers who prefer a social reference standard from teachers who prefer an individual reference standard. The typical reference standard a teacher adopts is also called teachers' frame of reference (TFR). Teachers using a social reference standard compare the results of one student with the results of other students, whereas teachers using an individual reference standard evaluate a student's result taking his or her prior achievement into account. The central characteristic of an individual frame of reference when assessing student's accomplishments is the emphasis on the intraindividual improvement of an individual student. Such an approach is believed to counteract the negative effect of social comparisons for low achieving students and, therefore, enhance students' self-concept.

Deku, Amponsah and Opoku (2013) investigated into the influence of teachers' classroom practices on the self-concept of primary school pupils with disabilities. Results indicated that teacher classroom practices have a moderate relationship with the self-concept of children with disability. This finding indicates that teachers are crucial in enhancing the self-concept of children. Similarly, Rehman, (2001) points out that the teachers' classroom practices which include the entire instructional, curriculum, social and organisational techniques influence the self-concept

development of children in specific areas. The way the teacher teaches and handles the students has an effect on the personality development of children. This development includes their (children) Mathematics-self-concept as well.

Additionally, there is the view that inequality exists in the classroom. For instance, Dickman (1993) posits that discriminatory teacher behaviour does not begin in the college classroom but rather with the advent of schooling. For instance, research has demonstrated that, from preschool onwards, the activities chosen for classes appeal to boys' interests and the presentation formats selected are those with which boys excel or they are encouraged more than are girls (Fennema & Peterson as cited in Deku, Amponsah and Opoku (2013). Apart from that, the quality of teacher contacts varies between the genders. That is to say boys receive more teacher reactions of praise, criticism and remediation (Sadker & Sadker as cited in Deku, Amponsah and Opoku 2013). Likewise, it has been reported by Baker (1986) in Rehman (2001) that in secondary Science classrooms, more precise teacher comments were rendered to males than to females in terms of both scholarship and conduct.

Similarly, Deku, Amponsah and Opoku (2013) cite, Graduate School of Arts & Sciences Teaching Centre of Colombia University as showing the following as some of the practices from teachers which influence the way boys and girls look at Mathematics and thus Mathematics self-concept. They indicated that:

> Teachers call on male students more frequently than female students; teachers are more likely to use male students' names when calling upon students and in attributing ideas advanced in discussion; they ask male students more abstract questions but female students more factual questions; teachers are less likely to elaborate upon points made by female students; they ask female students easy questions; asking male students more difficult questions that require higher-order thinking; teachers look at male students to answer questions before females even can raise their hands; and they refer only to male contributions (p. 629)

Broadly speaking, it can be said that boys and girls come to hold different beliefs as a result of differential treatment in the classroom. Boys are given more feedback as to the quality of their work, more chances to generate correct answers and more encouragement to persist on problems that they initially get wrong. Girls, on the other hand, have their incorrect answers attributed to poor ability and are not encouraged to continue working to get the correct answer (Rosenthal, 1973 in Deku,

Amponsah & Opoku 2013). In the same line the study done by Eccles (1992) in Hakalo (2014) found that teachers view girls as performing highly than boys, and as trying harder than boys. However, teachers view boys as having more Mathematics talent than girls. Such biased views unintentionally practiced by teachers seem to influence the way girls look at Mathematics.

The absence of female teachers in Mathematics related subjects is also another aspect which makes the girls view Mathematics as a male thing and eventually develop a negative self-concept. In Lee and Sriraman (2012)'s study, one of the girls studied, Kim, stated that most of the teachers she had met from the centre of gifted education as well as the private institute were male. This is how she expresses herself in front of the female interviewer who happens to have excelled in Mathematics:

> Were you (interviewer) really good at Mathematics? Why did you continue to study Mathematics? Any females from my family didn't major in Mathematics or science, so you look weird to me. And I think you are really cool. But I am getting to like other subjects than Mathematics like the other family members. How can one do well in Mathematics continuously? Did you study a lot of Mathematics every day? (Lee and Sriraman 2012, p.8).

Kim in the preceding excerpt seems to be surprised that there are women who are actually doing Mathematics. It is as if this was her first time to meet a female who had really excelled in the field of Mathematics. In the next excerpt Kim continues to show that Mathematics is not for women, *"I liked Mathematics, but I don't think Mathematics is suitable for women for all ages because they are only few female Mathematicians. I looked up on a website of Mathematics faculty, but professors are mostly men"* (Lee and Sriraman 2012, p.10).

It was pointed out in this Korean study that while the two girls were participating in gifted programs the girls perceived gender inequality in the society. Especially they noticed that whereas they were only few women professors and researchers in fields related to Mathematics, there were relatively higher proportion of women in humanities and sociology fields. They believed that it was difficult for them to choose Mathematics careers because of clear gender inequality in those occupations (Lee & Sriraman, 2012). And because the interviewer was female for this study they asked several times if it was hard to live as a woman in Mathematics areas. With this

Korean study, it is evident that the absence of role models in Mathematics related fields can have a negative impact on the development of Mathematics self-concept.

Apart from the absence of female teachers in Mathematics related fields, overcrowdness of classes can contribute to loss of interest in Mathematics especially among girls. Teaching sometimes can be stressfull especially when teaching Mathematics. Corcoran et al. (1998) in Hakalo (2014) found that overcrowding and heavy teacher workloads created stressfull working conditions for teachers and led to higher teacher absentism. Further, crowded classroom conditions not only make it difficult for girls to concentrate on their lessons, but inevitably limit the amount of time teachers can spend on innovative teaching methods such as cooperative learning and group work. This in the end lead to the girls having a low Mathematics self-concept.

Similarly, student materials are very important in improving the performance of pupils in any given subject. Miheso (2012) in Relich (1996) notes that a student/textbook ratio of 1:1 or 1:2, improves syllabus coverage, while a ratio of 1:3 and above slows down syllabus coverage, leading to poor performance. John and Blatchford (2007) in Hakalo (2014) hold that through reading Mathematics books, girls will develop their mental faculty that will help them handle the subject. Most schools in Zambia especially rural ones lack adequate learning materials this in itself makes learning very difficult especially the learning of Mathematics particularly among girls.

This section is important as it informs the current study that teachers can contribute to the development of either positive or negative Mathematics self-concept. The next, is a section on the role of peers in the development of Mathematics self-concept.

2.5.5 The role of peers in the development of self-concept

Robertson and Symons (2003) in their study found that educational attainment was not only a function of parental input and schooling but also peer group. Generally, the behaviour of peers toward a child communicates their evaluations about a child's worth as a person. This in turn influences how children develop self-concept. Gest, Domitrovich, and Welsh (2005) in their longitudinal study of 400 children in

Grades 3, 4, and 5 found that peer academic reputation may serve as an influential "generalized other" in the development of children's academic self-concept. Children's self-concepts are thought to emerge from feedback regarding performance as well as the expressed views of important others (Harter, 1998).

Given the amount of time children spend working together or in close proximity on academic tasks, the possibility that peers develop unique and valid knowledge regarding classmates' academic skills cannot be dismissed. Peer academic reputations, even if they are not entirely accurate reflections of actual academic skills, may nonetheless contribute uniquely to children's academic self-concept.

The impact of peer influence on the development of self-concept cannot be overemphasized. Marsh (1987)'s Big Fish Little Pond Model (BFLP) tried to explain further the influence of peers in relation to academic self-concept. The BFLP theory posits that students tend to compare their own achievement with the achievement of other students on their campus and use this comparison to judge their own abilities. The theory advances that it is better for a student's educational mobility to be a big fish in a small pond (or a relatively high achiever among relatively low achievers) than to be a small fish in a big pond (or a relatively low achiever among relatively high achievers). The central presumption of the model was that the comparison of one's academic performance with that of one's immediate peers is a strong determinant of academic self-concept.

Better peer relations are associated with better academic motivation and performance (Wentzel, 2003). For example, good students are more likely to have supportive peers than weaker students. Furthermore, the general level of success, emotional and social contentment, achieved by an adolescent can be dependent upon the number and quality of their peer relationships. Friendship can increase levels of comfort and communication to a point of satisfaction and accomplishment. The values of peers more frequently complement each other than conflict. Certainly, peers provide companionship and support as well as sources of learning experiences in cooperation and role taking. Peers also have an important influence on the adolescent's self-concept by giving him feedback about his/her personality and the kinds of behaviour for which he will be either accepted or rejected by peers. Thus,

the negative Mathematics self-concept of girls can be reinforced by having friends who do not have interest in Mathematics.

There are four ways that peers can influence each other's behaviour, namely: peer pressure, normative expectations, structuring opportunities and modelling (Matlala, 2011). Modelling in particular and in relation to the issue at hand, most girls relate with friends that they have modelled their behaviour and in this case girls who are themselves low in Mathematics self-concept. The role of peers in the adolescent's life is central. Generally, peer-group pressure is seen as very powerful in adolescence and the adolescents have been shown to spend far more time with peers than anyone else. According to Iheoma (1995) in Matlala (2011) the peer group is the fertile source of values especially during adolescence. And so depending on the type peers chosen one might develop either a positive Mathematics self-concept or a negative Mathematics self-concept.

Basically, this section is important as it informs the current study that peers have a role to play in the development of Mathematics self-concept. The next, is a section on other factors to the development of academic self-concept.

2.5.6 Other factors to the development of academic self-concept

Other factors that have been identified as important in the development of self-concept (Skaalvik & Skaalvik, 2002) are: causal attributions: reflected appraisal: and external and internal frames of reference. With causal attributions, this is to say, whether students attribute success or failure to their own action, or to external factors or chance. For example, if Bupe does well in physics, and attributes her success to her aptitude and hard work, her physics self-concept is more likely to be positively affected than if she were to attribute her success to having an easy instructor. Further, in reflected appraisal, this is generally, how students think others perceive them including peers, family, and role models. For example, Jane is more likely to develop an engineering self-concept if she perceives that her parents think she has an engineer's skill set and temperament.

In external and internal frames of reference, particularly external frames of reference involve comparing one's own abilities with the abilities of peers (e.g., I am a little better at science than *Kasonde*). Internal frames of reference on the other hand

involve comparing different abilities within one person. Internal judgments are made independent of judgments based on external frames (e.g., I am better at Mathematics than English). Internal and external frames simultaneously influence the development of self-concept. . For example, Bwalya may be a poor Mathematics pupil relative to her peer group (external), but may have a relatively high Mathematics self-concept because she perceives that she is better at Mathematics than English (internal).

In an international study (Marsh & Hau, 2004) of school achievement and self-concept in Mathematics and verbal domains, Marsh and Hau found that, within people, achievement in the domain of Mathematics negatively affected verbal self-concept. Similarly, achievement in verbal domains negatively affected Mathematics self-concept. However, conditions which lead to this have not been studied.

Overall, this section is important as it has informed the current study on other factors including causal attributions; reflected appraisal; and external and internal frames of reference to the development of academic self-concept.

In spite of abundant studies on self-concept and its influence on academic performance, studies that show that girls have a lower Mathematics self-concept than boys and also fragmented literature on how Mathematics self-concept can develop, one piece of research seems to be surprisingly missing in the literature—reasons to girls' low or negative Mathematics self-concept. As can be seen from the reviewed literature there seem to be just some fragmented literature on this topic hence the need for the study. It seems the only study close to this current research was carried out by Mujtaba, Hodgson and Reiss (2013) titled 'What factors affect London students' aspirations to continue with Mathematics post-16?' In this study they showed that factors that influence London students to continue with Mathematics post-16 among others was Mathematics self-concept. To this finding they went ahead to quantitatively, investigate factors that influence students' Mathematics self-concept and they were outlined as follows:

> students reporting that they found Mathematics interesting; students reporting that they enjoyed Mathematics lessons; students reporting that they did not get upset when doing Mathematics; students reporting that they paid attention when doing Mathematics; students reporting that they found it easy to apply Mathematical concepts to everyday problems; students reporting

> that their Mathematics teacher applied teaching strategies that engaged students and showed them how to apply Mathematics concepts to different situations (Mujtaba, Hodgson and Reiss, 2013 Factors that influence London students to continue with Mathematics post-16)

In the preceding study the factors presented seem to relate to individual and teacher factors only and leaving out the family and community factors in which the child was raised. This implies that the study was not holistic in nature. The child and all the different aspects of the environment in which growth occurs are together key in the development of a child according to Bronfenbrenner's ecological system's theory (Bronfenbrenner, 1994) and undeniably in the development of the child's self-concept.

While the study by Mujtaba Hodgson and Reiss (2013) is appreciated as it employed a quantitative approach to the factors that influence students' Mathematics self-concept the current study is on factors that influence negative Mathematics self-concept among girls and it has utilized the qualitative methods as well as the holistic approach in the quest to do justice to a study that hinges on human development and certainly Mathematics self-concept development. In the next section, I present the summary of the literature review chapter.

2.6 Summary

In this discourse, I have tried to elucidate the meaning of the term self-concept and how it is related to self-esteem and self-efficacy. An abundance of studies showing the relationship between self-concept and academic performance were also reviewed. Further, literature related to the development of self-concept and indeed Mathematics self-concept was discussed. What is remarkable really in this reviewed literature is that while a profusion of studies showed positive Mathematics self-concept as being paramount in reinforcing performance in Mathematics and that while boys have positive Mathematics self-concept girls have a negative Mathematics self-concept, the reasons to the girls' negative Mathematics self-concept are not studied and thus are missing in literature. By and large, it is this gap in scholarly research that necessitated the current study. To follow is the chapter on methodology.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodology used in this study. It is divided into nine sections. In the first section, I show the research design and why the qualitative research methodology was selected. This is followed by sections on description of research site and research participants. Description of data collection instruments namely, semi-structured interview and focus group discussion guides as well as documents and records followed. The last sections looked at data analysis, limitation and delimitation issues respectively. The chapter finally ends with the section on ethical issues.

3.2 Research design

A single case study design was employed utilizing the qualitative methods. The qualitative approach was critical to this study because there was need to develop deeper insights and understanding of the factors influencing negative Mathematics self-concept among girls. The study on Mathematics self-concept by Mujtaba, Hodgson and Reiss (2013) employed a quantitative approach and particularly looked at factors that influence students' Mathematics self-concept. These factors were largely individual factors and teacher factors leaving out the family and community factors in which a child is raised. Munsaka and Matafwali (2013) have pointed out that the relationship that a child has with parents, older siblings, peers and teachers to mention but a few, play a critical role in determining what kind of self-concept the child will have. It is in this light that I employed a qualitative and holistic approach so that I could have an in-depth understanding of the factors (individual, family and community as well as school factors) that influence girls' negative Mathematics self-concept. Willig (2001, p. 150) points out that:

> Qualitative research provides the researcher with an opportunity to study meanings. It allows the researcher to tap into the perspectives and interpretations of participants. In this way, it facilitates the generation of genuinely novel insights and new understanding. Qualitative methods of data collection and analysis may be thought of as ways of listening and their strength may be said to lie in their sensitivity to diverse forms of expression…such forms are able to tolerate and even theorize tensions and

> contradictions within the data. Unlike much quantitative analysis, which tends to discard 'outliers', qualitative research pays attention to exceptional cases and idiosyncrasies in order to gain a more complete understanding of a phenomenon.

Notably, qualitative methodology works well with small sample and allows one to study a phenomenon holistically. Willig (2001, p. 150) points out that "qualitative studies tend to work with small sample sizes in depth, which means that they can generate insights about the dynamics of particular cases". She further argues that qualitative research "tends to be holistic and explanatory rather than reductionist and predictive".

3.3 Study population

A population is a group of individuals, objects or items from which samples are taken for measurement Kasonde-Ng'andu (2013). The population consisted of all girls, teachers and parents to the girls at *Chipembi* girls' Secondary School.

3.4 Study sample

White (2005) defines a sample as a group of subjects or situations selected from a larger population. It is the number of participants selected from the study population to constitute a desired sample. For the purpose of this study, the sample consisted of a total of eighteen (18) participants. Thus, seven (7) pupils, seven (7) parents to the pupils who participated in the study, and four (4) teachers of Mathematics from the same school.

3.5 Sampling Procedure

Sampling procedure is a process of selecting a number of individuals or objects from a population such that a selected group contains elements representative of the characteristics found in the entire group (Orodho and Kombo, 2002). All the grade eleven girls were administered with the self-concept scale which was adapted from Ronsenberg (1965). The scale is a 10-item likert scale with items answered on a four point scale, from strongly agree to strongly disagree. The scale ranges from 0-30. Scores between 15 and 25 are within normal range; scores below 15 suggest low Mathematics self-concept. The actual sample size therefore, constituted girls with low scores (below 15) on this scale who were purposively selected. Their scores on

the scale were further compared with their Mathematics grades for the previous tests just to validate the scores from the scale.

A total of seven Parents to the girls who were selected from the list of those who were found with low Mathematics self-concept were also included in the sample. In order to study the problem of girls' negative Mathematics self-concept holistically four teachers of Mathematics from the same school (*Chipembi* Girls' secondary school) that the girls went to were also included in the sample. In line with the IPA method which I adopted in this study as my analytical framework, integrating the individual experiences of girls, parents, and teachers would help deepen and broaden the understanding of the problem of girls' negative Mathematics self-concept

Terre, Durrheim, and Painter (2002) maintain that purposive sampling is done to increase the utility of information obtained from small samples. Furthermore, Creswell (1998) comments that the purposive selection of participants represents a key decision point in a qualitative study. This type of sampling is entirely based on the judgment of the researcher in that a sample is composed of elements which contain the most characteristics, representative or typical attributes of the population. Thus, purposive sampling was used in order to fully understand the factors that influence negative Mathematics self-concept in girls. It is important to note that in purposive sampling, rich information rather than the number of participants is important.

3.6 Brief description of research site and research participants

3.6.1 Description of *Chisamba* Area and *Chipembi* Girls Secondary School

Chisamba district, where *Chipembi* Girls' secondary school is found is often misspelled as Chifamba, is a small town and electoral constituency, located near Chibombo, in the Central Province of Zambia. It is located about 97 km north of Lusaka. *Chisamba* is sparsely populated with 87,828 people. It is currently represented by Moses Muteteka (MMD) in the National Assembly of Zambia.

Chisamba was declared as a district by the late president Michael Sata in November 2012. Until its declaration as a district, *Chisamba* was just a huge farm block under Chibombo district. It is still largely an agricultural district with most farmers owning cattle. It has about 130 commercial farms, and hundreds of smallholder farmers

scattered around the district thus highly contributes to the country's food security. The district grows a lot of maize, wheat and soya beans, among other crops (https://www.daily-mail.co.zm/?p=5075).

It is against this information that work in government institutions such as Police and health centres and schools provide employment opportunities as a source of livelihood for a limited number of people. The majority of the local people work on the commercial farms and are employed as security personnel, drivers, plumbers and carpenters, or they provide secretarial, planting and harvesting, jobs. A number of these people supplement their income with backyard gardens where they grow vegetables for home consumption and sell at roadside market stalls.

Chisamba area is a typical rural setting which is dominated by traditional Lenje customs and cultural beliefs. A typical homestead in *Chisamba* area comprises three to four houses. The Lenje people are not largely into farming like the Tongas, they are known mainly for their love to engage into piece work kind of jobs. Like in many cultures in Zambia, in *Chisamba* when a child is born and a girl for that matter, it is highly expected that the child should grow up and be prepared for marriage. Education is not really a priority for the girl child in this area. This is compounded with the poverty situation which most people in this area seem to have.

In *Chisamba* area generally, the allocation of roles is done along gender lines. Girls and women are mainly expected to fulfil chores such as cooking, caring for the young ones, cleaning the house, cleaning plates, fetching water, fetching firewood, and other related chores. Boys and men on the other hand are expected to fulfil roles such as taking care of livestock, ploughing the fields, building and/or repairing houses. Most people in *Chisamba* area struggle to earn a living; survival is mainly through working as farm labourers as indicated earlier as well as practising subsistence farming, gardening, selling vegetables at the market, and doing odd jobs.

Chipembi Girls' Secondary School is in Chief Chamuka's area, 50 km off *Chisamba* turn off. The school was founded in 1926 by Revered Douglas Gray of the Methodist Church and it became the first girls' boarding school in Zambia (Check Appendix F for the history timeline of *Chipembi* Mission and the School). Douglas worked to fulfil his dream of liberating women and girls from ignorance,

superstition and disease. Writing about their need as shown in Snelson (1970, p.116) citing Gray, this is his declaration:

> It has been truly said that as no stream can rise higher than its source, so no people can rise higher than the level of their women. It is they who are the repositories of the teaching of the tribe, and upholders of the old traditions and customs.

Chipembi Girls' Secondary School is currently a grant aided boarding school run by the United Church of Zambia (UCZ). It is the oldest and as noted earlier, it is the first girls' boarding school in Zambia that showed interest in promoting girl-child education. Notably, after its founding, the school went on to become Zambia's premier educational establishment for girls. Its alumni were the first to go to universities in the then Southern Rhodesia (now Zimbabwe) and Britain, returning to take their places as key figures in the newly independent Zambia. To date (2015), the school is still ranked as one of the best girls' school in Zambia, the legacy which the school management, the teaching staff, the PTA as well as the pupils are endeavouring to uphold (Check Appendix G for the historical remarkable results at Grade 12 from the year 2005 to 2013)

The school is a 5 grade system, each running for 1 year. It has about 30 teachers and 620 pupils of which most of them are borders and just a few are Day scholars. Though the school caters for pupils from *Chisamba* area there are also pupils from Kabwe and Lusaka.

3.6.2 Description of research participants

Table 1: **Description of Girls with low Mathematics self-concept**

Pseudonym	**Age**	**Mother's education**	**Fathers' education**	**Raised by mother/father only or both or other relatives**
Jane	16	Grade 9	Grade 11	both
Milimo	17	Teachers' Diploma	Degree	Mother only
Busiku	17	Grade 7	Not known	relatives
Twaambo	16	Primary	Standard 4	both
Faith	16	Grade 9	Degree	Mother only
Beauty	17	Grade 7	Grade 11	relatives
Lwiche	17	Teachers' Diploma	Not known	Mother only

Apart from Jane and *Twaambo* who were raised by both parents, the other five girls were raised by either their mothers only or other relatives.

3.7 Data collection techniques and procedure

The data for this study was collected using multiple strategy technique (Yamba, 2014) which allowed for triangulation so as to increase the credibility of my findings. Due to the qualitative nature of this study the following instruments were used; semi-structured interview schedules, focused group discussions schedules and documents and records review. Semi-structured interview schedules were cardinal to collect data from pupils, teachers and parents while a focused group discussion schedule was used to collect data from pupils.

3.7.1 Semi-structured interviews

Semi- structured interviews allow interviewees to express their opinions and ideas in their own words (Esterberg, 2002). All the eighteen participants were interviewed individually and the interview was recorded on a digital recorder. Jupp (2006) states that the individual interview recorded on audio is a valid method of data collection, information or opinion gathering. Equally brief notes were taken as the interview was going on. To probe each participant's experience further, a free attitude interview technique was implemented. According to Meulenberg-Buskens (1997) a free attitude interview is a non-directive controlled in-depth interview used in qualitative research. When the participant is given the freedom to speak, the information obtained becomes more relevant and it allows the researcher to get more in-depth information from the participants.

As a study using the IPA method, IPA works with texts generated by participants (Willig 2001), thus, these techniques enabled me to capture the participants' perspectives of the girls' negative Mathematics self-concept. In the semi-structured interviews, I used interview guides with open-ended questions which were prepared with the help of my supervisor to explore participants' various experiences with girls' negative Mathematics self-concept (see Appendices H, I, J & K). During the actual interviews, apart from concentrating on verbal responses I also paid particular attention to other non-verbal cues such as tone of the voice, facial expressions,

hesitations and gestures when participants were giving their responses. These aided in the understanding and interpretation of what was exactly being communicated.

3.7.2 Focus group discussion

A focus group discussion for pupils was conducted. All the seven girls who were interviewed made up the focus group. Kruger (1990) points out that a focus group is a carefully planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment. I chose focus group discussion to allow participants to express their ideas or feelings, understand differences between groups or categories, behaviour or motivation. Focus group discussion guide had open-ended questions like the interview guide (see Appendix K).

3.7.3 Documents review

The documents referred to took different forms such as, mark sheets for the grade eleven girls, *Chipembi* Girls' Secondary School Strategic Plan 2011-2015, Grade Twelve Examination Analysis Reports to mention but a few. Necessarily, information which fitted in this study was compiled and used accordingly. Documents and records were mostly used in confirming some of the information obtained through interviews and also served in the background of the study. Particularly, the mark sheets were used when confirming the score gotten from the self-concept scale with the girls' grades in Mathematics.

Overall, I decided to triangulate the data collection methods (semi-structured interview, focus group discussion and document review) as well as the data sources (girls with low Mathematics self-concept, parents to the girls, and teachers of Mathematics in the school) so as to increase the credibility of my findings. Willig (2001, p. 30) points out that:

> Methods of data collection can also be used in combination (eg participant observation and semi-structured interviewing) to view the same phenomenon from different angles. This constitutes a form of triangulation…Since case studies concern themselves with the complex relationship between contextual and temporal dimensions of an event or phenomenon, it is unlikely that the use of a single research method would generate data that do justice to this complexity.

While data collection instruments are triangulated, the same can apply to data source thus girls with low self-concept in Mathematics, parents to the girls and teachers of Mathematics. In line with this, Willig (2001) points out that case study integrates information from diverse sources to gain an in-depth understanding of the phenomenon under investigation.

3.8 Procedure

I conducted the field work starting the second week of October to the fourth week of November 2014. Firstly, the interviews were done with the girls in their own free time. These interviews were each between an hour and one hour thirty minutes long. The questions ranged from questions about participant's own experiences with the subject, questions about participant's own experiences with the family and the community at large and questions about participant's experiences with teachers of Mathematics and the school at large (see Appendix H for the interview guide that I used with the girls). The interviews took place in the School Guidance Office.

After conducting the individual interviews with the pupils, a focus group discussion was then conducted with the girls only. The focus group discussion comprised all the seven participants who I had interviewed individually. The questions ranged from questions about their experiences with the subject, questions about the participants' experiences with the family and the community practices and beliefs as well as questions about the participants' experiences with teachers and the school practices in influencing girls' negative Mathematics self-concept (see Appendix K for the focus group discussion guide that I used with the girls.)The focus group discussion with the girls lasted about one hour and was conducted in the classroom.

When I completed the focus group discussion with the girls, I then conducted the individual interviews with the teachers The questions ranged from questions about girls' experiences with the subject, questions about the participant's experiences with the family and the community practices and beliefs in influencing girls' negative Mathematics self-concept as well as questions about the participant's experiences with teacher and school practices in influencing girl' negative Mathematics self-concept (see Appendix I for the interview guide that I used with

the teachers) The interviews took place in the department of Mathematics and ranged from one hour to one hour thirty minutes.

The last individual interviews were conducted with the parents or indeed other family members in case there were no parents. Questions ranged from questions about personal and parents' experiences with their girl child in the area of Mathematics, parents' experiences with the community in the area of Mathematics and questions about parents' experiences with teachers in particular teachers of Mathematics and the school at large (see Appendix J for the interview guide that I used with the parents). Unlike the duration for the girls and teachers the interviews for parents varied between one hour thirty minutes to two hours and were conducted in the open space at their homes except for two homes where interviews were conducted indoors.

Individual interviews for both teachers and girls as well as the focus group discussion for girls were conducted in English. While the interviews for four parents were in English, the other three interviews were conducted in *Chinyanja* and in *Bemba*, the native languages for the participants. This was to allow the participants to express themselves freely. Though I am not a native speaker of the *Chinyanja* and *Bemba* I am able to communicate effectively in both. All the interviews and focus group discussions were recorded with the use of the digital recorder so as to allow for translation, transcription, and more thorough analysis and interpretation afterwards. I am a fluent speaker of *Mambwe, Bemba, Chinyanja* and English so translation was not a problem. Below I present a section on the data analysis procedure that I followed in this study.

3.9 Data analysis

I analysed data for this study using the Interpretative Phenomenological Analysis (IPA) approach. Next I give a brief description of IPA after which I show how it was used in this current research.

3.9.1 Description of the Interpretative phenomenological Analysis (IPA)

I collected the data for this study using semi-structured interviews, focus group discussions and document review. I found the three data collection techniques most

suitable for my study because of their use of open-ended questions which allowed the researcher some flexibility in the research process to capture any relevant emerging themes (see Gray, 2004; Corbetta, 2003 in Munsaka, 2009). As a study using the IPA method, these techniques also enabled me to capture the participants' perspectives of the girls' negative Mathematics self-concept problem.

To capture the participants' perceptions of the problem of negative Mathematics self-concept among girls I chose to use the Interpretative Phenomenological Analysis (IPA) method to analyse the qualitative data that I collected. Willig (2001, p. 53) defines IPA as a "version of the phenomenological method which accepts the impossibility of gaining direct access to research participants' life worlds." He continues to point out that though IPA aims to understand the research participant's experience from his or her perspective, it recognises that such an investigation must necessarily implicate the researcher's own view of the world as well as the nature of the interaction between researcher and participant. The result of this is a phenomenological analysis which is an interpretation of the participant's experience. Thus, IPA as scholars (e.g. Fade, 2004; Willig, 2001 in Munsaka 2009) is a product of the combination of a descriptive approach (phenomenology) and an interpretative approach (hermeneutics).

IPA works with texts generated by participants meaning it works mainly with transcripts of semi-structured interviews (Willig, 2001). Willig further points out that apart from transcripts of semi-structured interviews which are the most widely used by IPA, participants can also be asked to produce accounts of their experiences through alternative means, such as the use of diaries (audio, video or written) or various forms of writing. Over and above, the aim of phenomenological analysis is to explore the quality of experiences and to obtain a better understanding of what it is like to live a particular moment or situation.

3.9.2 Procedure of IPA in this research

Data analysis and interpretation in this study was done in line with procedures in IPA (see Willig, 2001; Munsaka, 2009). In the first instance, each transcript was read and re-read to familiarize myself with the important issues in the participants' account. At this stage, wide ranging notes were recorded on the left side as I read

through each individual transcript. These unfocussed notes ranged from the language used, attitudes about Mathematics, to mention but few. In the second stage of analysis I identified and labelled themes that characterized each section of the text (Willig, 2001). At this stage unlike the first stage the theme titles captured something about the essential quality of what is represented by the text. For instance, themes namely; girls' negative perception in Mathematics; girls' poor background in Mathematics; culturally motivated practices of family and community; teacher's Mathematics related gender stereotypes; few female teachers in Mathematics related fields; poor organisation of the Mathematics club to mention but a few. These themes and many others not mentioned were recorded in the right margin of the transcripts. The third stage involved an attempt to introduce structure into the analysis. Cross-comparisons between the themes that I had generated in the second stage of analysis and the text of the transcripts were made (Munsaka, 2009).

After a series of cross-comparisons, three categories of themes emerged. In the first category, negative perceptions of Mathematics and poor background of Mathematics were the themes. This category of themes was tagged individual factors to girls' negative Mathematics self-concept. The second category had the following themes: Culturally motivated practices of family and community; parents' Mathematics related gender stereotypes; uneducated family and community; Parents' low socioeconomic status; and bad influence from peers. This category of themes was tagged family and community factors to girls' negative Mathematics self-concept. The third and final category of themes was labelled school factors. It had the following themes: poor personality qualities of teachers of Mathematics; Lack of support for the girls with low Mathematics self-concept; and teachers' Mathematics related gender stereotypes. Others included: few females in the field of Mathematics; lack of adequate and consistent guidance and counselling programs; and poor organisation of the Mathematics club.

The fourth stage of analysis involved the production of a summary table for each transcript of the structured themes, together with quotations that illustrate each theme, (Willig, 2001). Lines and page numbers where the full excerpts of those phrases could be found in the transcripts were shown also on the summary table. This was done so as to have easy access to the excerpts in the individual transcripts

during discussion of finding. Having the summary tables of each transcript the next step was to integrate the themes from various participants (Willig 2001 & Smith 2004 in Munsaka 2009).

As shown already, this study had three data sources namely; data from girls, data from parents, and data from teachers. To integrate the themes in each of these categories of participants, I made comparisons of the themes that I had generated across all the individual cases in each category. I further integrated the -parents and teachers transcripts in exactly the same manner. Over and above, this process allowed me to come up with the final categories of themes which captured the data from the participants in each data set.

3.10 Limitation

Any research that ignores the boundaries or its limitations is bound to be an incomplete one (Creswell 2009). While I triangulated three data sources as well as the three research instruments which were aimed at increasing the credibility of my findings, generalisation of the findings has been done with caution due to the qualitative nature of the study. Willig (2001) remarks that qualitative researches utilize small samples because the emphasis is not on quantity but on quality in-depth understanding of the issue at hand. Generally, purposeful small sample is typical of a qualitative study where the aim is to uncover depth and not breadth of findings.

3.11 Delimitation

The researcher only focused on the factors influencing negative self-concept in Mathematics among grade eleven girls at *Chipembi* Girls Secondary School.

3.12 Ethical Consideration

First and foremost, in line with the requirements for students doing research at the University of Zambia, an introductory letter is sought from particular schools. In my case, I got the letter from the School of Education, Department of Psychology, Sociology and Special Education (see Appendix A, for the letter of introduction) Secondly, clearance was sought through the University of Zambia Ethics Committee (see Appendix B, for the clearance form from the Ethical Committee). Thirdly, the

school manager at *Chipembi* Girls' Secondary School was availed the introductory letter to seek his permission. Further, before I administered the self-concept scale (see Appendix E) to the grade eleven girls I first explained the purpose and the importance of the study to the girls after which I gave each participant a consent form which gave them the freedom to accept or decline to take part in the study. In the consent form it is explicitly stated that all information provided by the participants would be held confidentially and that participants' names would not be used in the research report (see Appendix C). Filled in Participant Information sheets (see Appendix D) were later given to each of the respondents to provide full information about the research such as the benefits and risks of the research among others.

At each interview with the participants and during focus group discussion issues of consent, confidentiality and anonymity were explained first. For the sake of those who could not understand English these ethical issues were explained in *Chinyanja* and *Bemba* accordingly. On the whole, ethical considerations which were crucial for this study included informed consent, confidentiality and anonymity, reporting research results fully and honestly. In the next section, I present the conclusion which makes a summary of this whole methodology chapter.

3.13 Summary

In this methodology chapter, I have shown why the qualitative research methodology was adopted. I have further described the techniques and procedures used to collect and analyse data. Particularly, I have shown how the IPA method, a qualitative approach was used to analyse data from three perspectives that is, girls, parents, and teachers to gain a broader and deeper understanding of girls' negative Mathematics self-concept. Notably, triangulation a technique which increases the credibility of research findings was not only achieved when I used these three sources of data but also through the data collection instruments which included semi-structured interviews, focus group discussion and documents review.

In the next chapter, I present the findings that emerged from this study.

CHAPTER FOUR
PRESENTATION OF FINDINGS

4.1. Introduction

In this chapter I present the research findings from the interviews held with the three sets of participants: the girls with low self-concept in Mathematics, parents to the girls and teachers of Mathematics in the school as well as the focus group discussions held with the girls. The findings are presented in relation to the following aspects: individual factors, family and community factors and school factors that reinforced the development of low Mathematics self-concept in girls.

As mentioned earlier, I had three sources of data that is girls, parents and teachers as my research participants. I arrived at this so as to have a more holistic approach to the study of girls with low self-concept in Mathematics. Moreover, the three sources of information increased the credibility in the findings as the information given was triangulated (Patton, 1999). In order to authenticate the interpretations drawn from the data set, the findings are conveyed in the form of narratives with a thick description of the major events unfolding in the lives of these seven girls.

In this study, for the sake of participant identification, I have used pseudonyms for the seven girls and numbers for parents and teachers who participated. For the girls for example, the pseudonyms used for them are; Jane, *Milimo*, *Busiku*, Twambo, Faith, Beauty and *Lwiche*. In case of parents and teachers I have used numbers as well as gender designation. For instance, the identification of a female parent, number one would appear as, F/P1, where F is for female and P is for parent while that of a male parent with the same designation would appear as M/P1 where M is for male and P is for parent. Note that a P for parent also stood for guardian. A female teacher number two would appear as: F/T2, where F is for female and T is for teacher while that of a male teacher of the same number would appear as: M/T2 where M is for male and T is for teacher respectively. This format of identifying participants has been used in order to preserve anonymity and confidentiality. In the next section, I present the sub-theme that emerged under the theme of individual factors.

4.2 Individual factors

Individual factors that were found to influence girls' low Mathematics self-concept include; girls' negative perceptions of Mathematics and poor background of Mathematics.

4.2.1 Girls' Negative Perceptions of Mathematics

All the girls during interviews and focus group discussions expressed dislike of the subject as some of them quoted here revealed:

> *Mathematics is a very hard subject; it is very complicated; numbers and formulas make it complicated and it needs more time. Naturally boys have a better* ability (Jane, Interview, November, 2014).

Yet another participant observed as follows;

> *It is good except some topics are meant for boys such as Trigonometry, Earth Geometry and Vectors. Fractions and matrices are very good for girls…I love Mathematics but I think some topics don't just make sense for me* (*Milimo*, Interview, November, 2014).

In the two excerpts above, the girls seem to indicate that there are some aspects of Mathematics which make it difficult namely numbers and formulas and also some topics. Like Jane, the participant below reveals that understanding Mathematics needs a lot of time and so other subjects could be disadvantaged. This was how she put it:

> *Mathematics is a very difficult subject. The times that I've tried to study it I have seen that it consumes a lot of time and yet I do not understand a thing. I've reached a point that I've told myself to let it be and concentrate at least on the other subjects which I know I will pass if I just study them* (Faith, Interview, November, 2014).

Note that among the girls interviewed, Faith was the only one performing very well in all the other subjects except Mathematics. *Milimo* had this to say as a reason to why Mathematics is said to be difficult:

> *It is the mentality that we have developed about Mathematics otherwise the subject is not difficult*. (*Milimo*, Interview, November, 2014).

Milimo as indicated in the above excerpt was the only one during individual interviews and focus group discussions who seemed to show willingness to change

her view about Mathematics. Her performance is bad not only in Mathematics but in all the other subjects she was taking. Her desire to improve her performance in Mathematics even when she was performing poorly in all the subjects really interested me. Here is another interesting revelation from *Twaambo* who said she used to love Mathematics but due to continued failure in the subject, her interest had waned. Note how she put it:

> *I used to love Mathematics but now I just like it as a subject. My continued poor performance has made me lose interest completely* (*Twaambo,* Interview, November, 2014).

Yet Faith in line with *Twaambo* reveals as follows:

> *Continuous failure in Mathematics made me lose interest and I stopped putting in any effort* (Faith, Interview, November, 2014).

Parents in the study seemed to agree with their daughters about their views about Mathematics. One of the parents said:

> *My daughter says 'Mathematics is very difficult, it is a practical subject, men are good at practical subjects (meaning Mathematics) while girls enjoy information subjects'* (F/P1, Interview, November, 2014).

F/P1 continued her response with these statements:

> *I think overly my girl is a lazy type. To perform well in Mathematics one needs to be active. It is this laziness which makes her like information subjects more than practical subjects* (F/P1, Interview, November, 2014).

Another parent had this to say when asked about his girl child's view about Mathematics:

> *Her attitude is bad…she is not so interested in Mathematics and she lacks practice but now she is better and I think this is because of threats that she was going to be repeated if she continues to perform poorly (*M/P2, Interview, November, 2014).

The girl being talked about above is *Milimo* whom I mentioned earlier about interesting me in the way she looked at Mathematics later than the interview date. Though her performance in all the subjects was generally poor, she seemed to have been revived during the interview sessions. Notably, her score on the Mathematics self-concept scale was relatively on the higher side when compared with other girls found with lower self-concept.

Other parents when asked about their girls' views about Mathematics had this to say:

> *My girl says 'Mathematics is just for boys,' even when we encourage her to work hard. She naturally hates mathematics* (F/P3, Interview, November, 2014).

And yet another one revealed as follows:

> *My daughter seems not to know the importance of Mathematics, if she did, she would not choose careers anyhow from accountancy to clinical officer. This is what has killed her attitude…Besides, she continue to say 'math is difficult* (M/P4, Interview, November, 2014).

All the teachers indicated generally that girls who perform poorly in Mathematics had a negative attitude towards Mathematics. They pointed out that the subject was viewed as difficult to almost all the girls who were failing in the subject. One teacher reveals as follows:

> *Girls fail to think outside the box. They fail to apply the principles of math and complain when the work is difficult. If you give an example they want you to bring the questions exactly as the example…The problem really is that they come to class with wrong perceptions about the subject and this shuts their opportunity to learn* (M/T2, Interview, November, 2014).

The findings from girls, parents and teachers in this section have indicated the perceptions girls with low self-concept have about Mathematics. All the three groups of research participants gave similar sentiments indicating that girls look at Mathematics as a very difficult subject. In the next section, I present the findings that emerged under the theme: Poor background of Mathematics as a factor that influenced the development of girls' negative math self-concept.

4.2.2 Poor Mathematics background

Six out of seven girls who participated in the study indicated during interviews and focus group discussions that when they started school, Mathematics was not an issue. Things started changing beginning end of primary school through to junior grades and now senior level. I now quote the statements from *Lwiche, Twaambo* and Beauty about their experience with Mathematics from the time they started school:

> *I used to perform well in Mathematics when I was at primary school but things changed when I wrote my grade seven, I performed poorly and from then on things have not been good* (*Lwiche,* Interview, November, 2014).
>
> *I think at primary school I did not have any problems with Mathematics. The real problem started when I was in grade eight. My Mathematics teacher was rarely in class. We were all by ourselves most of the times. We were told most of the times that the teacher was busy with other school programs. This continued until second term of grade nine when we were given a new teacher and at least for him he was stable but it was difficult to cover up all that we missed as the examinations were just around the corner* (*Twaambo,* Interview, November, 2014).
>
> *I personally feel if I had a good teacher in Mathematics like I had in English and other subjects, the story would have been different. From grade eight until now that I am in grade eleven, the teachers of Mathematics have been female and I found it difficult to grasp concepts in the subject simply because the teacher was not clear enough. Moreover the teacher was not as friendly as the teachers of English and the other subjects. She was very arrogant to us especially when we did not seem to understand. The teacher I have now seems to be good because even most of the other girls say he is a good Mathematics teacher….I think why I am still failing is because I fail to connect things. I feel there are some things missing in my learning of Mathematics* (Beauty, Interview, November, 2014).

Generally, the experience of girls with Mathematics from the time they started school has been exemplified by the three girls' statements above. It seems the girls had a good start but their performance declined as they progressed through to higher grades.

Equally, the parents attested to what the girls said about their performance in Mathematics and indeed low Mathematics self-concept. I quote one parent, *Twaambo*'s father, to represent the other parents' responses, which were similar on this matter:

> *My child started very well that I didn't even think this would be an issue now…I just remember that in grade eight and nine she complained of the teacher not showing up for most of the lessons. I think that the learning periods which were lost have contributed somehow to her loss of interest in the subject and thus her poor performance* (M/P4, Interview, November, 2014).

Yet I quote *Lwiche*'s mother who also showed disappointment with the fact that her child is not really doing well in Mathematics:

> *She has been a good girl at Mathematics until she wrote her grade seven examinations. Really I don't know what happened but I suspect the change of schools made her change a lot of teachers and this made her somehow lose interest in the subject. From grade seven up to now, she has been to four different schools. Otherwise her step father is a mathematician and he encourages her here and there when he has time* (M/P7, Interview, November, 2014).

Though teachers had no information about the past experiences of the girls in Mathematics, they confirmed during interviews what the girls and parents said about the girls' loss of interest due poor background and hence their poor performance in Mathematics. According to one of the teachers:

> *Mathematics is not like Civics or Geography where when you finish one topic you can start another without any connections whatsoever. In Mathematics all the topics and concepts are connected and interrelated. Meaning, once you miss one topic, you can be sure to get lost as the teacher introduces a new topic* (M/T1, Interview, November, 2014).

Another teacher had this to say:

> *You know in Mathematics, the topics at primary level are important to understand the topics at junior level and these are also helpful for the topics and concepts at senior level. Equally, the concepts learnt at senior level are important for understanding topics in subject at higher learning. When one misses some topics and concepts at any particular level, it becomes problematic to progress smoothly and this is just how it is with Mathematics* (M/T3, Interview, November, 2014).

In this section I have presented findings indicating how girls' poor Mathematics background influenced the development of low Mathematics self-concept in girls. Girls and their parents indicated that girls were doing well when at primary school but things changed as they started junior secondary and onwards. Causes ranged from teachers missing lessons, poor teacher attitude during Mathematics lessons, and change of Mathematics teachers, to mention but a few. Though teachers could not specifically talk about the background of the girls in relation to Mathematics, they explained the connectedness and interrelatedness of topics and concepts in Mathematics which served as an explanation to the girls' poor performance in the subject. This was due to the girls' loss of interest in Mathematics and indeed their low Mathematics self-concept. In the next section, I present the findings on how the family and the community influenced the development of low Mathematics self-

concept in girls. Note that the findings for the two social factors namely, the family and the community were merged because they were related.

4.3. Family and community factors

A number of themes emerged here that showed how the family and the community influenced the development of low self-concept in Mathematics among girls. They include culturally motivated beliefs and practices of family and the community; parents' Mathematics-related gender stereotypes; the uneducated family and community members; Parents' low socioeconomic status; and bad influence from peers.

4.3.1 Culturally motivated beliefs and practices of family and community.

All the seven girls and parents that participated in this study indicated during interviews that, during their growth from childhood in their families, home chores were assigned according to gender just like all the other families in the community in which they lived did. Girls for instance, were given to do chores such as house cleaning, preparing meals for the family and baby-sit to mention just a few. On the other hand, boys were assigned chores such as slashing, cultivating in the garden, and helping out in the shop among others. Such practices performed at a tender age made the girls to believe that relatively harder chores were for boys and softer ones were for girls. From the tone of one elderly parent, I got the idea that the beliefs that boys and girls have specific roles like the ones mentioned above were held as culturally right as if they were biologically determined and so were subjects like Mathematics and Sciences. This is how he put it:

> *A boy child cannot be sent to cook nshima when his sister is around, it is not acceptable* (M/P4, Interview, November 2014).

Although in one family it was indicated that chores were not separated simply because by the time the grand daughter was brought to live with them all the other girls had left home leaving only the boys to do almost everything at home, they admitted that in the community in which they lived and before the girls left home, chores were allocated separately according to gender.

Generally, in the communities in which the participants lived, it is a common belief that Mathematics is difficult and that it is for boys. Even more problematic is a situation that they did not believe in taking their children to school more so the girl child. They believed that girl children were to be trained on things such as child rearing, cleaning of a home, preparing meals, among other things, to prepare them for marriage. It seemed as if the community had trained these young minds that Mathematics had no real application to what the community expects of them as girls and as women. One guardian recounted as follows:

> *Most of the people in this community are uneducated, traditionalist and are poor. They are charcoal burners, peasant farmers and farm labourers. In as much as they may want their children to be educated, they are limited with resources to do so. If they make any money, all they wish for is for their children to have knowledge of reading and writing and just a little understanding of counting to help them as they do their little businesses. With the little resources, parents always prefer to educate the boy child to educating the girl child. For their girl children, the parents' wish is for them to get married so they can benefit from them.* (M/P5, Interview, November 2014)

The preceding excerpt seems to tie well with the next excerpt from a parent whom together with her family was doing very well financially and was very zealous about their children's education. Notably, this was the only family among those interviewed that was financially sound and also very concerned about their children's education and in particular the girl children, despite them not having advanced in their education. Notice how she explained:

> *The community here is very backward (a term she struggled to find until she was helped by her daughter). All they think of is marriage; school is not a priority for them, worse for a girl child when her Mathematics abilities are considered. I don't like letting my children to interact with the people in this community. I would rather have them play around here at home, a thing which they have gotten used to. I fear they can be corrupted by their backward beliefs (this time she puts it more confidently* (F/P1, Interview, November, 2014).

Not only were the chores found to be given according to gender, the toys and games were also given according to the sex of children as they were growing up. Boys were given to play with toy cars, which were mainly wire cars and also cars made out of clay. Girls on the other hand played mainly with dolls. Notably, both the girls and their family members did not realize the consequences of these practices except for

one guardian who happened to be Faith's grandfather who is a retired veterinary doctor. He indicated that:

> *Dolls make the girls to develop just a motherly instinct but the wire cars boys play with make them to be creative and develop a mathematical mind* (M/P5, Interview, November, 2014)

The views in the excerpt above were also shared by the teachers of Mathematics one of whom lamented:

> *Parents discourage their girls from doing certain games. They buy dolls for them but car,s helicopter, draft, ladder, chess, solo and eagle - ati fya baume (that is to say they are for men). Toys and games help to learn Mathematics skills* (M/T1, Interview, November, 2014)

Similarly, other teachers expressed their sadness on the fact that parents are ready to buy more food and dolls but not books for the girl child as they do for boys.

In this section I have presented findings indicating how culturally motivated practices of families and community such as the gender role stereotyping in the way duties were allocated influenced the development of low Mathematics self-concept in girls. Though teachers could not specifically refer to the girls on the duties which were administered to them when they were growing up, they generally agreed with the girls and parents that home chores and duties were allocated on gender lines. This factor contributed in a way to the girls' development of low Mathematics self-concept. But what about parents' Mathematics-related gender stereotypes?

4.3.2 Parents' Mathematics related gender stereotypes

All the participants in this research (girls, parents and teachers) showed during interviews that stereotypical sentiments about Mathematics were passed by parents as well as other family members. Most of them admitted that such statements can be eroding in the girls' development of Mathematics self-concept.

When asked about the words her parents who were very zealous about her education used to refer to her poor performance in Mathematics, Jane indicated that her father would always say the following to her:

> *Math is simple; Mathematics is for real men (*Jane, Interview, November, 2014).

This statement as simple as it was, meant something else to the girl and this is what she said:

> *If Mathematics is simple most girls would enjoy and perform well, guys also though they are better than us it gives them a lot of problems, indeed it is for real men* (Jane, Interview, November, 2014).

Two other participants had this to say when asked during separate interviews about how family influenced their low self-concept in Mathematics:

> *My cousin told me Mathematics is difficult and that it is for boys when I was in grade seven and since then I have never liked the subject (Milimo,* Interview, November 2014).

Yet another one had this to say:

> *My brother told me that Mathematics long time was for boys but now it's for everyone. When he told me this I wondered what had happened for it to be for everyone. Personally I still think it is right to say it was for men because I can feel it…* (Jane, Interview, November 2014).

Though parents were very hesitant to state the exact statements they used on their girls and some of them showed that they never uttered any words which might have impacted on their girls negatively, through probing questioning one parent had this to say:

> *Mathematics is very challenging and so it looks as if it is for men but anyone can pass it if only they can concentrate* (F/P3, Interview, November, 2014).

This parent seemed to be deep rooted in the belief that Mathematics is for boys and so not wanting to show that her own sentiments could have impacted negatively on her girl's Mathematics self-concept she calculated her words before uttering them.

In a different interview with another parent, she had this to say concerning sentiments which could have contributed to her daughter's low Mathematics self-concept and expressed herself in Bemba, as if wanting to maintain the real meaning of these words:

> *Don't you see that this boy is doing very well in Mathematics, you girls Mathematics seem to be giving you a lot of problems but if there are girls who pass Mathematics then you can also be part of that number.*

> *Mathematics is difficult you need to give it time* (F/P1, Interview, November, 2014).

Equally, teachers like the pupils and the parents interviewed attested to the fact that parents pass stereotypical sentiments which can be so detrimental to the development of Mathematics self-concept among girls. Teachers of Mathematics pointed out generally that, most parents were not worried if their girls failed Mathematics but they were if they failed such subjects as English, Civic Education, Religious Education (R.E), History, Home Management and all the other information subjects which are basically known to be female dominated subjects. If a girl child performed well in Mathematics but poorly in the so-called female dominated subjects, one teacher recalls how most parents react:

> *How on earth do you fail this subject (meaning English, Civics Education, R.E., Home Management etc) as if it is Mathematics? If it was Mathematics I was going to understand you* (M/T2, Interview, November, 2014).

The excerpt above just reinforces the already held beliefs among the girls that Mathematics is difficult and can only be handled by boys and men. This is how the same teacher puts it in explaining how parents who have their children fail Mathematics as well as other subjects and come to collect the results during the Open Day would say:

> *You are a girl; Mathematics is difficult even if you fail it but not these other subjects (meaning English, Civic Education, R.E., Home Management etc). It is normal to fail Mathematics as a girl* (M/T2, interview, November, 2014).

These are just a few typical examples of the sentiments produced by some parents which are passed knowingly or unknowingly but are crucial to the girls' development of Mathematics self-concept. What parents lamented was lack of interaction between them and the Mathematics teachers.

Through the presentation of findings in this section, I have shown that parents pass comments which are discouraging to the girls' development of Mathematics self-concept. In the next section, I present the theme of the uneducated family and community as a factor that contributes to the development of Mathematics self-concept.

4.3.3 Uneducated family and community

The findings showed that the uneducated family and community influenced low Mathematics self-concept in the sense that the families and communities breed no role models and also parental involvement in the child's education was poor. I present these two themes: Lack of role models; and also poor parental involvement in girls' education as factors under the uneducated family and community which influence low Mathematics-self-concept in girls.

4.3.3.1 Lack of role models from families and community

Five out of the seven girls with low Mathematics self-concept interviewed had parents, and most of their siblings and other family members who were not educated. Notably, the community in which these girls lived had most of its people uneducated. Compounded with this situation is the fact that if there were people who were known to be educated in both the families and the community, then mostly it was the men and not the women and thus no role models either in Mathematics or in education in general. Some girls had this to say:

> *Both mum and dad just ended at primary they do not inspire me in any way. In our family we are nine and I happen to be the last born. Only two out of seven girls seem to perform well in Mathematics and other subjects in general while the rest just went up to grade nine after which they got married. In the community, it is even worse because most people have not been to school. Women are the majority lacking formal education. It's really bad!* (*Twaambo*, Interview, November, 2014).

> *I am not motivated by my mother she is just a maid and I've never lived with her. My dad passed away when I was a little girl and so I don't know much about him. I stay with my mbuyas (grandparents) and uncles who are not educated. They have little knowledge about Mathematics. I am not inspired by them in any way. Equally, the community in which I live is an uneducated one - Mathematics is not a subject taken seriously. There are completely no people to look up to academically and it is worse with this subject* (*Busiku*, Interview,November,2014).

The excerpts above confirm how critical the absence of role models is in influencing the development of low academic self-concept and in particular low Mathematics self-concept especially among girls.

Notably, during interviews with parents, it was found that their lack of formal education and that of most of the people in the community contributed to some extent to their girls' low self-concept in Mathematics as they lacked people to look up to - people they would call role models in Mathematics. To cite some parents to the girls:

> *I am not educated myself as I only reached grade eight when I got married to my husband who went up to grade eleven. I don't know much about Mathematics and I hated it. I took it to be a subject for men. Though it was like this for me, I try by all means to encourage my children and the girls in particular to work hard in Mathematics because the jobs that matter require Mathematics…my community lacks female role models - women who have excelled in Mathematics and later taken up jobs that really matter* (F/P1, Interview,November,2014).

> *Not sure if I inspire her because I just went up to primary level and though Mathematics was not an issue with me, I can't say I can help her with Mathematics problems. All I can do is to encourage her to work hard because it is possible that she can do it though the nature of the subject is that it is difficult especially with girls…In this community there are very few people who are in Mathematics oriented jobs and its worse for the females* (M/P4, Interview,November,2014).

It seems clear in both excerpts above that parents, families and communities where these girls come from lack role models. Note that in both excerpts, although parents indicated that they had not gone very far with their education, they took time to encourage their girls. Nevertheless, lack of role models in their families and communities, not only in the area of Mathematics but in education in general, influenced their low Mathematics self-concept.

Similarly, Faith's grandfather (interviewed due to unavailability of her father and mother) had this to say:

> *Her mother went up to grade ten when she got pregnant of her (Faith). She stopped school and she has never gone back. She was very bad at Mathematics herself when she was still in school and I am sure somehow she lacks that inspiration from her mother. She is not her model, the community too is not* (M/P5, Interview, November, 2014).

Teachers interviewed also attested to the fact that lack of role models in both the families and the community was a factor that contributed to low Mathematics self-concept among the girls. To cite one teacher:

> *Out of the seven girls who are participating in the research I teach four of them. I do not know much about their family backgrounds but what I am sure of is their communities from which they come from. All of them come from Chisamba area and most of the people in this area are uneducated, worse with women. Most women are just farm labourers and housewives and not in any way love Mathematics. I know one of the guardians to the girl who is not educated and just does piece works at this school. Generally speaking these girls, though I have not enquired about their families, they seem to come from uneducated families with no role models in Mathematics just like it is with the community in which they come from* (M/T2, Interview, November, 2014).

Let me now present the findings on the poor parental involvement in girls' education as a factor which influences low math self-concept in girls and which has come as a result of having uneducated parents.

4.3.3.2 Poor parental Involvement with girls with low Mathematics self-concept

Note that I am not saying lack of parental involvement, but I use the word poor so as to emphasize that it is not that parents are not getting involved, but it is the quality of involvement that I am concerned with. It was found through interviews and focus group discussion with the girls that girls are poorly supported by their parents in the area of Mathematics, a practice which among others has contributed to the girls' low self-concept in Mathematics. The pupils, as exemplified in the response below, show how parents and indeed families are poorly involved in improving the girls' low math self-concept:

> *I have been living with my grandparents since primary school. I am now in grade eleven but I have never been asked by them to bring the books so they can help me out. My uncle whom I live with also just says that I should work hard but he never takes upon himself to show me how I can really make it in Mathematics and I think sometimes all this is because they themselves are failures. Having poor education themselves they don't know how they can really help me. They say things here and there but tangible help is not there* (*Busiku*, Interview, November,2014).

Equally, Faith had this to say:

> *My mum stopped school in grade ten when she was pregnant of me. Since then, she has just been at home doing some small business. In her free time, it is rare that she finds time to help me with my Mathematics problems. All she does is to shout at me when I fail Mathematics, as well as other subjects. I feel it is not enough just to yell at me when I am failing but to get involved in what can make me improve like finding teachers who can be helping me.*

> *Unlike her, my grandparent tries to help me although not so much because of his busy schedules with farming* (Faith, Interview, November, 2014).

The two preceding excerpts show that parental involvement in girls with low Mathematics self-concept is really minor and that it was poorly done and this was mainly as a result of poor education of the parents and the families they lived with. However, in another instance where a girl who had educated parents was interviewed, she put it as follows when asked about her parents' involvement:

> *When I was still living with my parents until they divorced, dad whom I considered to be very good at Mathematics, and who is still is, was never home so I could consult with him. Mum who is late now regarded Mathematics to be difficult though she was a teacher, and she was equally not at home. Most of the times I was left home with the maid who only did not have a negative attitude toward Mathematics but also with education in general…I now live with my uncle who is a teacher. He is very good in Mathematics and very helpful, the only challenge is that he is mostly busy with other school responsibilities apart from teaching and so I find it difficult to benefit from him fully… (Milimo, Interview, November, 2014).*

The sentiments by parents seem to agree with what their daughters indicated about their parents' involvement. To cite some of the parents' responses when asked about their involvement concerning their girls' low Mathematics self-concept, this is what they said:

> *I don't attend to her sometimes because I have a busy schedule every day. I would like to help her to the point that she starts to change her low math self-concept because I enjoy Mathematics very much but I have limited time* (M/P2, Interview, November, 2014).

Another parent put it this way:

> *It is difficult to help her in solving her Mathematics problems because first of all, I do not really have that knowledge of Mathematics. We try to encourage her here and there but we can only do so much…Teachers of Mathematics can be helpful but we have never consulted them* (M/P3, Interview,November,2014).

The third parent put it this way:

> *Not aware that she is not performing well in Mathematics and we have not taken time to engage teachers of Mathematics* (M/P4, Interview, November, 2014).

The fourth one also revealed as follows:

> *Her mother is a strict disciplinarian but does not help her with books* (M/P5, Interview, November, 2014).

The excerpts above indicate that parents are not involved because they are not aware that their girls have problems with Mathematics or that they are aware but just do not apply adept measures to solve the problem. Their lack of involvement mainly is as a result of their lack of education. However, M/P2 was aware but the only problem was that he did not have time to try and reverse the situation. This parent being a teacher himself was fully aware of his girl's needs and so he tried to help her except he had limited time as he had too many responsibilities in the school and so the girl did not benefit from him.

One teacher had this to say about parents not having time and particularly in relation to M/P2 who is a teacher:

> *He buys for her all the necessary books in Mathematics and gives her past papers as well as some problems to solve but he has never consulted with me on the way forward for the girl, especially during Open Days. He seems to be preoccupied with a lot of things and so her girl's Mathematics problem is not a priority* (M/T2, Interview, November, 2014).

The findings in this section have indicated that participants viewed ineffective parental involvement in girls' learning of Mathematics, which mainly was as a result of having uneducated parents as one of the factors that led to the development of low math self-concept in girls. The girls particularly, indicated that their parents' involvement was when they told them to work hard in Mathematics but not being there to help them where they failed to understand. Parents indicated that the only help they gave was to encourage them to work hard and not to help solve their specific mathematical problems. Teachers on the other hand, indicated that parents did not complement their efforts in ensuring that girls were helped adequately - a thing they attributed to poor education background. In the next section I present the findings on the theme of parents' low socioeconomic status.

4.3.4 Parents' low socioeconomic status

The girls with low Mathematics self-concept indicated that they found it difficult to boost their low Mathematics self-concept due to economic constraints in their

families. The excerpts that follow try to show the levels of poverty in *Chisamba* area as told by some girls:

> *I am a day scholar, I really want to be a border but funds cannot allow. Being a day scholar I cover a relatively long distance between home and school. Sometimes I fail to attend both afternoon and evening prep because I usually get tired and at night it is dangerous to move. When I am home I am the only girl among the men who are my uncles. I am usually expected to help out with chores at home which are so tiring. I rarely work up to study because I am too tired to do so and that we do not have electricity at our home* (*Busiku*, Interview, November, 2014).

> *My father was a shopkeeper at the farm, he has since retired. My mother does some small business. We are nine of us in a family and I am the last born. It is really difficult to make ends meet. I would love to do tuitions in Mathematics but I cannot even start talking about it. Important textbooks also that I need cost a lot of money* (*Twaambo*, Interview, November, 2014).

Poverty also was cited by parents as one of the contributing factors to the development of low Mathematics self-concept in girls. One parent in the following excerpt indicates how her girl child ended up being a day scholar because of poverty:

> *I am just a house wife and my husband just does some piecework at the school. We can't afford to put her in the boarding* (F/P3, Interview, November, 2014).

In the next excerpt, the parent makes a serious observation:

> *We struggle to pay for school fees what more of extra tuition in Mathematics and other necessary materials in the learning of Mathematics?* (M/P4, Interview, November, 2014).

Teachers, like girls and parents also indicated that poverty was one of the major contributing factors to girls developing a low Mathematics self-concept. All the four teachers interviewed showed that because of poverty in the area, most girls who come from that area had parents who could not afford to buy for them materials needed to learn Mathematics effectively. The school textbooks are not enough to cater for everyone and so there is need for parents to help but most of them from this area had no potential to do so, and thus this situation invariably contributes to the development of a low Mathematics self-concept in girls in the area. According to one teacher:

> *Most of the families in this village are poor. What shocks me is that the soils are very good for farming in this area but it seems these people are naturally lazy people who just want to beg for everything. They don't really like doing their own farming instead they opt to be employed (*M/T3, Interview, November, 2014).

Another teacher had this to say:

> *I do conduct tuitions in my free time. I have never had these girls on my list except for one…*(M/T4, Interview,November,2014).

The findings in this section have indicated that low Mathematics self-concept in girls from *Chisamba* area was linked to the high poverty levels. Five out of the seven parents were not able to satisfy their girl children with all they needed to learn Mathematics effectively and consequently develop the needed Mathematics self-concept which further could lead to improved performance in Mathematics. In the next section, I present the findings on the theme on bad influence from peers.

4.3.5 Bad influence from Peers

Here I present the findings on bad peer influence from both the home communities where the girls grew up and school communities.

A number of perspectives were expressed by participants on this theme. To start with, *Chisamba* area, where these girls came from, is a rural set up where most people including young girls and boys were not educated and as indicated earlier, they hold some traditional beliefs which actually are a hindrance to excelling in school. Though many others would have wanted to be educated, they were unable to do so because of poverty. It is this situation which had led many young people, especially girls, not to be educated and thus the participants indicated that their friends in the community influenced them negatively about school. One girl was in boarding put it this way:

> *During school holidays I find it difficult to look at my books. Most of the friends I have at home stopped school at primary school…I can't even start talking to them about school, much less Mathematics* (*Twaambo*, Interview, November, 2014).

Another one who is a day scholar stated:

> *The friends at home are a letdown and if there was a way, I would be in boarding…In as much as I would want to concentrate on school, I also need friends but the problem is that I have no variety to choose from. All those of my age are school dropouts who are just waiting to be married off. It is difficult to start to talk about school work* (Faith, Interview,November,2014).

Further, six out of seven girls indicated that their friends at school were also not good at Mathematics and the only girl who had friends who were relatively good at Mathematics had this to say:

> *Friends get irritated because I ask a lot of questions so that I can understand. This discourages me to consult with friends who show they have no time to help me catch up, instead, I like to stick to books which I also don't seem to understand* (Faith, Interview, November, 2014).

From the tone of Faith's statement and voice during the interview, it seems that in a situation where Faith tried to put more effort by consulting her friends so she could be helped, it turned out that the friends were not really ready to help. From her revelations, it seems as though the friends were also trying to show their abilities in Mathematics as they were not good in the other subjects that the girl in question was good at.

The parents also admitted that there was influence coming from peers both in the community in which they lived as well as from the school community which reinforced the development of low Mathematics self-concept in girls. All but one parent indicated that *Chisamba* area being what it was, with more youths uneducated, had forced their children into friendships with people who did not value education at all and consequently, the value of Mathematics was not part of their vocabulary. The only parent who thought his child was not influenced by the peers from the community around was because he lived in the teachers' compound which was altogether different from the main community. Although he thought this way, he indicated that the main community had peers who could potentially discourage the girls not only in Mathematics, but in other subjects as well. Note how he gave his statement:

> *This community is notoriously traditional and most of its youths are uneducated. Living in a community like this one can make you feel comfortable with the evil you are doing because everyone (young girls) is doing nothing but hunting for men. Besides, in this culture (Lenje) working hard is not one of the things they promote. Girls in particular are raised to*

> *be married off and not to get educated. Parents encourage their girls to even hook married men and sometimes use charms to hook them. It's really terrible!* (M/P2, Interview,November,2014).

Though, parents could not comment much about the peers at school, their indications were like those of the girls that their role was really crucial in reinforcing the development of a low Mathematics self-concept in girls. One of the parents stated:

> *Their friends (children's friends) in school can either help them improve or actually fail in whatever they are doing. Our prayer is that they find friends who will not just encourage them to work hard in Mathematics or indeed in all the other subjects but also who will encourage them morally* (F/P1, Interview,November,2014).

It is noteworthy, from the excerpt above that when parents send their children to school, especially boarding schools, they also expect them to develop good morals even by associating with good friends. And so this simply shows how parents are informed about the impact of peers at school and indeed the community.

When asked how peers in the community influenced the development of girls' low Mathematics self-concept, some teachers had this to say in suiting with what both girls and parents indicated:

> *The community in which these girls come from though things are changing and most parents aspire to have their children educated, they have limited resources and so if they have any resources, they would rather take the boy child to school than the girl child. And so these girls in school are looked upon by their friends at home to have achieved greatly and held in high esteem such that even when they are not succeeding in their subjects worse more in a subject that they least expect them to perform well these girls feel okay and unconcerned simply because to be in school itself is a great achievement* (T2, Interview, November, 2014).

> *In Chisamba like many other rural areas, girls and parents look at marriage as the second ritual to be fulfilled after one is born. Many girls even when their parents have managed to put them in school it seems their hearts are still somewhere because most of the time these are the girls who are found with illicit relationships with boys outside the school* (M/T, Interview, November, 2014).

About peers in the school community this is what teachers had to say:

> *Poor performers in Mathematics like to play with average girls in the subject and most of the time you find them chatting, reading magazines and*

> *narrating movies to friends- the things which those who are high achievers rarely do. In most cases the kind of people one plays with determines to a larger extent how one performs in any field. It's like how one put it 'show me your friends and I will tell you what you are'* (M/T1, Interview, November, 2014).

Yet another teacher had this to say:

> *When pupils are labelled by their friends as poor performers, it is worse than if it was coming from the teacher. The pupil will continue to be with the friends at the dorms when they are doing their preventive maintenance and also during other lessons. This compounds the feeling of failure as long as they continue to meet with these friends who have already labelled them as failures and thus continues to feel so even about other subjects and situations* (M/T2, Interview, November, 2014).

The two excerpts above highlight the fact that influence from peers in schools in reinforcing the development of low self-concept in Mathematics is real.

Through the presentation of findings in this section, I have shown how peers influence the development of low Mathematics self-concept in girls. Girls, parents as well as teachers agreed that peers in the community in which the girls grew up were not encouraging in the sense that they had poor educational background and in fact most of them dropped out of school. On the other hand, when girls were in school, they chose to play with other girls with similar challenges in understanding Mathematics. They did so because they felt comforted with the group and that those who were doing well were not ready to help them. In the next section, I present the themes relating to how school factors might have contributed to the development of low Mathematics self-concept in girls.

4.4 School factors

In this section I present findings indicating how school factors contributed to the development of low Mathematics self-concept in girls. The following themes emerged: poor personality qualities of teachers of Mathematics, lack of consistent and adequate support for the girls with low Mathematics self-concept, teachers' Mathematics-related gender stereotypes, few females in the field of Mathematics, inadequate and inconsistent guidance and counselling programs in the school and poor organisation of the Mathematics Club.

4.4.1 Poor personality qualities of teachers of Mathematics

One of the questions that I asked the girls with low self-concept in Mathematics was how their teachers reacted to them when they seemed not to understand and so made a lot of follow up questions so they could understand. All the seven girls indicated that teachers were not encouraging in the way they responded. The girls, as exemplified in the two responses below, showed disappointment to the way teachers reacted as they were supposed to be more understanding:

> *I don't know how many times I can explain this for you to understand. This thing is very easy* (Jane, Interview, November, 2014).
>
> *You must be very dull how can you fail to get it* (*Busiku*, Interview, November, 2014).

The girls further stated that what was so disturbing was that these words were usually uttered in a harsh voice. They added that their understanding of a teacher was that they should be caring, interested in the improvement of their pupils, accommodative and cheerful. The girls' experiences were contrary to their expectations as the excerpts below indicate:

> *Teachers of Mathematics are harsh on us especially when we ask continuously. They are not accommodative especially with the poor performers. They lack the care and the patience that this subject demands* (Faith, Interview, 2014).

Note that Faith seems to suggest that Mathematics needs some extra care and patience on the part of the teacher.

Although parents could not refer to the particular teachers, they had this to say:

> *Teachers who lack a sense of humour are useless, they tend to be dry and uncaring and pupils do not enjoy such and much less for a subject like Mathematics* (M/P1, Interview,November,2014).
>
> *Teachers are mostly to blame for this low Mathematics self-concept in our girls. They shout at them when they do not get the right answers. Instead of helping them slowly they put them off by their own harshness and uncaring attitude* (F/P4, Interview,November,2014).

M/P1 seems to agree with Jane that somehow, Mathematics being what it is needs some extra care and patience as some of the attributes.

Teachers on the other hand, did not categorically indicate that they are harsh, uncaring and inpatient on poor performers but they admitted that if they do it, it was unintentional. One of the teachers said:

> *I do not remember being harsh on the girls or uncaring and even impatient. I always want to help my girls especially the low performers. Maybe I did that unconsciously I don't know* (M/T1, Interview, November,2014).

Another teacher expanded further in trying to justify the assertions by teacher 1 as follows:

> *We love teaching - I mean that is why we are teachers. We love our girls too and so if there are times that we have shown to be uncaring, maybe we were trying to catch up with time in finishing the syllabus and so when some girls persistently ask questions we want to ignore them for the sake of time otherwise we would not finish the syllabus* (M/T1, Interview,November,2014).

Through the presentation of the findings in this section, I have shown that teachers of Mathematics have to some extent some pockets of harshness, uncaring and impatient. In the next section, I present findings on the theme of lack of consistent and adequate teacher support as a factor that contributed to the development of low Mathematics self-concept in girls.

4.4.2 Lack of consistent and adequate support for the girls with low Mathematics self-concept.

Generally, girls indicated that they did not receive adequate support in terms of making the subject clear to them the low performers. All the girls interviewed revealed that most topics learnt in Mathematics did not make a lot of sense to them. One girl puts it as follows:

> *Topics like trigonometry, matrices, and equations I don't know how they are applied in real life. I do not like doing them as they bore me…worse the teacher does not consider that we are behind and make us catch up (*Jane, Interview, November, 2014).

Just like all the other girls, Jane in the excerpt indicated that Mathematics is a subject that is unrelated to everyday life and so she looked at it as a waste of time learning it.

Girls, continued to reveal that their teachers did not give them individualized attention during learning time and also that they were treated unfairly during lessons - things which made them feel cut off. One girl complained:

> *I usually do other things when teacher is teaching. I would be writing notes for either R.E or any other subject…I do this because teacher seem not to care about me and about us who are not among the bright ones. He teaches us as a group and is not concerned about our individual needs…It is not nice…The teacher speaks to himself alone* (Faith, Interview,November,2014).

In the above excerpt, the girl seems to indicate that teachers were not really interested in how each girl was fairing. It seems what is important with them is to move ahead as long as some have gotten the concept. It seems the teacher employs the teacher-centred method and only engages the bright ones when he needs the girls' participation. In the next excerpt, Faith spoke of the teachers not being fair to her during lessons:

> *Teachers are too fast when teaching. They do not concentrate on slow learners as much as they do with the bright ones. They teach as long as those who do well understood* (Faith, Interview,November,2014).

Yet *Milimo* had this to say:

> *They do not make both slow and fast learners understand. As if that is not enough they pick only girls who are good at Mathematics to belong to the Mathematics club…It is as if we do not exist* (*Milimo*, Interview, November, 2014).

Equally, Faith revealed:

> *Teachers have a tendency of comparing us with the good girls. They are not considerate of us who are slow learners. Besides, they point only at particular girls who perform well for answers* (Faith, Interview, November, 2014).

The excerpts above of the girls seem to reveal that teachers have a tendency of unfairness, comparisons, inconsiderate to mention just a few. These vices not only put off the girls from participating in class but also contribute to building their low self-concept in Mathematics. The next excerpt drawn from Faith interestingly states:

> *Teachers do not give us chance to improve…Yes other people are better than us in Mathematics but they should not make it obvious that we can't be better than them* (Faith, Interview, November, 2014).

Faith, who actually unlike all the other girls was performing very well in all the other subjects, seemed to indicate that if teachers were not reinforcing negative Mathematics self-concept on them with their unfair comparisons they would change.

Parents in this study spoke generally about teachers as not being very helpful in helping their girls with low Mathematics self-concept. Though they said this hesitantly knowing they were talking to one of the teachers at the school, their message about what they wanted to communicate about them was clear. One parent stated:

> *Teachers have a tendency of segregating between rich and poor girls. They further segregate between bright and dull girls. Whether they do it knowingly or unknowingly it is a bad thing. Some teachers also are too fast when teaching such that when the poor girls try to ask for them to repeat, their responses discourage the girls* (M/P1, Interview,November,2014).

M/P 1, in the excerpt above indicates that teachers seem to show more care and love to the girls who come from rich families and also were more concerned with bright girls than with those who were struggling with Mathematics. This agrees with what the girls themselves indicated earlier. In the next excerpt the parents also revealed that:

> *Teachers sometimes overemphasize, they over expect from pupils such that they fail to see and appreciate the little efforts being made by their pupils in their respective subjects especially in Mathematics* (M/P5, Interview,November,2014).

The parent in the preceding excerpt was trying to indicate that teachers did not take each pupil as a special case and as such they do not follow how each pupil was progressing so they could give extra support where needed. It is like teachers expect pupil to reach the expected target without fail at the same time - a thing which is almost impossible. But what were the findings from teachers themselves on this matter?

All the four teachers of Mathematics interviewed did not agree with the pupils on the fact that their teaching of the subject was done in an abstract way; that its usefulness was not really applicable to daily living. However, teachers who had been in the profession for a much longer time alleged that those who were recently recruited and less experienced were the ones who have this tendency.

Concerning provision of individual attention to the girls, all the teachers stated that this was almost impossible. They indicated that their inability to give pupils individualized attention was as a result of having so many periods to handle in a week and a high pupil-to-teacher ratio in the classes. One teacher expressed himself as follows:

> *The classes we handle are too big. In one class pupils will be more than forty and out of this number the majority will have difficulties with Mathematics. Attending to individual problems will mean not finishing the syllabus in good time which will cost me and also that this will not be fair to the bright girls who would have grasped the concept very quickly …In a week one teacher has more than twenty-five periods, we get so exhausted because apart from teaching, we have other responsibilities in the school not forgetting the responsibilities at home….In addition, we have marking exercises and tests to do, which in itself are quiet challenging but we are trying…*(M/T1, Interview,November,2014).

The teacher above seems to have been concerned about completing the syllabus in good time so as to avoid being questioned in the event of a high failure rate in the final examination. Some teachers also revealed that because of being in a hurry to finish the syllabus, most teachers especially the ones on teaching practice as well as the new teachers in the system they engage in teacher-centred methods which are not very helpful for the girls especially girls with low Mathematics self-concept. Another teacher further explained:

> *New teachers in the system and teachers on teaching practice have a tendency of showing off their knowledge and in the long run they end up employing a Teacher -centred method meaning they would not engage their pupils very much in their teaching. Sometimes you know they do it because they fear their lack of knowledge will be exposed and sometimes it's because they would want to win the confidence of the pupils especially if they are male teachers...These teachers specialize in producing formulas only to be memorized and not explained fully* (M/T1, Interview, November, 2014).

Some teachers also acknowledged making frequent comparisons between pupils although they said it was not done in the spirit of demeaning the pupils with the low Mathematics-self-concept and indeed poor performers. Teachers stated that they said this as a way of encouraging them to work hard and be like the bright girls. One teacher stated:

> *It is not in bad faith that we compare our girls. We do it to motivate them that they can do it as well … For instance, we would say if X (meaning one*

> *of the girls in class who is performing very well) is doing it (performing well in Mathematics) you can also do it, she is just a girl like you* (F/T4, Interview, November, 2014).

It is imperative to observe that while the teacher above thought his actions on the girls with low math self-concept had a positive effect, the girls themselves interpreted the actions to the contrary.

Through the presentation of the findings in this section, I have shown some of the practices of teachers, whether done intentionally or unintentionally, which hinder girls with low math self-concept to progress. Though girls and parents seemed to agree on most of the practices such as comparing the bright girls with the poor performers and unfair treatment of the two groups in relation to Mathematics, teachers themselves did not really see these acts as wrong and that they did them in a positive sense to help the girls be inspired. The teacher-centred method of teaching which was seen to have emanated from lack of individualized teaching (giving reasons of big classes and heavy teaching loads) was also seen to have reinforced the development of low math Mathematics-concept. In the next section, I present the findings on how the theme of Teachers' Mathematics- related gender stereotypes has influenced the development of low math self-concept in girls.

4.4.3 Teachers' Mathematics- related gender stereotypes

The girls with low math self-concept indicated that the attitude of some teachers could have reinforced gender stereotyping by passing statements to the effect that girls were not expected to do well. I cite some girls:

> *My teacher puts me off when he says 'if it were boys they would have understood a long time.' He also discourages us when he says 'you are slow learners you are not like boys who get it at once'* (Jane, Interview,November,2014).

> *Our teacher sometimes tells us that we are naturally lazy and that Mathematics is not for lazy people and that's why we continue to fail, unlike the boys* (*Busiku*, Interview,November,2014).

It is possible that the teacher might have uttered these statements with no intention to harm the girls but it is such utterances which continue to influence the development of low Mathematics self-concept in girls. Below is an excerpt from

another girl who expresses her feelings when such statements like the ones on top are uttered:

> *Somehow interest goes when the teacher compares us with the boys…Sometimes I even wonder why he is wasting his time to teach us. It's like he is just doing it for the sake of doing it - deep down his heart he knows it's difficult and only boys can handle it well* (Jane, Interview,November,2014).

The pupil above seemed to communicate that teachers themselves showed that Mathematics was difficult and it was for boys. In the next, excerpt a different girl indicated that these stereotypical sentiments about Mathematics did not start when the girl was in grade eleven but way back at primary school, if not at pre-school:

> *When I was in grade seven my teacher then told me that drawing and Mathematics were subjects for boys. I took it that way and I think it made a lot of sense because it was too hard not only for me but for most of the girls I knew* (*Milimo,* Interview,November,2014).

Parents also indicated that stereotypical sentiments and practices by teachers reinforce the development of low Mathematics self-concept in girls. Like girls, parents stated that they were some comments that were passed by teachers which can be very discouraging to the girls. Though they did not go into specifics of which ones were uttered by particular teachers involved in the teaching of their children, they indicated generally that most teachers especially the female ones were in the habit of passing bad comments to the pupils' education as a whole. One parent expressed herself as follows:

> *Some teachers say 'you need to be tough like a boy for you to succeed in Mathematics.' Similarly, others say 'for you to manage Mathematics you need to stop living a life of a girl and indeed a woman'… (F/P3, Interview, November, 2014).*

The excerpt above if uttered to a girl who already had problems in Mathematics could discourage her even if the one producing them meant well. Further, another parent stated that:

> *Teachers make it worse when they pass these comments as girls do not learn anything from them instead they get even bad (*M/P5, Interview, November, 2014).

To sum it up on how such words impact negatively on girls, I quote one parent:

> *In as much as our children listen to us when they start school they start considering their teachers' words as very important especially as regard to their education. So, what the teacher says is really taken seriously more so when the people at home are uneducated* (M/P5, Interview,November,2014).

Equally, some teachers expressed their sadness that they sometimes pass such injurious statements. One of them said:

> *Whether we do it knowingly or unknowingly the fact is the injuries are made. Of course sometimes we do it jokingly but in the process we reinforce what the girls have heard already and so when we say it in whatever way it becomes gospel truth* (M/T1, Interview, November,2014).

The teacher in the excerpt above seem to agree with Parent 5 who indicates that what teachers in most cases say about their academics are taken as gospel truth. In the next excerpt, I quote most teachers' gender stereotypical sentiments as exemplified by teacher 1:

> *Mathematics is challenging, boys enjoy challenging stuff and not girls…Let me see those who are men to come and solve these problems* (M/T2, Interview, November, 2014).

In line with Teacher 2, Teacher 1 seems to sum it up in this manner:

> *Sometimes as we teach the subject, we teachers tend to be boastful about the subject and make scaring comments as if really this subject is for the strong; and strong people are men* (M/T1, Interview, November, 2014).

In this section, I have presented findings showing how Mathematics stereotypical sentiments and practices by some teachers contributed to the girls' development of low Mathematics self-concept. All the three categories of research participants (girls, parents and teachers) seemed to agree that Mathematics stereotypical sentiments made by teachers such as the ones mentioned reinforced the development of girls' low Mathematics self-concept. In the next section, I present the findings on the theme of few females in the field of Mathematics.

4.4.4 Few females in the field of Mathematics

All the girls indicated in individual interviews and focus group discussions that their idea that Mathematics is for men was also reinforced when they discovered that

there was only one woman as a teacher of Mathematics at the school. The following two excerpts typify the responses that were given:

> *The presence of more female teachers as teachers of Mathematics can impact in a positive way on us as it makes us think women can also do it* (*Twaambo,* Interview,November,2014).

> *I wonder sometimes why we do not just leave Mathematics for boys because most teachers of Mathematics I have known are male. At this school alone, only one out of the four teachers is female. I think some things are just meant for boys* (Faith, Interview, November, 2014).

These two excerpts seem to suggest that the girls with low Mathematics self-concept had been comforted with the state of affairs at the school.

The inspirational role of role models was also underscored by the parents. Parents indicated that if there were a lot of Mathematics teachers who were women, the story would be different. One parent had this to say:

> *Every teacher is a role model to the pupils…In a subject like Mathematics, there is need for more females for the sake of girls. If you do not have them at your school take them to see in other schools where there are many, to just prove the point and encourage them. They say seeing is believing* (F/P1, Interview, November, 2014).

The parent above seems to re-emphasize the point that there was a need for more female teachers of Mathematics in schools. Because to the pupils, it was like you were saying something that was practically impossible. If one said Mathematics was easy and could be tackled by everyone, then it was important that there was practical, real life evidence of that possibility. Another parent revealed the following:

> *Looking at what the girls know about Mathematics already and how this has affected their performance, there is need for more female fork to show up as role models in the area of Mathematics* (M/P5 Interview, November, 2014).

Teachers in this study also seemed to agree with the views of the girls and parents that few female teachers of Mathematics had a negative impact on girls' development of Mathematics self-concept. To cite one teacher who was asked how the absence of female Mathematics teachers impacted on the girls' Mathematics self-concept, this was his response:

> *You know there is just something that happens when you know everyone is doing it and that it can be done. Girls who are exposed to role models are not even difficult to deal with especially now even when they are struggling with the subject. Rural girls in particular are the victims as they lack exposure and so they do not only have no one to look up to in their community but also at their schools …They do not seem to visualize the benefit of excelling in Mathematics and just how possible this is* (M/T3, Interview,November,2014).

The teacher's statement above seems to suggest that girls that come from urban areas, especially nowadays, are more exposed to women not only those who are teachers of Mathematics but also those who are in what is termed as Mathematics related jobs. These women to them are the driving force, the role models. On the contrary, girls in rural areas lack this exposure and so they still struggle with the question of why they should really pursue Mathematics, which was already giving them a lot of problems. I cite teacher 4 who cements what teacher 3 alluded to:

> *We all need role models in our respective fields and if we do not find them we seem not to go anywhere. Role models are like engines, they fuel us so we can move* (F/T4, interview, November, 2014).

In this section, I have presented findings on how presence of few females in the field of Mathematics is a factor that contributes to girls' low Mathematics self-concept. Next I present findings on lack of consistent guidance and counselling programs in the school.

4.4.5 Lack of adequate and consistent guidance and counselling programs in the school

All the seven girls who participated in the study indicated that the guidance and counselling department was present in the school except its programs were not only inadequate but also inconsistent. Here is a quote from Beauty's response:

> *I know that we have the guidance and counselling department in this school but the problem is that there isn't much to talk about it…programs are not consistent and I think there isn't much being done to help boost our morale for Mathematics…*(Beauty, Interview,November,2014).

The girls did not only put the blame on the teachers of Mathematics in not helping the situation but also on the Careers and Guidance teachers. Here is a statement from *Twaambo*:

> *In as much as our Mathematics teachers do not really link Mathematics learning to real life, I feel that if career teachers were effective, they would help the situation. They would tell us about different careers and how Mathematics is applied in those careers, and eventually we may start appreciating it…* (Twambo, Interview, November, 2014).

During interviews with the parents, four out of seven of them knew the role of the guidance and careers' department that if this department worked hard, it would complement the efforts of the teachers of Mathematics. I cite one of the parents:

> *The work of the guidance department cannot be overemphasised. If there were programs well laid down and followed consistently, girls could eventually change their attitude towards Mathematics. I remember in our time we used to have programs where by every term we had different college student visiting us. This helped us to value all the subjects as the students would tell us about how each subject was important…Actually it was through such activities that I developed my interest to do animal science and worked hard in Mathematics and science* (M/P5, Interview, November, 2014).

Like Parent 5, Parent 6 alluded to the fact that:

> *The guidance department can do wonders if it is well organised and the teachers in the department are very accommodative to help the pupils resolve their uncertainties...However, let me be quick to mention that even without the presence of the guidance teachers, if the teachers of Mathematics are committed they can still make the girls change their attitudes* (F/P6, Interview, November, 2014).

Teachers, like girls and their parents pointed to the careers and guidance teachers as not doing much in helping the girls see the importance of Mathematics. One teacher had this to say:

> *Careers' teachers are not really helping us. They do not complement our efforts. Pupils are supposed to be shown just how Mathematics is key in almost all the careers that people like. We do it as we teach but they should hear it from an independent person in this case the guidance teachers* (M/T2, Interview, November, 2014).

The teacher above seems to show that though the department of the careers guidance existed, it had not somehow devised effective, consistent and deliberate programs to help the girls come to the full realization and understanding of the importance of the subject. This came to light when another teacher revealed the following:

> *Some girls even when they know they are not performing well in Mathematics they will talk about wanting to do nursing, agriculture science*

> *and all the other careers which has Mathematics as key. To me this shows that in as much as we might be seen as not doing it as teachers of Mathematics the careers teachers have failed us completely* (M/T1, Interview, November, 2014).

All the three categories of participants in the interviews in this study indicated the key role that the guidance and careers' department had in helping girls with the low Mathematics self-concept. In the next section, I present the findings on the poor organization of the Mathematics club in the school.

4.4.6 Poor organization of the Mathematics club in the school.

In both interviews and focus group discussions, the girls indicated that the Mathematics club was not helpful to them as girls with low Mathematics self-concept. *Lwiche* elucidated:

> *The Mathematics club in the school is just for the bright girls. We are not allowed to join because we are poor performers …(Lwiche, Interview,November,2014).*

Beauty also had this to say about the club:

> *It is a club for the high achievers in Mathematics; it is an entry requirement to the club without it you are not welcome. In fact most of the clubs in school are organised with the motive of going out on trips* (Beauty, Interview, November, 2014).

Both excerpts above indicate that the club was mainly organised for bright girls. The latter excerpt suggests that why they make the club only for bright girls was to make trips possible as was the case for most of the clubs in the school. To show how serious this issue was *Milimo* emotionally stated:

> *They do not make both slow and fast learners understand. As if that is not enough they organised the Mathematics club consisting of bright girls in Mathematics.* (*Milimo*, Interview,November,2014).

Though parents could not indicate whether the Mathematics club consisted of bright girls only or not, they showed that the club was important in helping the girls with low Mathematics self-concept to interact with those who were excelling so that they could improve. F/P7 had this to say in relation to the club:

> *Sometimes pupils fail to ask in class but when with the friends in the group it is an opportunity for them to ask and learn from other good students* (F/P7, Interview,November,2014).

Teachers on the other hand, denied the fact that the club was organised on the pretext of making trips. Teacher 1 explained why girls thought clubs were mainly organised for trips:

> *Just because girls think most clubs in school are organised for trips does not make the Mathematics club to be part of that assertion. Girls naturally love fun, and trips to them are very important* (F/T4, interview,November,2014).

On the point of the fact that the Mathematics club comprised only the bright girls, M/T2 had this to say to justify the practice:

> *We formed a Mathematics club consisting only of those who are high achievers in Mathematics. The whole idea was to make these girls understand ahead of others so that when teachers of Mathematics are not around they can be able to teach others…In class, we would also want to use the same girls to help solve the problems so as to reduce on wasting time which we do not really have* (M/T2, Interview, November, 2014).

In this section the girls indicated that the organisation of the club was not done fairly and was not helpful to them. While the teachers of Mathematics justified the organisation of the Mathematics club, they saw the need to revisit its organisation and practices. The parents on the other hand showed the importance of having a Mathematics club in school. I present the summary of the findings in the next section.

4.5 Summary

In this chapter I have presented the findings that emerged from this study. The findings are categorised into three main themes indicating the factors that influenced the development of low Mathematics self-concept in girls. These themes were as follows: individual factors, family and community factors and school factors. Table 2 below gives a summary of the findings with regards to key themes and sub-themes.

Table 2: Summary of Findings

Key Themes	Sub-Themes
Individual factors	-Girls' negative perceptions about the subject -Poor Mathematics background
Family and Community Factors	-Culturally motivated practices of family and community -Parents' Mathematics-related gender stereotypes -Uneducated family and community - Lack of role models from families and community - Poor parental Involvement with girls with low Mathematics self-concept -Parents' low socioeconomic status -Bad influence from Peers
Teacher factors	-Poor personality qualities of teachers of Mathematics -Lack of consistent and adequate support for the girls with low Mathematics self-concept -Teachers' Mathematics gender related stereotypes -Few females in the field of Mathematics -Lack of consistent and adequate guidance and counselling programs in the school. -Poor organization of the Mathematics club in the school

Concerning the individual factors, it was found that girls themselves had negative perceptions about the subject and this played a role in developing a low self-concept in Mathematics. All the three categories of participants indicated that girls looked at Mathematics as a difficult subject and that it was for men. Poor background of Mathematics was also found to influence girls' negative Mathematics self-concept. The missing of lessons by teachers when the girls were in junior grades, changing of teachers, and teachers' high expectations about the girls' Mathematics ability, to mention but a few, seemed to have contributed to the poor background in Mathematics for the girls. In Mathematics, topics and concepts are interrelated such that if one missed earlier concepts it was a great challenge to understand the later topics and concepts.

As regards effects of family and community factors on development of low Mathematics self-concept, there seemed to be general agreement among the girls, parents and the teachers interviewed that: culturally motivated beliefs and practices

of family and community; parents' Mathematics related gender stereotypes; the uneducated family and community, the low socioeconomic status of parents, and bad influence from peers all had a hand in the development and reinforcement of low Mathematics self-concept in girls.

Among the school factors, the participants also agreed on most of the factors including: poor personality qualities of teachers of Mathematics, lack of consistent and adequate support for the girls with low Mathematics self-concept, teachers' Mathematics related gender stereotypes, few females in the field of Mathematics, lack of consistent guidance and counselling programs in the school and poor organization of the Mathematics club in the school as some factors that contributed to girls' low Mathematics self-concept. In the following chapter (chapter 5), I present the discussion of findings.

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.1 Introduction

In this chapter I discuss the findings with the use of the holistic approach as employed in the previous chapter on presentation of findings. Thus, I discuss the findings from girls with low Mathematics self-concept, and parents and teachers simultaneously. A study on school dropouts done by Munsaka (2009), who also used triangulation in IPA research, employed a similar integrative approach. Basically, the discussion will be centred on the three themes which are a reflection of the themes under findings and these include individual factors, family and community factors and school factors in influencing the development of low Mathematics self-concept in girls.

Four questions guided this study. To start with in this section of the discussion, I attempt to answer the first question, which sought to find out the individual factors that influenced the development of girls' negative self-concept in Mathematics. As indicated earlier, I use the integrative approach to discuss one theme (i.e theme relating to individual factors) at a time across the three sets of research participants simultaneously. This format of discussion helps to bring out the similarities and/ or variations regarding the girls, parents and teachers' perspectives on the various aspects of girls' negative Mathematics self-concept.

5.2 Individual factors

There are two themes which emerged indicating how individual factors of girls influenced the development of girls' negative Mathematics self-concept: negative perception about the subject and poor Mathematics background. In discussing these themes, the first question of this study which sought to explore individual factors of girls which influence the development of low Mathematics self-concept will be addressed.

5.2.1 Girls' negative perceptions about the subject

All the girls during interviews and focus group discussions expressed dislike of the subject as Jane and *Milimo* quoted here revealed respectively*:*

> *Mathematics is a very hard subject, it's complicated to understand, numbers and formulas make it complicated and it needs more time. Naturally boys have a better ability*.
>
> *It is good except some topics are meant for boys such as Trigonometry, Earth Geometry and Vectors. Fractions and matrices are very good for girls…I love Mathematics but I think some topics don't just make sense to me.*

In the above excerpts, the girls seem to indicate that not only is Mathematics difficult but also that there are some aspects of the subject such as numbers and formulas and some topics which make it difficult. Teacher 1 had this to say in part in relation to this finding, *"Mathematics is abstract in nature, that is to say, it involves numbers that you cannot touch in reality".* Just as an example, in Geography, we learn about tangible things like rivers and lakes, but in Mathematics, numbers and formulas cannot be touched or experienced like real life objects. This is apparently a big problem to girls who have grown up in a culture with beliefs that Mathematics is for men. Furthermore, and in line with the findings that Mathematics was for men, Sayers (1991) in his study found that girls were less confident, more nervous, enjoyed Mathematics less and regarded the subject as being less useful than did boys.

Like Jane in the excerpt above, Faith disclosed that understanding Mathematics needs a lot of time and so other subjects could be disadvantaged if one was not careful. Consider the following statement from her, "*Mathematics is a very difficult subject. The times that I've tried to study it, I saw much of my time consumed and yet the output was poor as I did not understand a thing."* Note that among the girls interviewed, Faith was the only one performing relatively well in all the other subjects including Chemistry and Biology but not in Mathematics.

Milimo, who seemed to show willingness to change her view about Mathematics, came out to give a reason as to why she thought Mathematics was difficult, *"It is the mentality that we have developed about Mathematics otherwise Mathematics is not*

difficult…" Not only was *Milimo*'s performance bad in Mathematics but in all the other subjects. Her desire to improve in Mathematics even when she was performing poorly in all the subjects showed a spirit of determination. After reviewing and comparing all the records about *Milimo,* it was clear that she was receiving warnings about her poor performance from one of her relatives who was a teacher. It appeared that this teacher told her that the way to get started was to start liking all the subjects and actually change the mentally she had towards Mathematics otherwise she was going to repeat. Against the background of these findings, it seems logical to conclude that all hope is not lost with the person with low Mathematics self-concept. With the right attitude and right support from significant others, the situation can be redeemed.

Twaambo and Faith gave other revelations about what led them to develop a negative attitude towards Mathematics, and here are their respective statements: *"I used to love Mathematics but now I just like it as a subject. My continued poor performance has made me lose interest completely", "Continuous failure in Mathematics made me lose interest and stopped putting in any effort."*

The findings of this study agree with Nherera (1999) whose study about attitude of girls towards Mathematics in selected secondary schools in Lusaka and Mazabuka showed that girls viewed Mathematics as a difficult and masculine subject. He further indicated that consecutive failure experiences in the subject influenced these negative attitudes among others. Thus, it seems that continued failure in Mathematics by the girls in the current research made them lose hope about ever making progress in the subject. The girls' concerns can be summarised in this expression, *'elephant input what comes out is Kalulu input'*. In view of this, teachers of Mathematics should try to encourage small efforts made in the subject rather than completely showing that the girls are too bad to make improvement. For example if a girl in a previous test got 29% and improved to 37% in the next test, it is imperative as a teacher to notice the progress and reinforce it, by praising her instead of just shouting at her for performing poorly and failing again.

Parents in the study also seemed to agree with the views of the girls about their children's perspective about Mathematics. I cite Parent 1, *"…My daughter says Mathematics is very difficult, it is a practical subject, boys are good at practical*

subjects (meaning Mathematics) while girls enjoy information subjects …" This revelation is also in line with the findings in the study of the gifted Korean girls-Kim and Lee in Mathematics but not interested in taking up Mathematics related courses in the university. Lee and Sriraman (2012, p.10) in their study cite Lee as stating the following:

> *I think that while men are gifted with logical skills, women are gifted with sensibility. I think that Mathematics has been developed by logical skills and sociology has been developed by sensibility. I liked Mathematics, but I don't think Mathematics is suitable for women.*

This finding by Lee and Sriraman (2012) can be explained also in line with what Nherera (1999) found in his study that the factors that influence attitudes of girls towards Mathematics seem to originate from indicators which appear to stem from the traditional notions of roles of men and women. This really takes us back to the powerful role cultural values and beliefs play in girls' lives and indeed our lives in influencing girls' negative Mathematics self-concept.

Generally it seemed that these girls also lack real guidance in the importance of Mathematics and motivation, a factor I have discussed in detail in sections 5.4.5. In line with this I reveal M/P4's sentiments:

> *My daughter seems not to know the importance of Mathematics; if she did she would not choose careers anyhow from accountancy to clinical officer. This is what has killed her attitude. Besides, she continues to say Mathematics is difficult.*

All the teachers indicated generally that girls who performed poorly in Mathematics had a negative attitude towards the subject. They pointed out that Mathematics was viewed as difficult to almost all the girls who were failing the subject. M/T2 emphasised, *"the problem really is that they (girls), come to class with already wrong perceptions about the subject and this shuts their opportunity to learn"*. Overall, in as much as this is the problem of the girls the real problem is deep rooted in the culture itself. Girls' weaker identification with Mathematics may derive from culturally communicated messages about the subject being more appropriate for boys than for girls. In this light, Cvencek, Meltzoff & Greenwald (2010) point out that *"Girls don't do Mathematics"* is a widespread cultural stereotype in the United States and that studies with both adults and children show that people in the United

States believe that Mathematics is stereotypically a male domain. Additionally, the findings in their study titled *' Math-Gender Stereotypes in Elementary School Children'* have suggested that the Mathematics-gender stereotype is acquired early and influences emerging Mathematics self-concepts prior to ages at which there are actual differences in Mathematics achievement.

In the next section, I discuss the findings under the theme: Poor Mathematics background as a factor that influences the development of girls' negative Mathematics self-concept.

5.2.2 Poor Mathematics background

Six out of seven girls who participated in the study indicated during interviews and focus group discussion that when they started school, Mathematics was not an issue. Things started changing beginning end of primary school through to junior grades and to senior level. I cite *Lwiche*, to exemplify the girls' experiences with Mathematics from the time they entered school, *"...I used to perform well in Mathematics when I was at primary school but things changed when I wrote my grade seven, I performed poorly and from then on things have not been good..."*

In this light, Deku, Amponsah and Opoku (2013) cite American Association of University Women as pointing out that boys and girls begin school with equal self-concept but by the time they reached secondary school level, the self-concept of girls would have become significantly lower than that of boys. It seems as girls and boys start to grow and get to secondary school level, their interaction with the culture in the society in which they live and the knowledge of the values and beliefs thereof is increased and so are the beliefs that Mathematics is a masculine subject. This knowledge on the part of girls contributes to their loss of concentration and the seriousness that the subject deserves, especially as Mathematics becomes more complex and thus the low Mathematics self-concept. Boys on the other hand, get strengthened by the positive beliefs about them in the society in relation to Mathematics and thus, their high Mathematics self-concept. In view of the foregoing, it can be concluded that the formation of negative Mathematics self-concept in girls permeates all facets of life (including culture) like an unbreakable thread.

Twambo in the next line, points out another reason that could have contributed to poor background in Mathematics and indeed negative Mathematics self-concept, *"…My teacher of Mathematics was rarely in class. We were most of the times all by ourselves…"* In the same vein, Beauty also puts it this way, *"…I personally feel if I had a good teacher (a teacher who would not miss class) in Mathematics like I had in English and other subjects the story would have been different…"* Equally, *Twaambo*'s father (M/P4), who attested to what the girls above said about their Mathematics experiences from the time they entered school stated:

> *My child started very well, I didn't even think this would have been an issue now…I just remember that in grades eight and nine, she complained of a teacher not showing up for most of the lessons. I think that period which was lost has contributed somehow to her loss of interest in the subject and thus her poor performance.*

It is important to note that in these study teachers of Mathematics missed classes mainly because they had other responsibilities in the school especially that of school statistician. Generally, when a teacher misses class, particularly for the primary and junior secondary classes, they might not have time to cover all the topics and as such they might leave out other important examinable topics. Apart from that they might rush through the lessons leaving the poor girls in Mathematics with nothing. Sometimes, because of limited time in which to finish the syllabus teachers resort to administering revisions with the use of past papers as a way of catching up with the syllabus what is commonly referred to as *Chipembi catch up* among pupils. This practice contributes to teachers missing important topics and concepts for the future which should have been taught thoroughly. This eventually may result in pupils failing Mathematics but because whether one fails Mathematics or not at grade nine (and even at grade 7) as long as one passes any six subjects, one qualifies for the next higher grade. Because of this, most pupils do not have pressure on them to learn Mathematics, especially where the teacher miss classes. By the time they would want to concentrate on it because they have now realized the importance of the subject to their career options, especially during senior grades, it is already too late as the needed background foundation to most of the topics and concepts they are learning at that particular time is not there. This in the long run leads to frustration and consequently psychological withdraw from the subject and hence continued low

self-concept, especially at senior level which seem to have been the case with the girls in the current study.

Over and above, the revelations by *Twaambo*, Beauty and *Twaambo*'s father exemplify how both girls and parents viewed the problem of girls' negative Mathematics self-concept. Simply put, the absence of teachers during Mathematics lessons could have contributed to a poor background in Mathematics which in turn led to a low Mathematics self-concept.

Similarly, the change of teachers, especially during primary school, was seen also to contribute to poor Mathematics background. To exemplify what both girls and parents alluded to, *Lwiche*'s mother (F/PT7) reasoned as follows, *"I suspect the change of schools made her change a lot of teachers and this made her somehow lose touch with the subject. From grade seven up to now, she has changed schools four times"* Four different schools in a period of five years means that *Lwiche* had a minimum of four different teachers, and this is too much for a young mind which is not yet very stable. It is important to note that while the change of teachers can come as a result of a pupil changing schools, sometimes a class can have different teachers of Mathematics in a short period of time as a result of transfers, promotions, study leave and death to mention but a few.

In view of the above, and as noted earlier, self-concept, and indeed Mathematics self-concept is not only determined by the relationships that a child has with parents, older siblings and peers but also by teachers (Munsaka and Matafwali, 2013). And Deku, Amponsah and Opoku (2013) also assert that self-concept is developed not inherited. According to them, social experiences influence the way boys and girls behave, and this can affect their self-concept development. Thus, a pupil who continues to change teachers may experience instability in the self-concept development and in this case Mathematics self-concept. For instance, if a pupil was always affirmed and validated by his/her teacher regarding his/her ability in Mathematics, that pupil is likely to develop a positive self-concept but, this can be disrupted if he/she changes teachers in the subject, especially if the new teachers do not affirm and validate his/her Mathematics ability. Ultimately, the new teacher might have altogether different attitudes, beliefs, and anxieties about the subject

which may influence the pupil in a negative way hence contributing to a poor Mathematics background and consequently a negative Mathematics self-concept.

Though teachers had no information about the past experiences of the girls in Mathematics, teachers agreed with what the girls and parents said about the girls' loss of interest and hence poor performance due to poor background in Mathematics. Teacher 1 said:

> *Mathematics is not like Civics or Geography where when you finish this topic you can start another without any connections whatsoever. In Mathematics, all the topics are connected and interrelated. Meaning, once you miss one topic, be sure to get lost as the teacher gets onto a new topic.*

Teacher 3 elaborated what Teacher 1 alluded to in this way:

> *You know, in Mathematics, the topics at primary school level are important to understand the topics at junior level and these are also helpful for the topics and concepts at senior level. Equally the concepts learnt at senior are important for understanding topics in Mathematics at higher learning. When one misses some topics and concepts at any particular level, it becomes problematic to progress smoothly and this is just how it is with Mathematics.*

The two excerpts from Teachers 1 and 3 above have attributed girls' low Mathematics self-concept to poor Mathematics background. In relation to what the two teachers alluded to above, Beauty put it this way in trying to justify her continued failure in Mathematics, *"I think why I am still failing is because I fail to connect things. I feel there are some things missing in my learning of Mathematics"* Here, is an illustration to try and elucidate the issue of connectedness and interrelatedness of concepts in Mathematics. A child at primary school who completely missed the concept behind the arithmetic $3 + 4 = \square$ or $3 + \square = 7$, will most likely have problems with equations during later grades. In equations where there is a box in the previous arithmetic problem, it will be replaced with letters such as X and or Y (i.e. 3+4 = X; or 3+Y=7) respectively. Over and above, topics and concepts in Mathematics build on each other, this is to say, one concept learnt at an earlier grade will be built on at a later stage as shown in the example above.

Not overriding the fact that all but one girl in the current study had no problem with Mathematics at primary school level, most teachers at primary level have problems

teaching the subject. Part of the problem is that, primary school teachers are trained to teach all the subjects including Mathematics. So, it follows that if a teacher is not interested and has problems with Mathematics, they would concentrate much on teaching other subjects leaving out Mathematics or indeed concentrate on simpler topics and leave out the difficult ones. The result of this is obvious, namely pupils who are half-baked or who have developed a poor foundation in Mathematics and hence have a low Mathematics self-concept.

Ultimately, going by what both girls and parents indicated, a poor Mathematics background can contribute to the development of a low Mathematics self-concept and indeed lead to poor performance of girls in Mathematics as attested to by what the teachers explained about the connectedness and interrelatedness of Mathematics topics and concepts. In the next section, I discuss the findings on how the family and the community influenced the development of low Mathematics self-concept in girls.

5.3 Family and community factors

There are a number of themes which emerged indicating how families and communities influenced the development of girls' negative Mathematics self-concept: culturally motivated beliefs and practices of family and community, parents' Mathematics-related gender stereotypes, the uneducated family and community, parents' low socioeconomic status and bad influence from peers. In discussing these themes, the second and third questions of this study which sought to find out how families and communities respectively in which the girls lived influenced the development of girls' negative Mathematics self-concept were addressed. The two questions were tackled together as the findings showed that they shared common aspects.

5.3.1 Culturally motivated beliefs and practices of family and community

All the seven girls and parents who participated in this study indicated during interviews that during their growing up (the girls or daughters), home chores were assigned on gender lines just like all the other families in the community in which they lived. Girls for instance, were given to do chores such as: house cleaning, preparing meals for the family and babysitting to mention but a few. Boys on the

other hand were given to do chores such as slashing, gardening, helping out in the shop among others. Such practices performed at a tender age made the girls to develop beliefs that relatively harder chores were for boys and simpler ones were for girls. From the tone of one elderly parent (M/P4), I got the idea that the beliefs that boys and girls have specific roles such as the ones mentioned earlier are held culturally as if they were biologically determined and so were subjects such as Mathematics and Sciences. This is how he put, *'A boy child cannot be sent to cook nshima when his sister is around; it is not acceptable'*

Generally, in the communities in which the participants lived, it was a common belief that Mathematics was difficult and that it was for boys. Surprisingly, they did not believe in taking their children to school, especially their girl children. They believed that girl children should be trained on things such as child rearing, cleaning of a home, preparing meals among other things to prepare them for marriage but not to go to school. It seemed as if the community had trained these young minds that Mathematics had no real application to what the community expects of them as girls and as women. To explain further on this matter, another parent (M/P4) recounted as follows:

> *Most of the people in this community are uneducated, traditionalists and poor. With the limited resources, parents always prefer educating the boy child to educating the girl child. For their girl children, the parents' wish is for them to get married and benefit from them.*

The preceding excerpt seems to tie well with the next excerpt from another parent (M/P1) whom together with her family was doing very well financially and was very zealous about her children's education. Notice how she puts it:

> *The community here is very backward. All they think of is marriage, school is not a priority and worse for a girl child because they have poor Mathematics abilities. I don't like letting my children to interact with the people in this community. I fear they can be corrupted with their backward beliefs.*

Not only were the chores allocated according to gender but toys and games as well. The boys were given to play with toy cars made from wires and clay, while the girls played with dolls. Interestingly, both the girls and their family members did not think there were any problems with this except for one parent (M/P5). M/P5 revealed the following: *"Dolls make girls to develop just a motherly instinct but*

wire cars which boys play with make them to be creative and develop a Mathematical mind." The message in the above quote was similar to that shared by the teachers of Mathematics one of whom lamented:

> *Parents discourage their girls from doing certain games. They buy only dolls for them and not cars or helicopter toys; or games such as Draft, Snakes and Ladders, Chess, Solo and Eagle which they believe belong to boys and men. But both toys and games boys play with help them to develop Mathematics skills.*

Broadly speaking, most parents knowingly or unknowingly hold some cultural values, beliefs and practices which are very detrimental to the girls' development of Mathematics self-concept. To give an illustration, a daughter asks her father to buy her a toy car. Her father refuses and tells her that toy cars are not for girls but for boys and that girls can only play with dolls. The daughter then asked why she could not play with toy cars when her mother could drive. This illustration shows that parents are partly to blame for the low Mathematics self-concept girls have. As indicated above, playing with dolls just develops a motherly instinct but toy cars, aeroplane and all the other so-called *'boy toys and games'* aid in a way to develop a mathematical mind. How this happens is above the scope of this research piece and thus a research opportunity worth attempting in future.

The findings in this research that culturally motivated beliefs and practices of family and community influence girls' negative Mathematics self-concept is in agreement with Lee and Sriraman (2012, P. 9)'s 8-year-long qualitative study of two gifted Korean girls-Kim and Lee and their parents. Their study found that Lee's father recognised her daughter's Mathematical abilities when she was in Grade 5. However, he did not want his daughter to choose fields in natural sciences such as engineering. The reason was mainly cultural and the father explained:

> To continue to study Mathematics may be okay, but if she majors in Science, she has to be in the labs late nights. I guess in the future her husband or family won't allow her to do so, so I want to persuade her not to choose those majors. Lee has a young brother and he is also good in Mathematics so I definitely want him to be in natural science and engineering fields, but it's hard because Lee is a daughter.

The concern of Lee's father was not that Mathematics was difficult but that girls should not take up Mathematics-related courses since they already had roles at home

of taking care of their husbands and children. Such thinking though revealed in Lee's father it is common in many cultures in the world, Africa and Zambia in particular. Little, though it may look, it is such small things that contribute to the development of girls' negative Mathematics self-concept.

On the whole, chores, toys and games assigned to children on gender lines encourages the erroneous belief that relatively harder things in this world are for boys and much simpler ones are for girls and as such Mathematics is one of the things they take to be difficult and for boys only. Notably, it seems children have been socialized in a way that there are separate chores, toys and games for girls and for boys, and so immediately they hear from the community *'Mathematics is for boys,'* a notion I have termed *'culturally constructed idea,'* they quickly make sense of it and take it as gospel truth mainly because everything in their community is done on gender lines. In this light, Cvencek, Meltzoff and Greenwald (2010, P. 3) point out that:

> "combining cultural stereotypes ('Mathematics is for boys') with the knowledge about one's gender identity ('I am a girl') to influence one's self-concept ('Mathematics is not for me') reflects the tendency to achieve what psychologists call cognitive balance".

It seems this cognitive balance is responsible for the existence of this fallacy *'Mathematics is for boys'* and indeed girls' negative Mathematics self-concept for many years and is still is!

In the next section, I discuss findings on how parents' Mathematics-related gender stereotypes influence girls' negative Mathematics self-concept.

5.3.2 Parents' Mathematics related gender stereotypes

All the participants in this research (girls, parents and teachers) showed that gender stereotypical sentiments about Mathematics were passed by parents as well as other family members. Most of them admitted that such statements can be eroding in the girls' development of Mathematics self-concept.

When asked about the words her parents used to refer to her poor performance in Mathematics Jane, whose parents were very zealous about her education, indicated that her father would consistently say to her*, "Mathematics is simple, Mathematics is for real men."* This statement, though apparently innocent, had a negative impact

on Jane. According to Jane, *"If Mathematics is simple, most girls would enjoy and perform well, but guys also, though they are better than us, it gives them a lot of problems, indeed it's for real men."* Equally, *Milimo* had this to say when asked during a separate interview about how her family reinforced her low self-concept in Mathematics, *"When I was in grade seven, my cousin told me that Mathematics is difficult and that it is for boys, and since then I have never liked it."*

Though parents were very hesitant to state the exact statements they used on their girls and some of them showed that they never uttered any words which might have impacted on the girls negatively, through stealth probing, one parent (M/P3) had this to say, *"Mathematics is very challenging and so it looks as if it is for men, but anyone can pass it if only they can concentrate."* This parent seemed to have beliefs that Mathematics is for boys and so not wanting to show that her own sentiments could have impacted negatively on her girl's Mathematics self-concept she apparently calculated her words before she uttered them.

Teachers, just like the pupils and the parents attested to the fact that parents pass gender stereotypical sentiments which can be so detrimental to the development of Mathematics self-concept among girls. Teachers of Mathematics pointed out generally that, most parents would not be worried if their girls failed Mathematics but that they would if it was other subjects such as English, Civics, Religious Education (R.E), History, Home Management and all the other information subjects regarded as feminine or female-dominated subjects. In expressing how most parents reacted if their girl children performed poorly in the feminine subjects and surprisingly, did well in Mathematics, one teacher (M/T2), put it as follows, *"How on earth do you fail this subject (referring to either English, Civics, R.E., Home Management etc) as if it was Mathematics? If it was Mathematics, I was going to understand you."* The message in the excerpt just goes to reinforce the already held beliefs among the girls that Mathematics is difficult and can only be handled by boys and men. These few typical examples of the sentiments produced by some parents are passed knowingly or unknowingly but have negative effects on shaping the girls' development of Mathematics self-concept. Gavin and Reis (2003, P.33) point out that, "one of the main reasons that girls do not succeed in Mathematics may not be due to any lack of ability or effort-rather it may be attributed to the fact

that they are not expected to excel by some of their parents, teachers or peers" This can further be explained in terms of the *self-fulfilling prophecy theory*. Merton (1968) points out that, Self-fulfilling prophecy is a process by which one's expectations about another person eventually lead the other person to behave in ways that confirm these expectations. Thus, the expectations of parents about their girls' ability in Mathematics which is usually negative can come to pass.

Also, Gunderson et al., (2012) in their study dubbed "The role of parents and teachers in the development of gender-related Mathematics attitudes" showed that adults' own Mathematics anxieties and adults' beliefs and behaviours related to trait stability can impact children's gendered Mathematics attitudes. Similarly, when parents endorse the gender stereotype that Mathematics and Science are male domains, they are more likely to underestimate their daughters' abilities in these domains and to overestimate their son's abilities [(Eccles and Jacobs, 1986; Tiedemann, 2000) in Bhanot and Jovanovic (2005)]. In contrast, when parents endorse the gender stereotype that English and social science are female domains, they tend to overestimate their daughters' abilities in these subjects and to underestimate their sons' abilities (Frome and Eccles, 1998 in Bhanot and Jovanovic, 2005).

Further, in a study done by Lee and Sriraman (2012, p.10) in their Korean study, at the end of 8th grade, Lee, one of the gifted girls studied, recogized that Korean society was very traditional and had gender stereotyping. This was part of her reaction, "things are unfair for women. My parents are more interested in my younger brother than me, and my relatives are more concerned about my brother's future than mine." Like in many societies in Africa, in Korea, girls and women are not a priority when it comes to education. They are considered to be second class citizens and so they are treated unfairly in almost all aspects of life. Generally, children's self-concepts are thought to emerge from feedback regarding performance as well as the expressed views of important others (Harter, 1998).

In as much as these findings are a matter of influence from parents' gendered stereotypes, Marsh and Hau (2004)'s study of school achievement and self-concept in Mathematics and verbal domains, established that within people, achievement in the domain of Mathematics negatively affected verbal self-concept. Similarly,

achievement in verbal domains negatively affected Mathematics self-concept. Marsh and Hau (2002) seem to suggest that when one's performance in Mathematics is good, it affects negatively the self-concept in verbal domains such as English language and other related domains and vice versa. In view of this, it would be argued that girls perform poorly in Mathematics because they have a high self-concept in English Language and other related subjects and that boys' good performance in Mathematics is as a result of a low self-concept in English Language and other related subjects.

In the next section, I discuss how the uneducated family and community influenced the development of negative Mathematics self-concept in girls.

5.3.3 Uneducated family and community

The findings showed that the uneducated family and community members influenced girls' low Mathematics self-concept in the sense that the families and communities bred no role models and parental involvement in a child's education was poor. I discuss these two themes: Lack of role models and poor parental involvement in girls' education, as factors which resulted from the uneducated families and community members.

5.3.3.1 Lack of role models from family and community

Five out of seven girls with low Mathematics self-concept interviewed had parents who were not educated. Further, the community in which these girls lived had most of its people uneducated. Compounded with this situation is the fact that if there were people who were known to be educated in both the families and the community, then mostly it was men and not women. This represents lack of role models not only in Mathematics but in formal education in general. *Twaambo* had this to say in reference to this:

> *Both mum and dad just ended at primary level; they do not inspire me in any way. In the community it is even worse as most people have not been to school. Women are the majority lacking formal education. It's really bad!*

Similarly, *Busiku* had this to say:

> *I am not motivated by my mother because she is just a maid and I've never lived with her, my dad passed away when I was a little girl and I don't know much about him. Equally the community in which I live is an uneducated one. Mathematics is not a subject taken seriously. There are completely no people to look up to academically and it is worse with Mathematics.*

During the interviews with parents it was also found that their lack of formal education as well as most of the people in the community contributed to some extent to their girls' low self-concept in Mathematics. There were no role models from whom to draw inspiration to excel in Mathematics and other subjects. One of the Parents (F/P1) 's assertion is representative of others:

> *I am not educated myself, I only reached grade eight when I got married, and my husband went up to grade eleven. I don't know much about Mathematics but I hated it. I took it to be a subject for men. Though it was like this for me, I try by all means to encourage my children and the girls in particular to work hard in Mathematics because the jobs that matter require Mathematics. My community lacks female role models - women who have excelled in Mathematics and later taken up jobs that really matter.*

Note that though the parent in the excerpt above agrees to the fact that she did not go very far with education, she points out that she took time to encourage her girls to perform well in Mathematics. Her eagerness to see her girls do well in Mathematics was further indicated in these words, *"Because the jobs that matter require Mathematics."* This statement in itself is suggestive of the fact that though parents might be uneducated, the importance of Mathematics in their children's future careers is somehow appreciated. It is for this reason that I continue to argue that the factors that influence the development of negative Mathematics self-concept in girls are interrelated and cannot be neatly underpinned to one specific, overarching factor.

In another interview, Faith's grandfather (M/P5), who lives together with Faith's mother, put it this way in relation to whether girls took their parents as role models:

> *Her mother (meaning the mother to Faith) went up to grade ten when she got pregnant of her (meaning Faith). She stopped school and she has never gone back. She was very bad at Mathematics herself when she was still in school and I am sure somehow Faith lacks that inspiration from her mother. Her mother is not her model, neither is the community.*

It is important to mention here that Faith grew up without her father because of circumstances beyond her control. Apparently, Faith's father is well educated and has a good job which is mathematically oriented but he is not concerned about her in

any way-a situation that has continued to torture Faith since childhood. Despite having a father who is well educated and in a career that is mathematically oriented, Faith continues to have a negative attitude towards Mathematics. This seems to suggest that girls seem to look up to their mothers more than their fathers especially when their fathers are not involved in their education and that broken homes impacted negatively on the girls' education.

Teachers interviewed also attested to the fact that lack of role models in both the family and the community was a factor that contributed to low Mathematics self-concept among the girls. Teacher (M/T2) stated:

> *Most women are just farm labourers and house wives and do not in any way love Mathematics. Generally speaking these girls seem to come from uneducated families with no role models in Mathematics just like it is with the communities they come from."*

In line with these findings, the study by Lee and Sriraman (2012) found that the absence of role models influenced nonmathematical aspirations. Furthermore, on Lee, the gifted of the two girls mentioned above, stated the following:

> There is no family member who worked in natural science or engineering fields…It is said a job that can allow much free time is good for women, but I think that studying Mathematics or science means to spend a lot of time. Many people said that natural science and engineering should be hard for women (p. 10).

What is coming out from the above quote is that natural science and engineering take a lot of time and culturally it seems jobs that do not allow for free time are not for women. Such notions yield few or no role models for girls. In the next section, I discuss how poor parental involvement with girls with low Mathematics self-concept influenced the development of negative Mathematics self-concept in girls.

5.3.3.2 Poor parental involvement with girls with low Mathematics self-concept

As I indicated earlier, in expressing parental involvement I am not using the word *lack* but *poor* to acknowledge parental involvement and of what quality it is i.e. the quality of involvement is what I am concerned about. From interviews and focus group discussions with the girls, it can be said that girls are poorly supported by their parents in the area of Mathematics. This lack of support, among others, has contributed to the low self-concept in Mathematics in girls. *Busiku*'s statement below shows that pupils can expose the poor involvement of parents (or indeed families) in the improvement of girls' Mathematics self-concept:

> *My uncle whom I live with also just says that I should work hard but he never takes upon himself to show me how I can really make it in Mathematics and I think sometimes all this is because they themselves are failures.*

The statement above shows that even if parents may want to help their girl children to improve their performance in Mathematics, the fact that they themselves are not educated means that there is no capacity in the family to do this. *Busiku* further indicates, "*Having poor education themselves they don't know how they can help me. They say things here and there but tangible help is not there."*

Another testimony was given by *Milimo*. *Milimo* was briefly raised by both her parents before they divorced, leaving her with her mother. At the time of interviews she was being kept by one of her relatives as her mother had died. Her response when asked about the involvement of her parents was as follows:

> *When I was still living with my parents till they divorced, dad whom I considered to be very good in Mathematics was never home so I could consult with him. Mum who is late now took Mathematics to be difficult though she was a teacher and she was equally not home. Most of the times I was left home with the maid who only did not have a negative attitude toward Mathematics but to education in general. I now live with one of my relatives who is a teacher. He is very good in Mathematics and very helpful, the only challenge is that he is mostly busy with other school responsibilities apart from teaching, and so I find it difficult to benefit from him fully.*

Milimo in the above excerpt seem to indicate that if the parents were serious in assisting her in learning Mathematics, the outcome would have been positive as

parents were educated enough to effectively help her. The problem here was not about the parents not being educated but it was about the unavailability of these significant people. How much time was spent with their girl child in improving her low Mathematics self-concept? Such questions led to the labelling of the theme as *poor parental involvement* and not *lack of parental involvement*.

Sentiments by parents seem to tie well with what their girls indicated about them. *Milimo*'s guardian (M/P2) is here quoted, "*I don't attend to her sometimes because I have a busy schedule every day".* In as much as M/P2 would love to help his girl, he does not seem to have time for that. Basically, as indicated earlier the poor involvement by parents, even those educated, is that they do not have adequate time to help their girl children.

Unlike *Milimo*, who had educated parents, *Busiku*'s father (M/P3), who just ended at primary school level, had this to say in explaining his involvement, *"It is difficult to help her in solving her Mathematics problems because first of all, we do not really have that knowledge of Mathematics ourselves."* In the same vein, Faith's guardian (M/P5) pointed out that, *"her mother is a strict disciplinarian but does not help her with books."* Faith's mother like *Busiku*'s father did not go far with their education and so even if they were aware about their girls' situations, they lacked effective measures to solve their girls' problems.

Teachers, like girls and parents, stated that parental involvement was poor. One teacher (M/T2) expressed himself as follows in relation to *Milimo*'s guardian (M/P2 who has a rich Mathematics background):

> *He buys for her all the necessary books in Mathematics and gives her past papers as well as some problems to solve, but he has never consulted with me on the way forward for the girl especially during the Open Days. He seems to be pre- occupied with a lot of things and so her girl's Mathematics problem is not a priority.*

The excerpt above of a teacher just like earlier indicated by excerpts from pupils and parents, shows that it is not only poor educational background but also failure of educated parents to spare time off their busy schedules that causes poor involvement of parents in their daughter's education. This case should be prominent with parents in the urban areas where the cost of living is so high and so people are always on the

move to make ends meet. Additionally, most of these girls came from broken homes as shown on Table 1. Out of the seven girls, only two were raised by both parents, the other five girls were raised by either their mothers only or other relatives. This situation seems to have exacerbated the poor involvement of parents in their daughters' education and in particular in the learning of Mathematics resulting in low Mathematics self-concept.

In line with these findings, Robertson and Symons (2003) found among others that educational attainment is a function of parental input. Thus, if girls are to improve in their low Mathematics self-concept, parents should improve on the time that they spend with their girls in helping them. Additionally, instead of passing on the *'hell'* that they had with the subject, they should try to stick to the positive side of life as regards Mathematics. In the next section, I discuss how parents' low socioeconomic status influenced the development of negative Mathematics self-concept in girls.

5.3.4 Parents' low socioeconomic status

Five out of seven girls with low Mathematics self-concept indicated during interviews that they found it difficult to improve in Mathematics due to economic constraints in their families. The following excerpt from *Busiku*'s statement epitomizes the levels of poverty for some girls in *Chisamba*:

> *I am a day scholar, I really want to be a border but funds cannot allow. Being a day scholar, I cover a relatively long distance between home and school. Sometimes I fail to attend both afternoon and evening preps because I usually get tired and at night it is dangerous to move. When I am home I am the only girl among the men who are my uncles. I am usually expected to help out with chores at home which are so tiring. I rarely work up to study because I am too tired to do so and that we do not have electricity at our home.*

Thus *Busiku* tries to show that the condition in which she is has somehow contributed to her low Mathematics self-concept. Her statements, "*I am a day scholar, I really want to be a border but funds cannot allow… I rarely work up to study because I am too tired to do so and that we do not have electricity at our home,"* suggest that *Busiku*'s parents are really wallowing in poverty. Similarly, *Twaambo* indicates, "*I would love to do tuitions in Mathematics but I cannot even start talking about it. Important textbooks that I need cost a lot of money."*

Poverty also was cited by parents as one of the contributing factors to the development of low Mathematics self-concept in girls. *Busiku*'s grandmother (F/P3) in the following excerpt and in line with what *Busiku* herself indicated above shows how *Busiku* ended up a day scholar because of poverty, *"I am just a house wife and my husband just does some piecework at the school. We can't afford to put her into boarding,"* In addition, *Twaambo*'s father makes a serious observation, *"We struggle to pay for school fees, what more paying for extra tuition in Mathematics and other necessary materials in the learning of Mathematics?" Twaambo*'s father seems to suggest that to learn Mathematics, one need to do extra tuitions but as was their case, poverty is a limiting factor.

Teachers also indicated that poverty was one of the major contributing factors to girls developing a low Mathematics self-concept. All the four teachers interviewed showed that because of poverty in the area, most girls from there had parents who could not afford to buy for them materials needed to learn Mathematics effectively. The school textbooks were not enough to cater for everyone and so there was need for parents to help but most of them from this area had no potential to do so. Therefore poverty invariably contributed to the development of a low Mathematics self-concept in girls in coming this area (*Chisamba*). One of the teachers (M/T3) said, *"Most of the families in this village are poor…"* Another one (M/T4) added, *" I do conduct tuitions in my free time. I have never had these girls on my list except for one…"*

In this section, I have discussed how five out of seven girls who had low Mathematics self-concept from *Chisamba* area had their low Mathematics self-concept linked to poverty in their families. However, the other two girls who came from richer homes were indicative of the fact that factors that influence low Mathematics self-concept in girls were not atomistic but holistic in nature. In the next section, I discuss how bad influence from peers influenced the development of negative Mathematics self-concept in girls.

5.3.5 Bad influence from peers

Here I discuss the findings on peer influence as observed from both communities, that is the community in which the girls grew up and the school community. A

number of perspectives were expressed by participants about this theme. To start with, *Chisamba* area where these girls came from is a rural set up. Most people, including young girls and boys are not educated and as indicated earlier, they hold some traditional beliefs which actually are a hindrance to excelling at school. Though again many others would want to be educated, they are unable to do so because of poverty a factor just discussed above. It is this situation which led many young people, especially girls, not to be educated and thus the girls' indication that their friends in the community influenced them negatively about school. *Twaambo* who is a boarder put it this way:

> *During school holidays I find it difficult to look at my books. Most of the friends I have at home stopped school at primary level…I can't even start talking to them about school, much less about Mathematics.*

Similarly, *Busiku* who is a day scholar had this to say:

> *My friends at home are a letdown; if there was a way I would be in boarding…In as much as I would want to concentrate on school, I also need friends but the problem is I have no variety to choose from. All those of my age are school dropouts who are just waiting to be married off. It is difficult to start to talk about school work.*

Twaambo and *Busiku* in the excerpts above seemed to complain about the people they called friends in the community in which they lived. Most of their friends were said to be school dropouts. For *Busiku*, being in boarding was a dream she wished would come true but due to lack of finances, she was unable to realise the dream

Further, six out of seven girls indicated that their friends at school were also not good at Mathematics. Marsh (1987)'s Big Fish Little Pond Model (BFLP) tried to explain further the influence of peers in relation to academic self-concept. The BFLP theory posits that students tend to compare their own achievement with the achievement of other students at their campus and use this comparison to judge their own abilities. The theory advances that it is better for a student's educational mobility to be a big fish in a small pond (or a relatively high achiever among relatively low achievers) than to be a small fish in a big pond (or a relatively low achiever among relatively high achievers). The central presumption of the model was that the comparison of one's academic performance with that of one's immediate peers is a strong determinant of academic self-concept. The BFLP theory

fits well in this finding in that though, the friends to the girls under study were equally low achievers, the general performance (not considering quality results that is grades 1-3) in Mathematics by the grade 11 girls following their main mock-examination is not bad. That is to say, while 23% failed (girls with a grades of 9 in Mathematics) completely in Mathematics, 77% (meaning with grades from 1-8) had passed (*Chipembi* Girls Secondary School Grade 11 Main Mock Examination Mark Sheets 2014). The girls with low self-concept in the BFLP theory are the small fish in the big pond and thus, in line with the theory, this works against them.

Additionally, Faith, the only one who had friends who were relatively good in Mathematics said the following concerning her friends who were not ready to help her when she consulted with them:

> *Friends get irritated because I ask a lot of questions so I can understand. This discourages me to consult with friends who show they have no time to help me catch up, instead I like to stick to books which I also don't seem to understand the contents.*

From Faith's revelations it seemed as though the friends were also trying to show their abilities in Mathematics as they were not good in the other subjects that Faith was good at. This finding is in line with what Nherera (1999) in the study of attitudes of girls towards Mathematics indicated. In this study it was found that peer pressure was one of the factors that contributed to girls having negative attitudes towards Mathematics. He stated that, girls do not co-operate amongst themselves and that they tend to look at each other with suspicion. Nherera (1999, p.210) quotes Tonge one of his participants for the study as follows, "Girls are jealousy. If you ask, they might even tell you a wrong answer…" Generally, his study found that the co-operative spirit which appears among boys was very weak among the girls and that at a single-sex school, girls tended to consult boys from near-by schools. The girls in the study expressed that boys were more helpful than fellow girls. Ultimately, this study shows that even when girls have friends with potential to help them, the friends were not very helpful.

The parents also admitted that peer pressure, both in the community in which they lived and in the school community, reinforced the development of low Mathematics self-concept in girls. All but one parent indicated that *Chisamba* area being what it was, with more youths uneducated, had forced their children into unhealthy

friendships with people who did not value education. The corollary is that their children would not expect to gain academic benefit, including of Mathematics, from such friendships. Only *Milimo*'s uncle (M/P2) thought his child was not influenced by the peers from the community around. This was probably because *Milimo* was living in the teachers' compound that was altogether different from the main community. Though he thought this way, he indicated that the main community had peers who could potentially disturb girls academically. Note how he made this statement:

> *This community is notoriously traditional and most of its youths are uneducated. Living in a community like this one, you can feel comfortable with the evil you are doing because everyone (youth) is doing nothing but hunting for men. Besides, in this culture (Lenje) working hard is not one of the things promoted. Girls in particular are raised to be married off and not to get educated. Parents encourage their girls to even hook married men and sometimes use charms to do so. It's really terrible.*

Though, parents could not comment much about the peers at school, they made similar indications as did the girls and the teachers that their role was really crucial in reinforcing the development of a low Mathematics self-concept in girls. Jane's mother (F/P1) said:

> *Their friends in school can either help them improve or actually fail in whatever they are doing. Our prayer is that they find friends who will not just encourage them to work hard in Mathematics, or indeed in all the other subjects, but also who will encourage them morally.*

It is noteworthy, from the excerpt above that when parents send their children to school, especially boarding schools, they also expect them to develop good morals apart from attaining academic excellence. This would be achieved through interaction with morally upright friends. It appears that parents were well informed about the impact of their children's peers at school and indeed the community. According to Iheoma (1995, as cited in Matlala (2011)), the peer group is the fertile source of values especially during adolescence. Thus, depending on the type of peers chosen, one might develop good or bad morals including acquiring positive or negative Mathematics self-concept.

Teacher (M/T2) made a statement that was in consonant with what the girls and parents indicated about Mathematics self-concept:

> *The community from which these girls come from have limited resources and so if they have any resources, they would rather take the boy child to school than the girl child. And so these girls in school are looked upon by their friends at home to have achieved greatly and held in high esteem such that even when they are not succeeding in their subjects worse more in a subject that they least expect them to perform well these girls feel okay and unconcerned simply because to be in school itself is a great achievement.*

Another teacher (M/T3) also had this to say:

> *In Chisamba, like in many other rural areas, girls and parents look at marriage as the second ritual to be fulfilled after one's birth. Many girls will still have their hearts set on social activities that blight their future even when their parents have managed to put them in school. They will be found with disciplinary cases such as involvement in illicit relationships with boyfriends outside school.*

Robertson and Symons (2003) found in their study that educational attainment was not only a function of parental input and schooling but also peer groups. Generally, the behaviour of peers toward a child communicates their evaluations about a child's worth as a person. This in turn influences children's development of self-concept.

Similarly, better peer relations are associated with better academic motivation and performance (Wentzel, 2003). For example, good students are more likely to have supportive peers than weaker students. Certainly, peers provide companionship and support as well as sources of learning experiences in cooperation and role taking. Peers also have an important influence on the adolescent's self- concept by giving him feedback about his/her personality and the kinds of behaviour for which he will be either accepted or rejected by peers. Thus, the negative Mathematics self-concept of girls can be reinforced by having friends who do not have interest in Mathematics. Equally, girls can be influenced by peers who failed Mathematics at grade 9 but now are in senior grades, because of Mathematics not being a determinant subject to get to grade 10. Generally, peer group pressure is seen as very powerful in adolescence and the adolescents have been shown to spend far more time with peers than anyone else (Matlala, 2011).

In the next section, I present the themes relating to how the teachers and the school contributed to the development of low Mathematics self-concept in girls.

5.4 School factors

In this section, I discuss findings indicating how teacher and school factors contributed to the development of low Mathematics self-concept in girls. The following themes will be discussed: Poor personality qualities of teachers, lack of support for the girls with low Mathematics self-concept, teachers' Mathematics-related gender stereotypes, few females in the field of Mathematics, lack of adequate and consistent guidance and counselling programs in the school and poor organisation of the Mathematics club.

5.4.1 Poor personality qualities of teachers of Mathematics

All the seven girls indicated during individual interviews and focus group discussions that teachers were harsh and not considerate to them when they made a lot of follow up questions in trying to understand how to work out some problems in Mathematics. Jane and *Busiku* testified against teachers' manifestation of this negative quality by reciting the following as examples of expressions teachers would make: "*I don't know how many times I can explain this for you to understand. This thing is very easy…" "…You must be very dull how you can fail to get it…"* The girls showed that they had no problems with the actual words uttered but they showed concern over the manner in which the words were uttered – the tones were hostile most of the times. They added that their understanding of a teacher was that they should be caring, interested in the improvement of their pupils, accommodative and cheerful.

Contrary to this expectation, the girls observed that teachers of Mathematics were harsh on them, especially when they asked questions continuously. It seems to me that to learn Mathematics effectively, the teachers should try to exercise a little bit of patience and consideration.

These findings are in line with what Rehman (2001) pointed out that teachers' classroom practices that include the entire instructional, curriculum, social and organisational techniques influence the self-concept development of children in specific areas. In addition, the way the teacher teaches and handles the students has an effect on the personality development of children. This development thus includes their (children) Mathematics-self-concept as well.

5.4.2 Lack of consistent and adequate support for the girls with low Mathematics self-concept.

During interviews and focus group discussions, all the seven girls showed that most topics learnt in Mathematics did not make a lot of sense to them. For example, Jane pointed out, *"For topics like trigonometry, matrices, and equations, I don't know how they are applied in real life. I do not like doing them, they bore me especially that the teacher does not consider us."* Jane's statement was echoed by the other girls that Mathematics was a subject unrelated to everyday life and considered studying it as waste of time.

The girls did not hide their disappointment with their teachers who did not give them individualized attention during learning time. They regarded themselves treated unfairly making them feel cut off from the teacher and the rest of the class. Faith retorted, *"…he teaches us as a group and not concerned about our individual needs…It is not nice…The teacher speaks to himself.* Faith thus indicates that teachers were not really interested in how each girl was fairing. She concluded that what was important to the teacher was moving ahead with the syllabus as long as some of the pupils understood the concept. Considering the statements shows that teachers employ the teacher-centred method and only engage the bright pupils whenever they felt the need to engage the class's participation. In the next excerpts *Lwiche* expands more on the issue of engaging the bright ones, *"teachers have a tendency of comparing us with the good girls. They are not considerate of us who are slow learners. Besides, they point only at particular girls who perform well for answers"*

The above quotes from the interviews with the girls indicate that teachers have a tendency of not being fair, making comparisons between pupils in a class in unhealthy ways and lack courtesy. These vices not only put off the girls from participating in class but also contribute in building their low self-concept in Mathematics. Faith interestingly elaborated on this point stating, *"…teachers do not give us chance to improve…Yes other people are better than us in Mathematics but they should not make it obvious that we can't be better than them."* Faith, who actually unlike all the other girls has been performing very well in all the other subjects, seems to indicate that if teachers were more

courteous in the way they handled them, they would not be reinforcing a negative low self-concept in Mathematics and they would be encouraged to try their best to improve.

These finding are in line with what Rheinberg (1980) as cited in Relich (1996) tried to clarify. He tried to distinguish teachers who prefer a social reference standard from teachers who prefer an individual reference standard. He pointed out that the typical reference standard a teacher adopts is otherwise called *teachers' frame of reference* (TFR). Teachers using a social reference standard compare the results of one student with the results of other students, whereas teachers using an individual reference standard evaluate a student's result taking his or her prior achievement into account. The central characteristic of an individual frame of reference when assessing student's accomplishments is the emphasis on the intra-individual improvement of an individual student. Such an approach is believed to counteract the negative effect of social comparisons for low achieving students and therefore enhances students' self-concept.

Parents in this study spoke generally about teachers as not being very helpful to girls with low Mathematics self-concept. Though they said this hesitantly knowing they were talking to one of the teachers at that school, their message was clear of what they really wanted to communicate about them. One of them (F/P1) said:

> *Teachers have a tendency of segregating rich girls from poor girls. They further segregate between bright and dull girls. Whether they do it knowingly or unknowingly it is a bad thing. Some teachers also are too fast when teaching such that when the poor or dull girls try to ask for them to repeat some concepts, their unwelcoming responses discourage the girls.*

In the above excerpt, the parent seems to indicate that teachers have a tendency of showing more care and love to the girls who come from rich families and those who bright girls than those poor and/or struggling with Mathematics. Thus the parent was in agreement with the girls statements quoted earlier in the discussion. Another parent (M/P5) claimed, *"Teachers sometimes overemphasize and over expect from pupils such that they fail to see and appreciate the little efforts being made by their pupils in their respective subjects more so in Mathematics…)*. According to M/P5, teachers were not taking each pupil as a special case and as such they were not in a position to keep track of each pupil's performance so as give extra support where

needed. It is as if teachers expect everyone to reach some expected performance target without fail and at the same time – an expectation which is farfetched.

In consonant with these findings, Rosenthal (1973, cited in Deku, Amponsah and Opoku, 2013) claims that boys are given more feedback as to the quality of their work, more chances to generate correct answers and more encouragement to persist on problems that they initially get wrong. Girls, on the other hand, have their incorrect answers attributed to poor ability and are not encouraged to continue working to get the correct answer.

All the teachers of Mathematics interviewed did not agree with the pupils on the fact that their teaching style of Mathematics was done in an abstract way and that the usefulness of the subject was not really applicable to daily living. Nevertheless, those who had been teaching for long in the system pointed out generally that the less experienced were to blame for poor delivery of lessons and reckless classroom communication. And so the abstract teaching of Mathematics that made the girls not to realize its importance and thus the negative attitude towards the subject was largely attributed to the less experienced teachers.

Concerning provision of individual attention to the girls, all the teachers stated that this was almost impossible. Their inability to do so was due to the tight teaching schedules in the several periods assigned to them per day, and the high pupil-to-teacher ratio at the school. One teacher (M/T1) expressed himself as follows:

> *The classes we handle are too big. A class is made up of more than forty pupils, most of which have difficulties with Mathematics. Attending to individual problems will mean not finishing the syllabus in good time which will cost me. This will not be fair to the bright girls who would have grasped the concepts very quickly. In a week one teacher has more than twenty-five periods, we get so exhausted because apart from teaching, we have other responsibilities in the school not forgetting the responsibilities at home…Marking exercises and tests can be quiet challenging but we are trying.*

In line with this, Corcoran et al., (1998, as cited in Hakalo, 2014) found that overcrowding and heavy teacher workloads created stressfull working conditions for teachers, and led to higher teacher absentism. Further, overcrowded classroom conditions not only make it difficult for girls to concentrate on their lessons, but inevitably limit the amount of time teachers can spend on innovative teaching

methods such as cooperative learning and group work. This in the end leads to loss of concentration in the subject and contributes to perpetuating low Mathematics self-concept on the part of the learner.

The teacher (M/T1) quoted above indicated not only his worry about not finishing the syllabus in good time, but also feared being reprimanded especially if the failure rate in the subject was high. Some teachers disclosed that in a quest to complete the syllabus, most teachers, especially those on teaching practice and the newly recruited ones resorted to using teacher-centred methods. These methods are not very effective especially for pupils who have negative preconceived ideas about the subject such as those with low Mathematics self-concept. Again M/T1 explains, "*New teachers in the system and teachers on teaching practice have a tendency of showing off their knowledge. In the long run they, end up employing a Teacher - centred method, meaning they do not engage their pupils very much in their teaching."*

Although the teachers were not affirmative that they concentrated more on bright pupils than those performing poorly in the subject, a closer look at their own statements indicated their true practice of being unfair in the way they treated the two groups of girls. One of them, teacher (M/T2) stated:

> *We formed a Mathematics club consisting only of those who are high achievers in the subject. The whole idea was to make these girls understand ahead of others so that when teachers of were not around, they could be able to teach others. In class we would also want to use the same girls to help solve the problems so as to reduce on wasting time which we do not really have.*

In the excerpt above the teacher seemed not to realize the negative impacts of such a practice on girls with low Mathematics self-concept. First of all, the girls who were not part of the club felt marginalised. They were filled with a sense of worthlessness concerning the subject consequently having their low self-concept bolstered. Some teachers admitted to having indulged the practice of making performance comparisons between pupils. They were however quick to add that it was not done with the spirit of demeaning pupils who were lagging behind in the subject. It was to encourage them to work hard and be like the bright girls. Here is F/T1 statement, *"It is not in bad faith that we compare our girls. We do it to motivate them that they can*

do it as well…" Further, F/T1 recalls telling one girl the following, "*…You are performing very poorly, try to be like X (meaning one of the girls in class who was performing very well). If she can do it you can also do it, she is just a girl like you..."* While M/T1 thought his actions on the girls with low Mathematics self-concept would have a positive effect, the girls themselves regarded them as injurious to their learning process. When brought to their attention, the teachers learnt this with regret.

Reflecting on the responses from all the three categories of participants in this section, it can be concluded that there are no dull persons but only slow learners. Further, it seems that it is difficult for a teacher to effectively address the needs of both fast and slow learners in a class of over 40 pupils. To avoid benefiting one category of pupils at the expense of another requires employment of adequate measures. For example, the teacher can embrace a culture of looking at the subject as simple and manageable by everyone. Thus, instead of introducing the topic as the most difficult topic as is the culture of most teachers of Mathematics, it should be introduced as the most interesting and simplest topic. In life, people generally, like to go for simple things. The right content, put together with the right attitude and interest on the part of the teacher can help to make the subject interesting and simple. In the next section, I discuss how teachers' Mathematics-related gender stereotypes influenced the development of low Mathematics self-concept in girls.

5.4.3 Teachers' Mathematics- related gender stereotypes

The girls with low Mathematics self-concept indicated that the attitude of some teachers could have reinforced Mathematics gender stereo-typing by passing such discouraging remarks as, *"Girls do not do well in Mathematics"*. Jane and *Busiku* said the following respectively:

> *My teacher puts me off when he says 'If it were boys they would have understood a long time. You are slow learners you and not like boys who understand at once'.*
>
> *Our teacher sometimes tells us that we are naturally lazy and that Mathematics is not for lazy people and that's why we continue to fail unlike boys.*

It is possible that the teachers might have uttered these statements loosely with no ill intentions but it is such utterances which continue to influence the development of low Mathematics self-concept in girls. Jane indicated that the effect of such words on her was negative, "*Somehow interest goes when the teacher compares us with the boys... It's like he is just doing it for the sake of it but deep down in his heart he knows it's difficult and only boys can handle it well."* Broadly speaking, teachers communicate to the girls that Mathematics is difficult and it is for boys. In the next excerpt *Milimo* indicates that these stereotypical sentiments about Mathematics did not start in grade eleven (where she was at the time of the interviews) but during her primary school days. She recalls, "*When I was in grade seven, my teacher then told me that drawing and Mathematics were subjects for boys and I took it that way. I think it made a lot of sense because it is too hard not only for me but for most of the girls I know."* In line with this, Dickman (1993) posits that, discriminatory teacher behaviour does not begin in the college classroom but rather with the advent of schooling. For instance, research has demonstrated that, from preschool onwards, activities chosen for classes appeal to boys' interests and the presentation formats selected are those with which boys excel or they are encouraged more than are girls (Fennema & Peterson as cited in Deku, Amponsah and Opoku (2013).

Parents also indicated that stereotypical sentiments and practices by teachers reinforced the development of low Mathematics self-concept in girls. Like girls, parents stated that sometimes teachers pass comments that are discouraging the girls. Though they did not go into specifics of which ones were said by particular teachers involved in the teaching of their children, they indicated generally that most teachers, especially the female ones, were in the habit of passing bad comments. One of the parents (M/P3) expressed herself as follows, *"Some teachers say 'you need to be tough like a boy for you to succeed in Mathematics." Similarly, others say 'for you to succeed in Mathematics you need to stop living a life of a girl or a woman".*

The excerpt above, if uttered to a girl who already has comprehension challenges in Mathematics would only serve to further discourage her, regardless of the intentions of the one saying them. These research findings indicate that both teachers and girls believe that Mathematics is too difficult for girls and is meant for boys. Similarly,

Tiedemann (2000) in his study of the 3rd, 4th and 5th grades in Germany found the following: that teachers believed that boys had greater Mathematics ability than girls; that boys were more capable of logical thought than girls; and Mathematics was a more difficult subject for girls than for boys. One parent (M/P5) had this to say about the power of a teacher's sentiments:

> *In as much as our children listen to us, when they start school they consider their teachers' word as very important especially as regard to their education. So what the teachers say is really taken seriously, especially if the family members at home are uneducated.*

Equally some teachers expressed their sadness that they sometimes pass such injurious statements. For example, one teacher (M/T1) said:

> *Whether we do it knowingly or unknowingly the fact is that injuries are made. Of course sometimes we do it jokingly but in the process we reinforce what the girls have heard already and so when we say it in whatever way, it becomes gospel truth.*

M/T1 agrees with Parent 5 who indicated that what teachers in most cases say about the pupils' academic performance is regarded as gospel truth. In the next excerpt, I quote most teachers' stereotypical sentiments as said by M/T2, "*Mathematics is challenging, boys enjoy challenging stuff more than girls…let me see those who are men to come and solve these problems."*

In line with M/T2, M/T1 seems to sum it up in this manner, "*Sometimes as we teach the subject, we teachers tend to be boastful about the subject and make scaring comments as if this subject was just meant for men".*

In view of this, Deku, Amponsah and Opoku (2013)'s study, which investigated the influence of teachers' classroom practices on the self-concept of primary school pupils with disabilities, found that teacher classroom practices have a moderate relationship with the self-concept of children with disability. This finding indicates that teachers' practices in class are crucial in enhancing the self-concept of children and indeed the Mathematics self-concept. Further, in their study they cited, Graduate School of Arts & Sciences Teaching Centre of Colombia University (2012) as showing the following as some of the practices from teachers which influence the way boys and girls look at Mathematics (i.e. Mathematics self-concept):

> Teachers call on male students more frequently than female students; teachers are more likely to use male students' names when calling upon students and in attributing ideas advanced in discussion; they ask male students more abstract questions but female students more factual questions; teachers are less likely to elaborate upon points made by female students; they ask female students easy questions; asking male students more difficult questions that require higher-order thinking; teachers look at male students to answer questions before females even when females have also raised their hands; and they refer only to male contributions (p. 629).

Broadly speaking, it can be said that boys and girls come to hold different beliefs about their academic abilities as a result of differential treatment in the classroom. In this case, even when the current study was a single sex one, with girls only, the impact seemed to be felt as teachers always compared between the two sexes in terms of Mathematics ability. Teachers generally, should refrain from sentiments such as 'this subject or topic is the one which separates women from men and turns men from women'. Male teachers especially have a culture of making things difficult as a way of gaining respect mainly from pupils of the opposite sex. Overall, the sentiments from teachers, harmless as they may look, are detrimental to the girls' formation of a positive Mathematics self-concept. In the next section, I discuss the findings on how few females in the field of Mathematics influenced the development of low Mathematics self-concept in girls.

5.4.4 Few females in the field of Mathematics

All the girls indicated in individual interviews and focus group discussions that their idea that Mathematics was for men was reinforced when they discovered that there was only one woman as a teacher of Mathematics at the whole school. The following two excerpts from *Twaambo* and Faith statements, typify the responses that were given, *"The presence of more female teachers of Mathematics can impact in a positive way on us as it makes us think women can also do it" "*and Faith said *"I wonder sometimes why we do not just leave Mathematics to boys because most teachers of Mathematics I have known are male. At this school alone only one out of four teachers is female. I think some things are just meant for boys."* These two excerpts seem to suggest that the girls with low Mathematics self-concept had been comforted with the state of affairs not only at *Chipembi* Girls but in many schools in the country. This situation seem to be aggravated by also the fact that out of about ten teachers in the Natural Sciences department only about three are female.

The inspirational role of role models was also underscored by the parents. Parents indicated that if there were a lot of Mathematics teachers who were women, the story would be different. F/P1had this to say:

> *Every teacher is a role model to the pupils…In a subject like Mathematics, and for the sake of girls, there is need for more females teachers. If you do not have them at your school take them to see in other schools where there are many to just prove the point. They say seeing is believing.*

F/P1 saw the need for more female teachers of Mathematics at the school as a means of motivating girls. And according to the parents, if for sure Mathematics was a subject even girls could successfully study, then there was need for tokens of that possibility in the person of more female teachers in the subject. M/P5 added, "*Looking at what the girls know about* Mathematics *already (that* Mathematics *is for men) and how this has affected their performance, there is need for more female fork to show up as role models in the area of Mathematics."*

Teachers in this study also seemed to agree with the views of the girls and parents that having few or no female teachers of Mathematics had a negative impact on girls' development of Mathematics self-concept. One teacher (M/T3) had this to say when asked on how the absence of female teachers of Mathematics impacted on the girls' self-concept of Mathematics:

> *You know there is just something that happens when you know everyone is doing it and that it can be done. Girls who are exposed to role models are not even difficult to deal. Rural girls in particular are victims as they lack exposure and so they not only have no one to look up to in their community but also at the school … They do not seem to visualize the benefit of excelling in Mathematics.*

The teacher above seemed to suggest that the girls that come from urban areas especially in this era are more exposed to women, not only teachers of Mathematics but also those who are in what is termed as Mathematics-related jobs such as engineering. Such women are a driving force to them. On the contrary, girls whose homes in rural areas like *Chipembi* lack this exposure and so they still struggle with the question of why they should really pursue Mathematics which is already giving them a lot of problems. In agreement with M/T3, M/T4 stated, *"We all need role models in our respective fields and if we do not find them we seem not to go anywhere. Role models are like engines, they fuel us so we can move."*

By and large, the absence of female teachers in Mathematics-related subjects is another aspect which makes the girls view Mathematics as a male territory and eventually develop a negative self-concept. In Lee and Sriraman (2012)'s 8-year-long qualitative study of two the Korean gifted girls (Kim and Lee), one of the girls, Kim, stated that most of the teachers of Mathematics she had met from the centre of gifted education as well as the private institute were men. This was how she expressed herself in front of a female interviewer who had excelled in Mathematics:

> Were you (interviewer) really good at Mathematics? Why did you continue to study Mathematics? Any females from my family didn't major in Mathematics or science, so you look weird to me. And I think you are really cool. But I am getting to like other subjects than Mathematics, like the other family members. How can one do well in Mathematics continuously? Did you study a lot of Mathematics every day? (p.8)

Thus Kim was surprised that there were women who excelled in Mathematics. It seems this was her first time to meet a female who has really excelled in the field of Mathematics. In the excerpt below Kim further showed that Mathematics was not for women:

> I liked Mathematics, but I don't think Mathematics is suitable for women of all ages because they are only few female Mathematicians. I looked up on a website of Mathematics faculty, but professors are mostly men.(p. 10).

It was pointed out in this Korean study that while the two girls were participating in gifted programs, they perceived gender inequality in the society. In particular, they noticed that whereas there were only few women professors and researchers in fields related to Mathematics, there were relatively higher proportions of women in humanities and sociology fields. They believed that it was difficult for them to choose Mathematics-related careers because of clear gender inequality in those occupations (Lee & Sriraman, 2012). With this Korean study, it is evident that the absence of role models in Mathematics-related fields can have a negative impact on the development of Mathematics self-concept. In the next section, I discuss the findings on how lack of consistent guidance and counselling programs in the school influenced the development of low Mathematics self-concept in girls.

5.4.5 Lack of adequate and consistent guidance and counselling programs in the school

All the seven girls who participated in the study indicated that the guidance and counselling department was existent in the school except its programs were not only inadequate but also inconsistent. Beauty argued:

> *I know that we have the guidance and counselling department in this school but the problem is that there isn't much to talk about it…programs are not consistent and I think there isn't much being done to help boost our morale for Mathematics.*

The girls did not only put the blame on the teachers of Mathematics in not helping the situation but also on the careers and guidance teachers. Further, *Twaambo* had this to say:

> *In as much as our Mathematics teachers do not really link Mathematics to real life, I feel the careers teachers would help if they were effective. They would tell us about different careers and how Mathematics is applied in those careers eventually we may start appreciating it.*

During interviews, four out of seven parents indicated that knew the role of the guidance and careers' department. They claimed that if this department worked hard, it would complement the efforts of the teachers of Mathematics. One of them, M/P5 said:

> *The work of the guidance department cannot be overemphasised. If there were promotion programs laid down and followed consistently, girls could eventually change their attitude towards Mathematics. I remember in our time we used to have programs where by every term we had different college students visiting us. This helped us to value all the subjects as the students would tell us about how each subject was important. Actually, it is through such that I developed my interest to do animal science and worked hard in Mathematics and Sciences.*

Note that M/P5 ended up becoming a veterinary doctor and he happens to be the grandfather to Faith. Had it not been for the programs of the guidance department, he might not have become a doctor. So the work of the guidance teachers should not be over looked instead it should be supported. In consonant with M/P5, F/P6 commented:

> *The guidance department can do wonders if it is well organised and the teachers in the department are very accommodative to help the pupils with*

> *their uncertainties...However let me be quick to mention here that even without the presence of the guidance teachers if the teachers of Mathematics are committed they can still make their girls change their negative attitude in Mathematics.*

Parent 6 seems to suggest that in as much as the guidance and counselling department was important, the teachers of Mathematics also can still make a difference if they worked towards improving the girls' low Mathematics self-concept. This also entails that the factors that influence negative Mathematics self-concept in girls are interwoven and cannot be traced to one specific factor.

The teachers interviewed were in agreement with pupils that careers and guidance teachers were not doing much to help the girls see the importance of Mathematics. M/T2 lamented:

> *Guidance teachers are not really helping us. They do not complement our efforts. Pupils are supposed to be shown the importance of subjects like Mathematics to almost all the careers that people like. We do it as we teach but they should hear it from independent persons of whom the guidance teachers are key.*

In the quote above, the teacher showed that though the department of careers existed, it had not put in place effective, consistent and deliberate programs to help the girls come to the full realization and understanding of the importance of Mathematics. In corroboration, another teacher stated, "*Some girls have aspirations of doing nursing, agriculture science and other Mathematics-demanding careers even when they know they are not performing well in the subject."* Thus the poor career guidance services were apparent. These findings are in line with what Nherera (1999) recommended, that girls should be guided and counselled. He added that they should be encouraged to learn and understand the importance of Mathematics at all stages in their education. According to him, guidance and counselling should start at primary school and continue into tertiary education. This emphasis to take guidance and counselling from primary to tertiary just shows how this department is important, not only to the girls but boys as well. In the next section I discuss the findings on poor organisation of the Mathematics club in the school.

5.4.6 Poor organisation of the Mathematics club in the school

Both in interviews and in Focus group discussions the girls indicated that the Mathematics club was not helpful to them as girls with low Mathematics self-concept. They argued that the club was purely organised to benefit the so called 'bright girls'. The girls made similar statements concerning. For example, *Lwiche* claimed, *"The Mathematics club in this school is just for the bright girls. Being bright in Mathematics was a gateway to joining the club"*. And Beauty added, *"Being good at Mathematics is an entry requirement to the club. Without it you are not welcome."*

Further, Beauty also claimed that the rationale for most clubs in the school was to gain access to outings. "*Most of the clubs in school are organised with the motive of going out on trips". Milimo* emotionally stated, *"They do not make both slow and fast learners understand. As if that is not enough they pick only girls who are good in Mathematics to belong to the Mathematics club. It is as if we do not exist."* These sentiments show that girls felt left out such that even if they wanted to improve, such practices in the school discourages them.

However, teachers denied the allegation that the Mathematics club was organised for trips. One of them, M/T1, arguing on why girls thought clubs were organised for trips stated, *"Just because girls think most clubs in school are organised for trips does not make the* Mathematics *club truly a part of that assertion. Girls naturally love fun, and trips are very important to them."* On the point that the club was made up of only bright girls, the teacher (M/T2) involved had this to say to justify the practice:

> *We formed a Mathematics club consisting only of those who are high achievers in Mathematics. The whole idea was to make these girls understand ahead of others so that when teachers of Mathematics were not around, they could able to teach others…. In class, we would also want to use the same girls to help solve the problems so as to reduce on wasting time, which we do not really have.*

Although parents were not in position to tell that the Mathematics club consisted of bright girls only, they regarded it as one way in which girls with low Mathematics self-concept could be helped to improve their performance in the subject. One parent (F/P7) had this to say in relation to the club, *"Sometimes pupils fail to ask in class*

but when with their friends in a group, it is an opportunity for them to ask questions and learn from others."

Broadly speaking, and in line with one of the parents (F/P7), in as much as it was important to organise the Mathematics club consisting only of the bright girls who would later teach others, the practice seems not to have been well received by those who were low performers. The idea behind the formation of the club was clearly misplaced and not beneficial to the girls who are struggling with Mathematics. Pupils seem to learn better when they interact with their peers. Segregation the fast from the slow learners can only breed alienation between peers as the latter feel that they are second class nonetheless. In the next section, I give a summary of the chapter on discussion of the findings.

5.5 Summary

In this chapter, I have discussed the findings of this research. I categorised the discussion into three main themes indicating the factors that influenced the development of low Mathematics self-concept in girls at *Chipembi* girls' Secondary School. These themes were: Individual factors, family and community factors, and teacher and or school factors.

Concerning the individual factors, it was found that girls themselves had negative perceptions about the subject and this played a role in developing a low self-concept in Mathematics. All the three categories of participants indicated that girls looked at Mathematics as a difficult subject and that it was meant for men. The other individual factor that fed into low Mathematics self-concept was poor Mathematics background.

As regards family and community factors, all the categories of participants in the interviewed were in consonant that the following factors contributed to the development of low Mathematics self-concept in girls: culturally motivated practices of family and community, parents' Mathematics-related gender stereotypes, and the uneducated family and community. Others included parents' low socioeconomic status and bad influence from peers.

Among the school factors, the participants also agreed on most of the factors including: poor personality qualities of some teachers of Mathematics, lack of support for the girls with low Mathematics self-concept, and teacher Mathematics-related gender stereotypes. Lack or limited number of females in the field of Mathematics or those teaching Mathematics, lack of consistent guidance and counselling programs in the school, and poor organisation of the Mathematics club in the school were the other factors that encouraged a low Mathematics self-concept in girls. In the next section, I give my conclusions and recommendations.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

In this whole study I have endeavoured to show that the factors that influence negative Mathematics self-concept in girls require a more holistic approach. Particularly, I have shown how individual factors, family and community factors as well as teacher and school factors influenced the development of negative Mathematics self-concept in girls. In this chapter I first present a summary of the main findings, then the recommendations arising from this research and lastly I make suggestions of areas that require further research.

6.2 Summary of the main findings

The purpose of this study was to establish individual factors, family and community factors, and school factors that reinforced the development of girls' low Mathematics self-concept in selected grade eleven pupils at *Chipembi* Girls' Secondary School in *Chisamba* District of the Central Province of Zambia. In order to have an in-depth and broader understanding of these factors, I used qualitative research methodology and particularly the IPA to analyse the qualitative data. I also integrated the findings from girls, parents, and teachers.

Individual factors that were found to influence girls' low Mathematics self-concept include, negative perceptions of Mathematics and poor background of Mathematics. The findings from girls, parents and teachers in this study have indicated that girls look at Mathematics as a very difficult subject and that it is for men. These perceptions seem to emanate from cultural beliefs.

With regard to the second theme, this study revealed that poor background of Mathematics influenced the development of low Mathematics self-concept in girls. The girls and their parents indicated that during primary school, Mathematics was not really a problem but things negatives changed come in beginning from junior secondary school. The reasons they gave to this change ranged from teachers missing lessons, unpalatable teacher attitude during Mathematics lessons, and change of teachers to mention but a few. Though teachers could not specifically talk

about the background of the girls in relation to Mathematics, they gave an indication of how interrelated topics and concepts in Mathematics were. It was this nature of the subject that saw some girls with poor Mathematics backgrounds consequently made them develop low Mathematics self-concept.

A number of themes emerged showing how the family and the community influenced the development of low self-concept in Mathematics among girls. These included: culturally motivated practices of family and community, parents' Mathematics-related gender stereotypes, the uneducated family and community members, parents' low socioeconomic status, and bad influence from peers.

Culturally motivated practices of families and communities such as the gender role stereotyping in the way duties were allocated influenced the development of low Mathematics self-concept in girls. Though teachers could not specifically refer to the girls on the duties which were administered to them when they were growing up, they generally agreed with the girls and parents that home chores and duties were allocated on gender lines. This was a factor that could have contributed in a way to the girls' development of low Mathematics self-concept. Under the theme of parents' Mathematics- related gender stereotypes, it was agreed by all participants that parents pass comments which are discouraging to the girls' development of Mathematics self-concept.

The findings on the theme of the uneducated family and community showed that uneducated family and community members influenced low Mathematics self-concept in the sense that the families and communities breed no role models and also parental involvement in the child's education was poor. With regard to parents' low socioeconomic status, findings indicate that low Mathematics self-concept in girls from *Chisamba* area was linked to the high poverty levels. Five out of the seven parents were not able to satisfy their girl children with all they needed to learn Mathematics effectively and consequently develop the needed Mathematics self-concept which further could have improved performance in Mathematics.

The final theme that emerged among family and community factors was bad influence from peers. The findings indicated that the peers in the community in which the girls grew up were not encouraging in the sense that they had poor

education background. In addition most of them were school drop outs. Similarly, when girls were in school they chose to play with friends who had similar problems, including in Mathematics. They did so because they felt comforted to be in a group with attributes they shared rather than to associate with those that were doing well in Mathematics from whom they received no help.

Themes that emerged indicating how teacher and school factors contributed to the development of low Mathematics self-concept in girls include: poor personality qualities of some teachers of Mathematics, lack of support towards the girls with low Mathematics self-concept, and teachers' Mathematics- related gender stereotypes. Others were fewer or no females in the field of Mathematics such as teachers, lack of consistent guidance and counselling programs in the school, and poor organisation of the Mathematics club in the school.

Findings have shown that teachers of Mathematics were to some extent harsh, uncaring and impatient – all of which are hostile attributes for a learning environment. The teachers themselves did not agree to these allegations but instead said if at all they had such qualities in them they did not mean to harm their pupils. With regard to lack of support for the girls with low Mathematics self-concept, the findings have shown that there were some practices of teachers which hindered girls with low Mathematics self-concept from progressing. Though girls and parents seemed to agree on most of these practices (such as comparing the bright girls with the poor performers and unfair treatment of the two groups in relation to Mathematics), teachers themselves did not really see these acts as wrong. They thought they would obtain a positive effect as an outcome of such actions, and that is to help the girls get inspired. The teachers put the blame on the careers teachers whom they thought had not employed effective programs to help the girls realize the full importance of Mathematics not only in their daily lives but also in their preferred careers. The teacher-centred method of teaching which was attributed to big classes and heavy teaching loads was seen to have reinforced the development of low Mathematics self-concept.

Teachers' Mathematics-related gender stereotypes was another factor that influenced the development of low Mathematics self-concept in girls. All the three categories of research participants seemed to agree that Mathematics gender stereotypical

sentiments passed by teachers reinforced the development of girls' low Mathematics self-concept.

The findings on the theme 'few females in the field of Mathematics' showed that the idea that Mathematics was for men was reinforced when it was discovered that there was only one woman as a teacher of Mathematics at the school and indeed in many Mathematics related fields such as sciences at the school and elsewhere.

Another theme that was found was inconsistent guidance and counselling programs in the school. Although all the categories of participants in this study indicated that the guidance and careers' department had a key role in helping girls with the low Mathematics self-concept, they were aware that the services were inconsistent and effectiveness at the school. Lastly, poor organisation of the Mathematics club in the school was also seen as a factor that influenced the development of low Mathematics self-concept in girls. In this study, all the girls indicated that though the Mathematics club was in existence in the school, the way it was organised as was unfair and not helpful to those with low self-concept in Mathematics. Nevertheless, the teachers defended the manner in which the club was organised. They argued that it was for the purposes of helping the same girls who had problems with Mathematics in a more efficient way especially during the periods when the teacher of Mathematics were not in class.

Reflections on these findings seem to suggest that to better understand girls' negative Mathematics self-concept, one needs to employ a holistic approach and not an atomistic one. The holistic approach allows studying the problem in context rather than studying it in fragments. For one to have a broader and deeper understanding of the girls' negative Mathematics self-concept, one needs, to not only understand what girls go through as individuals in relation to Mathematics, but also what goes on in girls' families and communities as well as their encounters in schools, where teaching and learning takes place.

In view of these findings, I make some recommendations in the next section which have the potential to benefit not only *Chipembi* Girls' Secondary School but the whole education system in Zambia.

6.3 Recommendations

1. The findings in this study indicated that chores, toys and games assigned to children on gender lines encourages the erroneous belief that relatively harder things in this world are for boys and much simpler ones are for girls and as such Mathematics is one of the things they take to be difficult and for boys only. Therefore, chores, toys and games should not be assigned to children on gender lines as a way of avoiding this fallacy.

2. The results showed that teachers of Mathematics have a tendency of paying more attention to bright girls than the poor performers in Mathematics. Teachers should know that both increased attention with the bright girls and even negative attention with low Mathematics self-concept girls reinforce behaviours and that girls need equal attention for them to perform effectively. Ultimately, teachers of Mathematics should try to be courteous and considerate in the teaching and learning of Mathematics. Additionally, the math club should not be restricted to bright girls only as this make the low performers not cared for.

3. The findings established that *"Mathematics is abstract in nature, that is to say, it involves numbers that you cannot touch in reality".* In Mathematics, numbers and formulas cannot be touched or experienced like real life objects. This somehow makes Mathematics seem difficult to girls as they would like to experience the world. Therefore, Mathematics teaching and learning should be made girl friendly and related to real life. For instance, the teacher can encourage the use of practical problems in assignments and also the Careers department can be proactive on career and education guidance program.

4. Teachers' Mathematics-related gender stereotypes were among the factors that reinforced the development of girls' negative Mathematics self-concept. There is need for teacher-training institutions to have in their curriculum gender issues so as to sensitize would-be teachers about Mathematics gender stereotypes and the dangers thereof before they are deployed.

5. The findings showed that there were few females in the field of Mathematics and Sciences locally and country wide. For instance, in the Mathematics department alone only one teacher out of four was female at the school. In the natural Sciences department only three were female out of a total of about ten teachers. This situation robbed the girls of role models and mentors who would have boosted their low Mathematics self-concept. The MOESVE to train more female teachers in Mathematics and Sciences subjects.

6. School managers and heads of Mathematics department should find ways of avoiding overloads on teachers of Mathematics so that they could spend more contact hours with pupils, thereby giving more opportunity to girls with low self-concept in Mathematics to improve. In addition, ways should be put in place to reduce the high turn-over of teachers as it takes more time to establish new bonds with new teachers.

7. Parents and teachers should monitor the friendship lines of their girls. In the school environment for example the teachers can deliberately pair the low achievers in Mathematics with the high achievers. Further, enhanced interactions between teachers and parents should be encouraged so as to map out strategies that can benefit the girls both at home and in school.

8. Through Continuous Professional Development (CPDs) and refresher courses, teachers of Mathematics can improve their pedagogical skills so as to be effective in their profession. They should be reminded to continue to be gender sensitive in their teaching and the methods of teaching should appeal to the needs of a girl. Teacher-centred methods should be minimised while individualized teaching should be encouraged so that in the process pupils who are lagging behind can also be taken on board and receive the help they need.

9. Passing Mathematics is not currently a requirement for entry into both grades 8 and 10. This could be partly the contributing factor to the apathy girls have toward the subject and therefore, a pass in Mathematics should be an entry requirement. This can significantly encourage girls to work hard at an early stage and thus, improve performance standards.

10. The Guidance and Counselling department should devise more consistent and proactive programs to meet the needs of the girls with low Mathematics self-concept as most of them were found to have come from poor socioeconomic backgrounds and broken homes as well as not knowing the importance of Mathematics in their future careers! If possible there should be a full time qualified counsellor and at least a period per week reserved for him/her to attend to all these issues.

11. Through the Guidance and Counselling department, female role models and mentors in various Mathematics related professions can be invited to talk to girls about their experiences in Mathematics. Thus they would indicate how they managed to overcome obstacles to girls' success in Mathematics. Additionally, these role models can be guest speakers at the club meetings, and field trips can be taken to explore career options - all of which may inspire a budding mathematician!

A number of issues that require future investigation were identified in this research; probably due to the fact that there has been limited research work done in Zambia on girls' negative Mathematics self-concept. The next section has suggestions of areas that need further research.

6.4 Suggested further research

Based on the findings of this study, the following are some of the areas that I think need further research:

1. This research study was based on a single sex school (girls only). It would be interesting to conduct a study of girls' low Mathematics self-concept at a co-education school.

2. The current study was also done at a school in a rural set up. To add value to the study of girls' low Mathematics self-concept, comparative studies of the factors that influence girls' low Mathematics self-concept in rural areas and those in urban areas could be carried out.

3. This study among other things has indicated that one of the factors that led to development of negative Mathematics self-concept was lack of role models in families and communities. Therefore, conducting a study to find out the differences in levels of Mathematics self-concept between those girls who have role models in their families and communities and those who do not would be interesting.

4. A comparative study on the factors that influence positive Mathematics self-concept in both girls and boys who are high achievers would add great value to the study of self-concept.

5. In this study, it was also found that the Guidance and Counselling department was inconsistent in its programs. Conducting a study on what activities can effectively improve the self-concept of girls in Mathematics could add value to the body of knowledge on Mathematics self-concept.

6. How *'toys and games'* boys play with influence a Mathematical mind in boys, and how *'dolls'* girls play with influence a motherly instinct which further impact on their Mathematics self-concept would be exciting to research on.

7. A comparative study on the factors that influence positive Mathematics self-concept in high achievers and factors that influence negative Mathematics self-concept in low achievers among girls would add great value to the study of Mathematics self-concept

8. A longitudinal study would be interesting to carry out, on the same girls with low Mathematics self-concept in the current study, to ascertain among others their career paths and more importantly their Mathematics self-concept and what would have been the factors.

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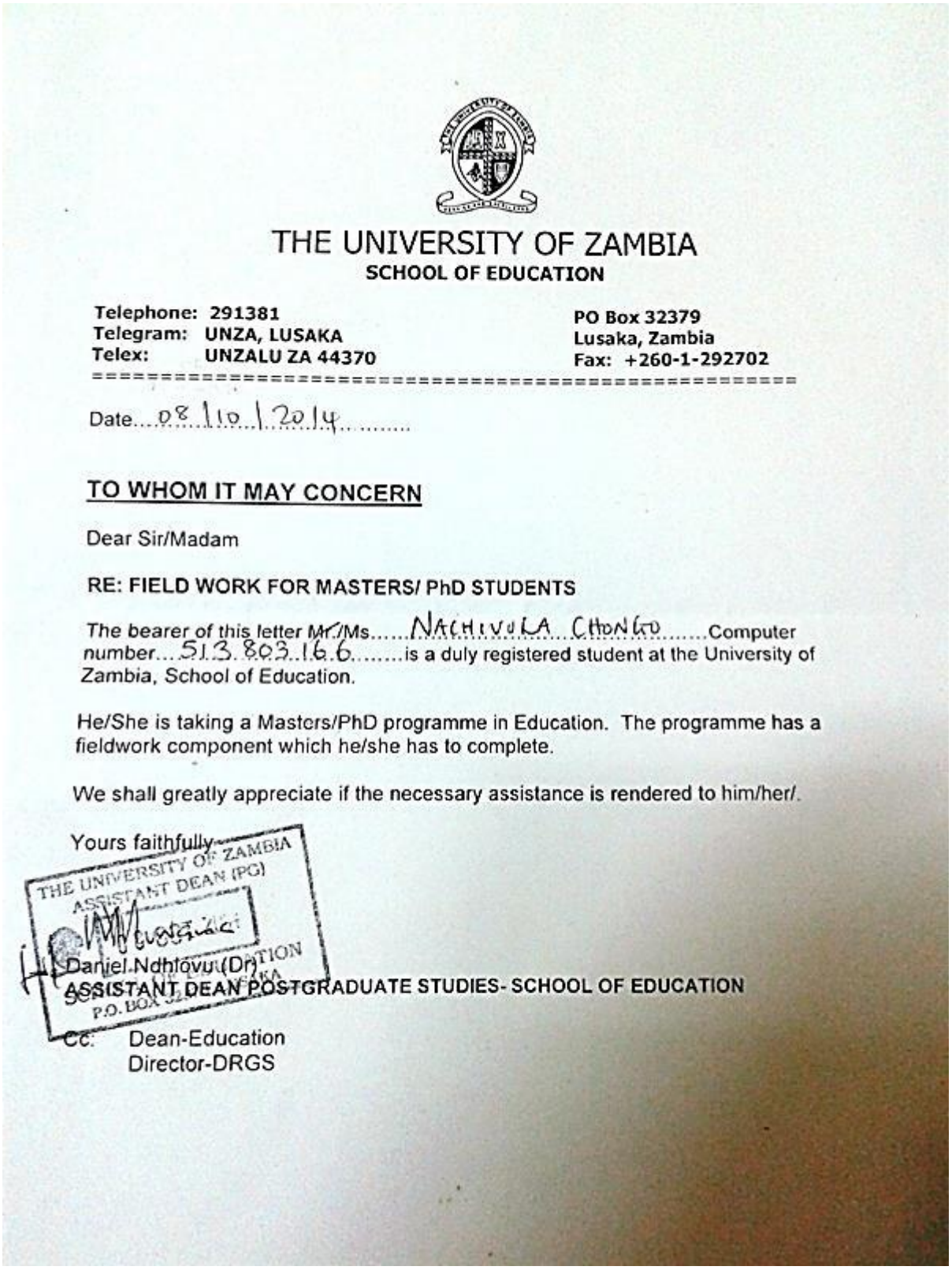
APPENDICES

APPENDIX A: INTRODUCTORY LETTER



THE UNIVERSITY OF ZAMBIA
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Fax: +260-1-292702

Date 08/10/2014

TO WHOM IT MAY CONCERN

Dear Sir/Madam

RE: FIELD WORK FOR MASTERS/ PhD STUDENTS

The bearer of this letter Mr/Ms NACHIVULA CHONGO Computer number 513.803.16.6 is a duly registered student at the University of Zambia, School of Education.

He/She is taking a Masters/PhD programme in Education. The programme has a fieldwork component which he/she has to complete.

We shall greatly appreciate if the necessary assistance is rendered to him/her/.

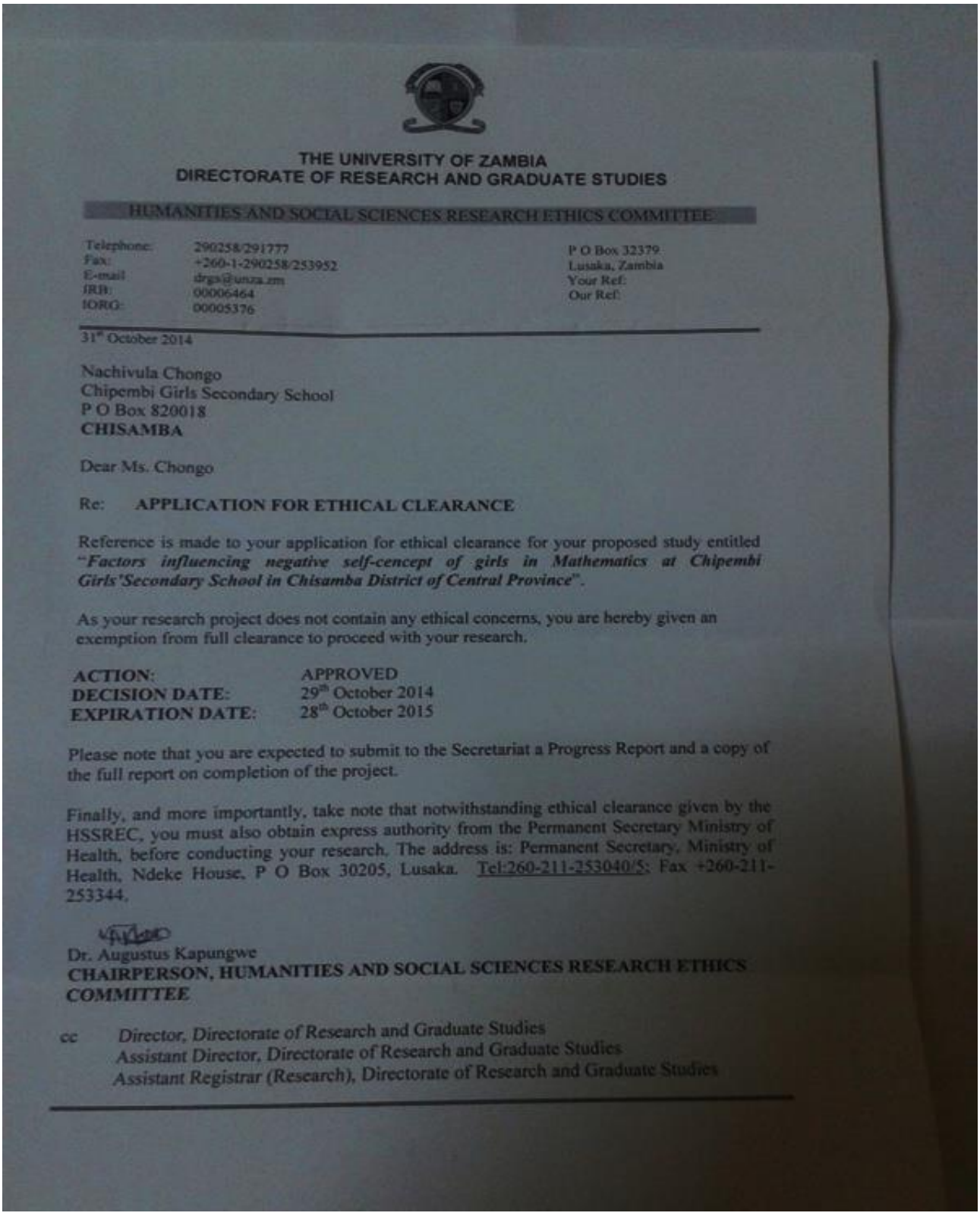
Yours faithfully

THE UNIVERSITY OF ZAMBIA
ASSISTANT DEAN (PG)
P.O. BOX 32379

Daniel Ndhlovu (Dr)
ASSISTANT DEAN POSTGRADUATE STUDIES- SCHOOL OF EDUCATION

Cc: Dean-Education
Director-DRGS

APPENDIX B: ETHICAL CLEARANCE



THE UNIVERSITY OF ZAMBIA
DIRECTORATE OF RESEARCH AND GRADUATE STUDIES

HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

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E-mail: drgs@unza.zm
IRB: 00006464
IORG: 00005376

P O Box 32379
Lusaka, Zambia
Your Ref:
Our Ref:

31st October 2014

Nachivula Chongo
Chipembi Girls Secondary School
P O Box 820018
CHISAMBA

Dear Ms. Chongo

Re: **APPLICATION FOR ETHICAL CLEARANCE**

Reference is made to your application for ethical clearance for your proposed study entitled "***Factors influencing negative self-cencept of girls in Mathematics at Chipembi Girls'Secondary School in Chisamba District of Central Province***".

As your research project does not contain any ethical concerns, you are hereby given an exemption from full clearance to proceed with your research.

ACTION: APPROVED
DECISION DATE: 29th October 2014
EXPIRATION DATE: 28th October 2015

Please note that you are expected to submit to the Secretariat a Progress Report and a copy of the full report on completion of the project.

Finally, and more importantly, take note that notwithstanding ethical clearance given by the HSSREC, you must also obtain express authority from the Permanent Secretary Ministry of Health, before conducting your research. The address is: Permanent Secretary, Ministry of Health, Ndeke House, P O Box 30205, Lusaka. Tel:260-211-253040/5; Fax +260-211-253344.

Dr. Augustus Kapungwe
CHAIRPERSON, HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS *COMMITTEE*

cc *Director, Directorate of Research and Graduate Studies*
Assistant Director, Directorate of Research and Graduate Studies
Assistant Registrar (Research), Directorate of Research and Graduate Studies

APPENDIX C: CONSENT FORM

UNZAREC FORM 1b

THE UNIVERSITY OF ZAMBIA
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HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

CONSENT FORM
(Translated into vernacular if necessary)

TITLE OF RESEARCH:

REFERENCE TO PARTICIPANT INFORMATION SHEET:

1. Make sure that you read the Information Sheet carefully, or that it has been explained to you to your satisfaction.
2. Your permission is required if tape or audio recording is being used.
3. Your participation in this research is entirely voluntary, i.e. you do not have to participate if you do not wish to.
4. Refusal to take part will involve no penalty or loss of services to which you are otherwise entitled.
5. If you decide to take part, you are still free to withdraw at any time without penalty or loss of services and without giving a reason for your withdrawal.
6. You may choose not to answer particular questions that are asked in the study. If there is anything that you would prefer not to discuss, please feel free to say so.
7. The information collected in this interview will be kept strictly confidential.
8. If you choose to participate in this research study, your signed consent is required below before I proceed with the interview with you.

VOLUNTARY CONSENT

I have read (or have had explained to me) the information about this research as contained in the Participant Information Sheet. I have had the opportunity to ask questions about it and any questions I have asked have been answered to my satisfaction.

I now consent voluntarily to be a participant in this project and understand that I have the right to end the interview at any time, and to choose not to answer particular questions that are asked in the study.

My signature below says that I am willing to participate in this research:

Participant's name (Printed): .....

Participant's signature: ..... Consent Date: .....

Researcher Conducting Informed Consent (Printed) .....

Signature of Researcher: ..... Date: .....

Signature of parent/guardian: ..... Date: .....

APPENDIX D: PARTICIPANT INFORMATION SHEET

HSSREC FORM 1a

THE UNIVERSITY OF ZAMBIA

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HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE

PARTICIPANT INFORMATION SHEET

TITLE OF RESEARCH:

PURPOSE OF THE STUDY:

DESCRIPTION OF THE STUDY AND YOUR INVOLVEMENT:

CONFIDENTIALITY:

VOLUNTARY PARTICIPATION AND WITHDRAWAL:

RISKS AND BENEFITS:

CONTACTS FOR QUESTIONS (Names, addresses and phone numbers of the following):

1. **Principal Investigator**

2. **Dr. A. Kapungwe**
   Chairperson, Humanities and Social Sciences, Research Ethics Committee,
   University of Zambia
   P O Box 32379
   LUSAKA

3. **Prof. I.A. Nyambe**
   Director, Directorate of Research and Graduate Studies
   University of Zambia
   P O Box 32379
   LUSAKA

APPENDIX E: SELF-CONCEPT SCALE

Instructions: *Below is a list of statements dealing with your general feelings about Mathematics. If you strongly agree, tick under SA; if you agree with the statement, tick under A; if you disagree, tick under D; and, if you strongly disagree, tick under SD.*

STATEMENT		Strongly Agree(SA)	Agree(A)	Disagree(D)	Strongly Disagree(SD)
1.	I feel that I am a person of worth in the area of Mathematics, at least on an equal plane with others.	○	○	○	○
2.	I feel that I am good at Mathematics.	○	○	○	○
3.	All in all, I am inclined to feel that I am a failure in Mathematics	○	○	○	○
4.	I am able to solve Mathematical problems as well as most other people.	○	○	○	○
5.	I feel my performance in Mathematics is not something I can be proud of.	○	○	○	○
6.	I take a positive attitude toward Mathematics.	○	○	○	○
7.	On the whole, I am satisfied with my performance in Mathematics.	○	○	○	○
8.	I wish I could have more knowledge on solving Mathematical problems.	○	○	○	○
9.	I certainly feel useless solving mathematical problems at times.	○	○	○	○
10.	At times I think I am no good at all in Mathematics.	○	○	○	○

Your score on the scale is: ☐.

Scores are calculated as follows:

For items 1, 2, 4, 6, and 7: Strongly agree = 3, Agree=2,

Disagree = 1,

Strongly disagree = 0

For items 3, 5, 8, 9, and 10 (which are reversed in valence):

Strongly agree = 0,

Agree = 1,

Disagree = 2

Strongly disagree = 3

The scale ranges from 0-30. Scores between 15 and 25 are within normal range; scores below 15 suggest low self-esteem.

(Source: Adapted from Rosenberg, 1965)

APPENDIX F: HISTORY TIMELINE OF CHIPEMBI MISSION AND THE SCHOOL

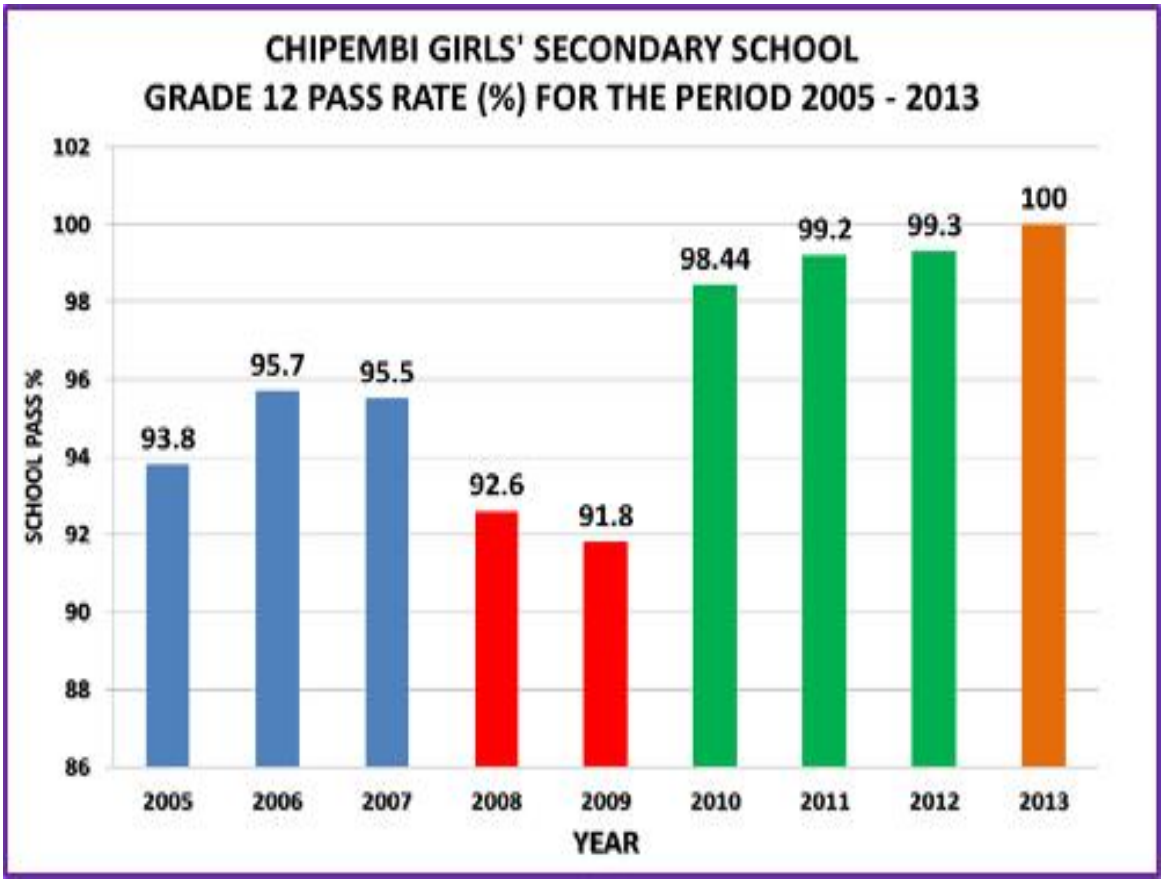
Date	Event
1912	Rev. Loveless settled near *Chipembi*'s village, where it was heathier, and built a hut on a nearby hill – the start of *Chipembi* Mission.
1913	AndriasMtshede started the village school at *Chipembi*. Rev. Douglas Gray replaced Rev Loveless who became ill with malaria and had to return to England.
1914	Rev. Gray spent 7 months on trek, exploring the surrounding country and placing evangelists at village stations. Rev. J. Ward Nave sent to assist in the work at Chipemb Rev. Gray left *Chipembi* to act as a medical orderly to the armed forces on the borders of Kenya during the First world War.
1915	Rev. Hertbert Carter spent a year at *Chipembi* as Rev. Nave's colleague before returning south.
1918	Rev. Gray returned to the mission station with his wife Mrs Louie Gray, who was a trained nurse Rev. and Mrs. Gray established extensive vegetable gardens, planted fruit tree, visited flu victims and made a well.
1918-1922	Local evangelist-teacher were trained at the annual winter School held at *Chipembi*. This became the Evangelists' village to enable longer training for the men and their wives.
1926	Permission granted to build a boarding school for boys and girls. The boys' compound was at the bottom of the hill and the girls' compound was on the hill top, 150 feet above the surround countryside. 13th August the Boarding School for Boys at *Chipembi* opened Mr. Lazarus Kamera, a Mutonga who had been trained at Waddilove, was the first teacher at the Boys School. Miss Dorothy Hinks, who was to be the first teacher at *Chipembi* Girls' School, sent out from the Methodist Women's Department and went first to Waddilove to gain experience.
1927	1st March – the first girls (27) arrived at *Chipembi* Boarding School for Girls. School motto "Atuumeluteeta" "Lets us blaze the trail" Miss Hilda Ramakupelo came from Waddilove (boarding school in Southern Rhodesia) as an assistant teacher. Miss Grace Harrison came from England as a Domestic Science teacher. September – 20 boy boarders arrived.

1928	Upper primary school was started at *Chipembi*
1929	The Government granted 350.00 per annum for 5 years to enable the Mission to appoint an Agricultural Missionary.
1930	Mr. W. Hubert Turbull, an agriculturalist, strated an agricultural Training scheme at *Chipembi*, for the Evangelists as well as the boys. The farm provided food for the school. Miss Helen Dugdale arrived at *Chipembi* to develop the Domestic Science teaching and to train the wives of the evangelists in hygiene and housecraft. Mrs Louie Gray (Ba Ma) died in hospital in Salisbury (Harare), suddenly and unexpectedly, from cerebral malaria.
1931	Mr. Headley j. Roberts became the first Schoolmaster. Rev. Herbert G. Rolls joined the staff and trained and inspired the small group of evangelists. Rev. Rolls also introduced 'Scouting' for the boys Naomi Kalulu and Miriam Mukabila became the first two women in Northern Rhodesia to qualify as teachers and were appointed to the staff of the school *Chipembi* became the first African school in Northern Rhodesia to train women teachers.
1932	The first paid medical worker was appointed by the Methodist Mission Society to *Chipembi* – Miss eric Martin; she had grown up in the country and been trained at Bulawayo
1933	40 girls and 66 boys in residence at the Boarding School 4 classes of *Chipembi* girls took appointments on the *Chipembi* Plan and held services.
1934	Mary kalulu became the first girl in Northern Rhodesia to pass Standard 6. Having taken her Middle school Teacher Certificate, she joined the staff at *Chipembi*.
1936	Rev. Gray left *Chipembi* to take on the Circuit at Nambala Mission.
1941	Boys in Standard 5 and 6 were transferred to Kafue School. The remaining boys transferred to a new Middle School at Chamuka and there was a small provision for weekly boarders. This left *Chipembi* as a girls school.
1945	Miss M. A. Huntely appointed to *Chipembi* to train teachers. Synod agreed to move the school down to the plain
1946	March- Miss Audrey Gray and Rev. Merfyn Temple were married in the church at *Chipembi* by Miss Gray's father, Rev. Douglas Gray Girls at *Chipembi* had to cook for themselves and sometimes had to find mice and wild vegetables in the bush because food was scarce. The accommodation was very primitive and the girls often slept on mats on the floor.

1947	The first Junior Secondary School for Girls in Northern Rhodesia was opened at *Chipembi*, with Miss Helen Dugdale as Principal.
1948	*Chipembi* school girls move 750 tons of stones and rubble down the hill to the new site to make cement and enable the new school to be built.
1950	Honor Kaluba became the first girl in Northern Rhodesia to go from *Chipembi* to start Secondary School studies at the well-known Southern African School, Tiger Kloof.
1955	Miss Nancy Green was appointed to teach French and Maths
1956	Senior Secondary classes opened at *Chipembi* and took girls from all round the country who had completed primary education. Miss Dora Warwick was Principal
1957	Eight girls passed their School Certificate examination – the first in Northern Rhodesia. One of these was Mrs. Gertrude Zulu.
1958	12 first year trainee teachers were transferred to the David Livingstone Teacher Training College in Livingstone. Miss Huntley took over as Principal at short notice
1961	First Form 6 for girls in the country was opened at *Chipembi*
1962	*Chipembi* celebrated its Golden Jubilee – 50 years and Rev. Gray was the chief guest.
1972	51% of Form 5 gained School Certificate
1997	Denny Lumbama, Headmaster of *Chipembi* Girls'
2002 2003	Maybin Luulu appointed Headteacher
2003 Aug	Link established between Oatridge Agricultural College and *Chipembi* Farm College. Donation of material on farming techniques and animal husbandry.
2005	Dorothy Munansangu appointed Headteacher
2010	Albert Chituka appointed Headteacher of *Chipembi* Girls' Secondary School A five year (2011 – 2015) Strategic Plan developed for the school. First of its kind in UCZ Schools The school had a record high passing percentage, i.e. 97.84 and 98.44 for Grade 9s and 12s, respectively.
2011	Minister of Education, Dora Siliya visited the school and influenced the Government to disburse One Hundred & Fifty Million Kwacha (K150,000,000.00) for the construction of a new pupils' hostel. Strategic academic interventions yielded historic results for Grade 12s. Only one candidate got a GCE, giving the school a 99.22% pass rate.

Source*: http://Chipembigirls.com/index.php/history/2-history*

APPENDIX G: CHIPEMBI GIRLS SECONDARY SCHOOL HISTORICAL RESULTS AT GRADE 12 FROM 2005-2013



Source: ***Chipembi Girls Secondary School Headteacher's Office Data Base-2015***

APPENDIX H: INTERVIEW GUIDE FOR PUPILS

QUESTIONS ABOUT PARTICIPANT'S PERSONAL INFORMATION AND EXPERIENCES WITH THE FAMILY AND THE COMMUNITY AT LARGE

1. How old are you?
2. What kind of environment have you grown up from? (rural or urban)
3. Tell me about your performance in Mathematics since you started school (eg. primary education and secondary education)
4. How do you view Mathematics?
5. How do people at home (parents, siblings, close relatives) view Mathematics?
6. What level of education have your parents attained? (e.g. primary education, secondary education or higher education)
7. What kind of jobs do parents, siblings and close relatives do?
8. What are your career aspirations?
9. It seems Mathematics is key in your proposed career how are you going to go round this?(optional)
10. How true is the view that Mathematics is for men?
11. Could we talk about some practices that your parents engage in which influence your attitude towards Mathematics.
12. How about some utterances which your parents use which influence the way you look at mathematics.
13. In which ways are you inspired by your parents to take up Mathematics?
14. Tell me about the reaction of your parents when you don't perform well in mathematics?
15. Do your parents get involved in solving your mathematical problems?

QUESTIONS ABOUT PARTICIPANT'S EXPERIENCES WITH TEACHERS OF MATHEMATICS

16. Let us talk about some of the practices of teachers that contribute to your attitude towards mathematics.
17. What are some of the utterances teachers use that have contributed to the way you look at mathematics.
18. How do teachers show that mathematics is the subject for men?
19. What support do teachers of mathematics provide for you in the area of mathematics
20. How do other teachers in other subjects treat you concerning your performance in mathematics?
21. What practices should teachers engage in to improve your performance in mathematics?
22. Could you talk about some of your role models.
23. How does the presence/absence of female teachers of mathematics affect the way you look at mathematics?

QUESTIONS ABOUT PARTICIPANT'S EXPERIENCES WITH THE PEERS

24. In what ways do peers influence the way you look at mathematics?
25. Do most of your peers perform well in mathematics?
26. What activities do your peers like to do in their spare time?
27. What do most of your peers' parents do?
28. Tell me about most of your peers' career aspirations.
29. What do you think can help boost your attitude and performance in mathematics?

END OF INTERVIEW

APPENDIX I: INTERVIEW GUIDE FOR TEACHERS

QUESTIONS ABOUT TEACHERS' PERSONAL INFORMATION AND EXPERIENCES WITH THE GRADE ELEVEN GIRLS

1. How long have you been teaching Mathematics to girls?
2. How do you view Mathematics?
3. What is your general experience of teaching Mathematics to girls?
4. What reasons can you give for the low self-concept in mathematics concerning the girls in question.
4. What are some of the practices that you engage in that you think influence the way girls think about Mathematics?
5. How about some utterances that you use that might have had an influence on girls' outlook of Mathematics.
6. In which way do you think mathematics is the subject for men?
7. What support do you provide for your girls with negative attitude in the area of Mathematics?
8. How do other teachers in other subjects treat the girls concerning their performance in Mathematics?
9. Who is to blame in the poor attitude that girls have toward Mathematics?
10. How are you a role model to the girls?

QUESTIONS ABOUT PARTICIPANT'S EXPERIENCES WITH THE PARENTS OF GIRLS WITH LOW SELF-CONCEPT

11. What are some of the parents 'practices that you think influence the way girls look at Mathematics?
12. How about the utterances from parents which may influence the way they look at Mathematics
13. How are parents involved in improving their children's attitude towards Mathematics?
14. How have you involved parents to the girls with poor results in the improvement of Mathematics?

QUESTIONS ABOUT PARTICIPANT'S EXPERIENCES WITH THE PEERS (IN THE SCHOOL AND HOME ENVIRONMENT) TO GIRLS WITH LOW SELF-CONCEPT

15. In what ways do girls with low self-concept influenced by their peers in the area of Mathematics?
16. Do most of the peer group of the girls with low self-concept perform well in Mathematics?
17. What activities do the peers to the girls with low self-concept like to do in their spare time?
18. In which way does the sex of the peer group matter in influencing the way girls look at Mathematics?

END OF INTERVIEW

APPENDIX J: INTERVIEW GUIDE FOR PARENTS

QUESTIONS ABOUT PERSONAL AND PARENTS' EXPERIENCES WITH THEIR GIRL CHILD IN THE AREA OF MATHEMATICS

1. What do you do for a living?
2. What level of education have you attained?
3. What career aspiration did you have when you were growing up?
4. Let's talk about the career aspirations that you have for your child.
5. Tell me about your performance in Mathematics when you were still in school.
6. How do you view mathematics?
7. How do people in your community view Mathematics?
8. Could we talk about some practices that you engage in which influence your child's negative attitude towards Mathematics.
9. How about some utterances which you produce which may influence the way your child look at Mathematics.
10. In your own opinion what made your child to develop a negative attitude towards Mathematics?
11. What generally are the reasons for girls attitude towards Mathematics in your community?
12. How does your community perceive girls' attitude towards Mathematics.
13. In which ways do you inspire your child to take up Mathematics?
14. What is your reaction to your child when she does not perform well in Mathematics?
15. Do you get involved in solving your child's mathematical problems?

QUESTIONS ABOUT PARTICIPANT'S EXPERIENCES WITH TEACHERS (E.G. TEACHERS OF MATHEMATICS)

16. Let us talk about the practices of teachers that may contribute to your child's attitude towards Mathematics.
17. What are some of the utterances you think teachers use on pupils that might have contributed to the way your child looks at Mathematics.
18. What support do teachers of Mathematics provide for your child in the area of Mathematics?
19. How do other teachers in other subjects treat your child concerning her performance in Mathematics?
20. During Open Days do teachers of Mathematics take time to explain to you how you can help your child in the area of Mathematics?
21. Have you made any effort with the teachers to help your child in the area of Mathematics (e.g. engaging your child in extra tuitions)
22. Could you talk about some people who are your child's role models

QUESTIONS ABOUT PARENTS' EXPERIENCES WITH THE PEERS TO THEIR CHILDREN

23. In what ways do peers influence the way your child looks at Mathematics?
24. Do most of her peers perform well in Mathematics?
25. What activities do most of your child's peers like to do in their spare time?
26. What do most of the parents to your child's peers do?

END OF INTERVIEW

APPENDIX K: FOCUS GROUP DISCUSSION GUIDE FOR PUPILS

QUESTIONS ABOUT PARTICIPANTS' EXPERIENCES WITH THE FAMILY AND THE COMMUNITY AT LARGE

1. How do you view Mathematics?
2. How do people at home (parents, siblings, close relatives) view Mathematics?
3. What are your career aspirations?
4. What are some of the expectations from your parents and the community at large concerning your future career?
5. What do you think are some of the reasons why you have a negative attitude towards Mathematics
6. Do you share in the view that Mathematics is for men?
7. Could we talk about some practices that your parents engage in which influence the way you look at Mathematics.
8. How about some utterances which your parents use which influence the way you look at Mathematics.
9. In which ways are you inspired by your parents to take up Mathematics?
10. Tell me the reaction of your family when you do not perform well in Mathematics?
11. Do your parents get involved in solving your mathematical problems?
12. How does the community in which you live influence the way you look at Mathematics?

QUESTIONS ABOUT PARTICIPANTS' EXPERIENCES WITH TEACHERS OF MATHEMATICS

13. Let us talk about the practices of teachers that contribute to the negative attitude towards Mathematics.
14. What are some of the utterances teachers use that have contributed to the way you look at Mathematics.
15. What support do teachers of Mathematics provide for you in the area of mathematics
16. How do other teachers in other subjects treat you concerning your performance in math.
17. Could you talk about your role models
18. How have the role models influenced the way you look at Mathematics?

QUESTIONS ABOUT PARTICIPANTS' EXPERIENCES WITH THE PEERS

19. In what ways do peers influence the way you look at Mathematics?
20. Do most of your peers perform well in Mathematics?
21. What activities do your peers like to do in their spare time?
22. What do most of your peers' parents do?
23. Tell me about most of your peers' career aspirations.
24. Does the sex of the peer group matter in influencing the way you look at Mathematics.

END OF INTERVIEW