PERCEPTIONS OF PARENTS ON GENDER DIFFERENCES IN MATHEMATICS PERFORMANCE IN SECONDARY SCHOOLS IN ARUA MUNICIPALITY, ARUA DISTRICT, UGANDA.

BY

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DECLARATION

I Mustafa Mundu M. MEDMGT/3998/62/DU do here by declare that the study titled "Gender differences in Mathematics Performance in Arua Municipality" is entirely my own work, except where acknowledged. This title has not been submitted before to any other University or Institution of higher learning for the award of a degree.

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APPROVAL

This thesis has been submitted for examination with our approval as the candidate's University supervisors.

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DEDICATION

This work is dedicated to the FEMALE children of the nation who would wish to aspire for Mathematics and Scientific courses for advancement of Science and Technology in the country. And to My late Dad who put the corner stone of this foundation and would have loved to see the out come of such. He shall always receive such dedications. From ALLAH we all came and unto Him we shall return.

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Yes, it has come to be real, the credit for this goes to the Almighty ALLAH, and with Him everything is possible.

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LIST OF ACCRONYMS

APA	:	American Psychological Association
CDSS	:	Community Day Secondary Schools.
DRC	:	Democratic Republic of Congo
EFA	:	Education For All.
FEMSA	:	Female Education in Mathematics, Science and Technology in
FGD	:	Focus Group Discussions.
SMT	:	Science, Mathematics and Technology.
UCE	:	Uganda Certificate of Education.
UNESCO	:	United Nations Education Scientific Organization.
US	:	United States of America.

ABSTRACT

Over the past two decades, women limited participation in science, technology and mathematics (SMT) courses in tertiary institutions have been a cause for a concern in Uganda. Women today, constitute over half of the world population. This research was designed to investigate the present situation of female participation in SMT in Arua Municipality, visa-a vis the effects of this limited participation on national development. Data for the study were obtained from a survey conducted in two Local Government Division Areas of Oli River and Arua Hill divisions, the west Nile region head quarters.

Questionnaires, guided interviews and focus group discussions were among the methods used in soliciting for the data from the respondents. A total of 100 students, 40 parents and 50 teachers were successfully interviewed. The result obtained confirms the earlier assertion that female are underrepresented in SMT. It also showed that more than 70% of the parents, 66% of teachers and 76% of students accepted that there was gender disparity in SMT;socialization processes inculcated gender biases through the different roles and responsibilities assigned to girls and boys.

A package of communication strategies are therefore recommended to encourage teachers and researchers to recognize prejudicial practices which may still disadvantage girls particularly within classrooms, even where policy and statistics suggest that equality has been achieved. Also, career guidance teachers should play a major role in showing girls how to choose subjects combination in high school which suits their aptitudes and, family members should encourage girls to take up scientific programs.

CHAPTER ONE

INTRODUCTION

1.0 *Chapter Overview*

This chapter puts down the write up of the background to the study, the magnitude of the problem statement, the research objectives and questions that were generated for the study, the scope of the study and it shows the out right beneficiaries of the project and how they will benefit from its outcome.

1.1 Back ground to the study

Education is a fundamental human right. It is the key to sustainable development and peace and stability within and among countries, and thus an indispensable means for effective participation in the societies and economies of the twenty-first century, which are affected by rapid globalization. Achieving Education For All (EFA) goals should be postponed no longer. The basic learning needs of all can and must be met as a matter of urgency (Dakar, 2000). EFA goal number five calls for an equal number of girls and boys to be enrolled in primary and secondary schools by 2005-this is what gender parity means (even though not all girls and boys may be enrolled at this stage). It further aims to achieve gender equality in education by 2015. This is a more ambitious goal, meaning that all girls and boys have equal opportunity to enjoy basic education of high quality, achieve at equal levels and enjoy equal benefits from education. This was a reaffirmation of the vision of the world declaration on Education For All in Thailand city of Jomtien (Jomtien, 1990). Examples of some of the important speeches in the famous Dakar conference emphasizing on EFA and equality in education are stated below:

"...This conference is a test of all of us who call ourselves the international community. Ten years ago, at Jomtien, we set ourselves the goal of basic Education for All. We are still far from achieving it. Let us start this conference by resolving not to rest until we have made it a reality..."

(Annan, 2000).

'...The commitment made at Jomtien 10 years ago promised education as a reality for all in 2000. Why make such a commitment? First and foremost because education is a fundamental right enshrined in the Universal Declaration of Human Rights, a sine qua non for the development of the individual; deprived of basic education, individuals will remain unaware that this education to which they were not given access was a right that they could have demanded. Secondly, because education helps to improve security, health, prosperity and ecological balance in the world, just as it encourages social, economic and cultural progress, tolerance and international cooperation. It is the essential bedrock for the building of sustainable peace and development. You are all strongly convinced of this, and that is why we are all here together...'

(Matsura, 2000)

'...No country has succeeded without educating its people; education is key to Sustaining growth and reducing poverty.' (Wolfenson, 2000)

According to the Socio-economic conditions (UCC, 2000), only 41% of the eligible school going population aged 6 – 24 years are in school. 3% are temporary out of school, 28% have left school another 28% have never attended school. Today over 330,000 children go to school who mostly attend UPE with very few going to private schools. Education in the district is characterized by high costs to parents as evidenced by low retention of children in schools. The schools in the district continue to have inadequate infrastructure such as books, desks, classrooms, sanitation facilities, teacher houses and so on.

The district has over 320 primary schools of which over 270 are UPE and the rest are run by private entrepreneurs. There are 47 secondary schools, 25 government aided and 22 in private hands. As for higher institutions, the district has one primary teacher training college government aided, one National Teacher College also aided by the government. Added to that, there are 3 technical institutes all in the hands of the government and 2 business colleges in private hands. Lastly, the district has one nurse-training institute (UCC, 2000).

Arua district is strategically located at the frontline of two countries namely, the Sudan and the Democratic Republic of Congo (DRC). Most of the trade with these two countries passes through the district. The society is multilingual with its diverse peoples co-existing peacefully. It is the leading producer of fire-cured tobacco in Uganda

Arua district is found on latitudes between 2 degrees 30' north and 3 degrees 50' north; and longitudes 30 degrees 30' East and 31 degrees 30' East in the north western part of Uganda (see appendix C). The total land area of Arua district is 5419 sq. km of which 5208 sq. km is arable land and the rest wetland (UCC, 2000).

The district of Arua has many challenges in the education sector and most important of these are as follows:(i) High school drop out of students (ii) Inadequate secondary schools in light of high enrolment in primary schools due to UPE programme (iii) Gender differences in mathematics performance (iv) Very low levels of school infrastructure (v) Inadequate water and sanitation facilities in Schools (vi) Low numbers of qualified and poorly motivated teachers (UCC, 2000).

In spite of the various actions and inputs by government as well as intervention by Non-Governmental Organisations (NGOs), religious organizations and international organizations, girls still lag behind boys at all levels of education. They continue to avoid courses, which lead to careers in science and technology.

Deeper forces in society that extend well beyond the boundaries of educational systems, institutions and processes cause gender inequality in science, mathematics and technology (SMT). As observed in some studies (Alele-Williams, 1988; Adelman, 1991; Erinosho, 1994; Kahle & Meece, 1994), the basic causes of gender discrimination against women involvement in education generally, are deeply rooted in socio-culturally determined attitudes. The socio-cultural factors include patriarchy which encourages and perpetuates discrimination against females, sex stereotype, division of labour in which domestic chores at home are assigned to females. All these factors tend to discourage females from more active participation in science and technology.

For instance, in some homes, particularly of illiterate parents who still form the majority of Ugandan populations, given the literacy level of less than 30% (UCC, 2000), education of boys is given priority and more prominence in view of the need to perpetuate family name in a competitive society.

Furthermore, the cultural division of labour stereotypes certain careers as unfeminine and incompatible with marital demands. Largely because majority of science and technology-related careers have in-built inflexibility in work schedules, requiring those involved to be taken out of their homes to the laboratory or the field, they are believed to be incompatible with feminine responsibility to meet the dual-role demand of home and work. Consequently, majority of girls with potentials for technical and scientific skills, are discouraged from pursuing SMT subjects. As observed by Kahle and Meece (1994) that it is not that girls cannot and do not have the ability to succeed in science, mathematics and technology courses, but rather that obstacles arise in recruiting and retaining girls.

Studies have also, shown that girls are facing many obstacles caused by societal ills such as poverty (Alele-Williams, 1988; Erinosho, 1994). Because girls are still largely under-valued by society, when family members become incapacitated by illness or old age, girls are often the first to be relegated to the caregiver status and thus further compromising their chances of self-development and success. They are also the most defenseless and vulnerable; hence, they are more open to rape, sexual harassment and gender-based violence in schools and society (Adelman, 1991).

Since there are no policies against gender balance in science and technology activities and access to educational institutions enjoy reverse discrimination in favour of females, the constraints against parity in participation or performance in science and technology are mainly sociocultural, economic and of teaching/learning process factors.

Research is therefore, essential to up-date knowledge and information on this subject matter. This research, therefore, open up new areas on how to overcome socio-cultural and economic barriers associated with gender differentials in science, mathematics and technology and encourages more girls to study science and mathematics and ultimately play an important role in technological development of Arua district in particular and Uganda in general.

1.2 Statement of the Problem

Since 1986, the Uganda Government's Ministry of Education and Sports (MoES) has through a number of key policy documents, declared its commitment towards redressing the disparities that characterize the provision of education for girls (MoES, 1990). The government has, both of its own volition and through collaboration with donors and Non-government Organizations, set up several gender-responsive programs to expand and improve education of girls. These efforts have been intensified by Uganda's belief that the girl-child is entitled to equal access to education as a human right and that the educated girl-child is a linchpin in the development of the nation.

Currently, the gender disparities in education are mostly caused by high dropout rates of girls in upper primary school characterized by low retention, repetition, dropout and non-completion. Thus while countrywide enrolment figures for girls are fairly good in P1 and P2 (48% for girls and 52% for boys), from P4 onwards there is widening of the gender gap. The completion rate for girls is estimated to be 65% while that of boys is 71% (MoES 2003).

Most of our current education system is based upon competition among students for grades, scholarship and admission to schools. On the other hand, the society is tending towards assuming unified challenges for both male and female. There is therefore the need to give equal opportunities to both male and female to enable them develop the necessary required skills and capabilities to face the challenges.

The need to identify the status of differences in boys and girls in mathematical problems and open up new areas on how to overcome socio-cultural and economic barriers associated with gender differentials in mathematics so as to make for closing the gap, if any, is imperative.

1.3 Purpose of the Study

The study sought to determine the reasons for gender differences in mathematics in secondary schools.

1.4.0 Research Objectives

The following specific objectives were generated for the study:

(i) To find out the parent's perception of their child's performance in mathematics.

(ii) To find out whether there is gender differences in mathematics performance.

(iii) To analyze the relationship between mathematics and science and technology.

1.4.1 Research Questions

The following questions were carefully generated for the study:

(i) In what ways do the parents account to their child's success and failure in mathematics?

(ii) What are the differential factors for gender differences in mathematics performance?

(iii) What is the relationship in performance between mathematics and science and technology?

1.5 Scope of the Study

This study was conducted in Arua municipality a cosmopolitan town comprising of two great divisions comprising of several wards, namely; Tanganyika, Pangisha and Kenya wards (Oli river division) and the Hill division which lies right on the historical hill of the municipality. Islam is the predominant religion practiced in this town.

The study was to confirm the assertion that there is gender differential in mathematics performance.

1.6 Significance of the Study

In SMT subjects, mathematics is the heart in secondary school curriculum. It is the language of understanding other science subjects and in the evaluation of the student's performance. There is, therefore, a paramount need to close the gender differential that exists in mathematics performance.

The findings of the researcher may assist the following:

The Ministry of Education and Sports. The Ministry will find the researcher's recommendation useful and may adopt them for proper planning to help close the gender gap in mathematics performance.

The World Education Forum. To formulate policies to address gender disparity in education.

The National Curriculum developers would ensure that the curriculum designed does not include mathematical topics that are not of direct relevance to the secondary schools/students.

The researcher expects *The Inspector of schools* to use these resourceful ideas to constantly monitor the administration and activities of schools to avoid continual gender differential cases in mathematics performance.

The *stake holders* like the parents and teachers association is expected to benefit by providing their child's basic mathematics requirements to enhance the closure of the gender gap.

Mathematics *teachers and students* would learn and get further experience from their past performances that could have created gender differentials in mathematics performance.

The *researcher* too is expected to benefit from the research, for it, will promote his career in research and enable him come out with adoptable recommendations that can partly or fully solve the title problem of the research in question.

Other researchers too in a similar or related topic from within or outside the scope of the study would find this report very resourceful and interesting to consult from.

CHAPTER TWO

REVIEW OF THE RELATED LITERATURE

2.0 *Chapter Overview*

This chapter focuses on the conceptual frame work and the review and critique on other people's research work on gender differences in mathematics.

2.1 The Conceptual Frame Work

The main purpose of this research was to seek out the reasons for gender differences in mathematics performance.

The term gender refers to the social differences between females and males throughout the life cycle that are learned, and though deeply rooted in every culture, are changeable over time and have wide variations both within and between cultures. "Gender" determines the roles, power and resources for females and males in any culture. Historically, attention to gender relations has been driven by the need to address women's needs and circumstances as women are typically more disadvantaged than men (UN Office of the Special Adviser on Gender Issues & Advancement of Women, 2002). Increasingly, however, the humanitarian community is recognizing the need to know more about what men and boys face in crisis situations.

As field practitioners, team leaders and policy-makers our job is to make sure that the assistance and protection we provide meets the needs of all the population equally, that their rights are protected and that those most affected by a crisis receive the support they need (UN Office of the Secretary-General, 2003).

For many people the term "gender" evokes specific issues. Some think of gender as being about women only. Others consider it to be related to reproductive health matters or gender-based violence. Confusion about the terminology and some individual and institutional resistance has resulted in *ad hoc* analysis and action. Some argue that addressing gender inequality in programming is akin to "social engineering" and goes against cultural norms in different societies. People conducing gender analysis point out that what is taken as the "cultural norm," however, may disguise a strong desire to retain male privilege, and that women themselves may have a different perspective than men on their own needs and rights (UN Office of the Special Adviser on Gender Issues and Advancement of Women, 2002).

Gender equality or equality between women and men refers to the equal enjoyment by females and males of all ages and regardless of sexual orientation of rights, socially valued goods, opportunities, resources and rewards.

Equality does not mean that women and men are the same but that their enjoyment of rights, opportunities and life chances are not governed or limited by whether they were born female or male. Protecting human rights and promoting gender equality must be seen as central to the humanitarian community's responsibility to protect and provide assistance to those affected by emergencies.

Two main strategies are needed to reach the goal of gender equality, namely gender mainstreaming and targeted actions in response to a gender analysis, as well as a number of programmes which together make up a gender equality programme. In 1997, the UN system adopted the strategy of gender mainstreaming as a means of attaining gender equality. It is shorthand for saying that the impact of all policies and programmes on women and men should be considered at every stage of the programme cycle — from planning to implementation and evaluation.

According to the *English dictionary* 'mathematics –in a strict sense- is the abstract science which investigates deductively the conclusions implicit in the elementary conception of spatial and numerical relations'

The knowledge of mathematics is based on our observations of physical and social environment i.e. it arises out of practical applications. We form certain intuitive ideas or notions known as *axioms* and *postulates*. These are self- evident truths.

Therefore; the research independent variable (often called explanatory variables or predictors) is 'gender differential' while the research dependent variable (sometimes called outcome or criterion variable) is 'performance'.

The conceptual factors that cause the gender differential in mathematics include; home and community based factors (e.g. parental education; masculine fallacy of SMT subjects; cultural practices; traditional belief of a woman as a wife and mother; house hold chores, and money); poor facilities and physical inputs, distance to and fro school; safety of girls and the time use by girls. These are as shown below in the conceptual diagram:

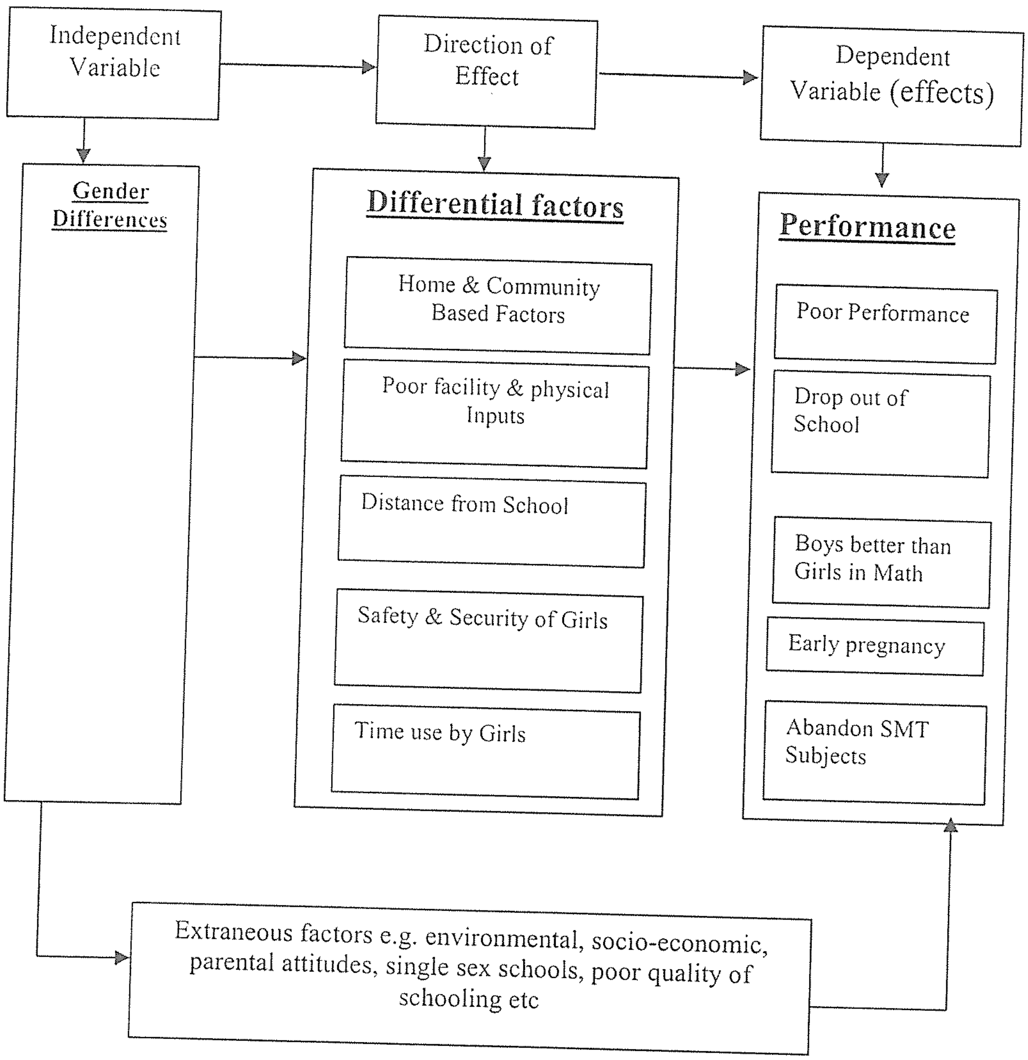

Fig 1: Conceptual frame work

2.3 The Review of Related Literature

2.3.1 Parents Perception of their Child's Performance in Mathematics

Available literatures have not been able to identify a single direction of difference in performance between male and female students subject to inequalities in their physiological structures (Kadiri, 2004).

A child's gender is an attribute that has been repeatedly demonstrated to direct parental perception of children. According to our culturally predominantly representation of intelligence, boys are expected to surpass girls in the cognitive domain in mathematics particularly, whereas girls are expected to surpass boys in the verbal domain.

There is ample research evidence to show the existence of gender differentiation in parents of their child's competencies. Accordingly, boys are seen as superior to girls in mathematics and physical sciences, whereas girls are seen to be superior to boys in language skills and reading (Andre, Whigham, Hendrickson & Chambers, 1999; Bornholt & Goodnow, 1999; Eccles, Janis, & Harold, 1990).

Further more, these differentiations seem to be independent of any differences that might exist in the children proficiencies as measured by tests and grades; parental influence also seem to influence children self perceptions and tasks involvements (Eccles-Parson et al.,1982).

Although boys and girls do equally well at school, parents are still inclined to perceive gender-related differences. This suggests that parents may interpret equally good performances by boys and girls in different fashions. It is, then, useful to look at the parental explanations for their child's school achievement (Weiner, 1986).

Drawing on attribution theory, Yee and Eccles (1988) postulated a hypothesis that parents elaborate different views of boys' and girls' mathematical ability because they may make different casual attributions for their sons' and daughters' mathematical performance. In a test of this hypothesis, they found that parents of boys rated 'natural talent" as a more important reason for their child mathematical success than did parents of girls. In contrast, parents of girls rated effort as a more important reason for their child s' mathematical success than did the boys parents. Yee and Eccles did not detect a gender effect on parental attributions of mathematical failures, as parents usually saw a lack of effort as the reason for mathematics failures of both boys and girls. Consequently, to the extent that parent's attributions impact differently on girls and boys, it is their attributions for success that are the likely mediators, not their attributions for failure.

Yee and Eccles (1988) only focused on parental attributions of mathematical performance. An interesting research question for a subsequent studies would be, in what ways do parents account their child's success and failure in verbal tasks , when, according to our culturally predominant representations of intelligence, girls are expected to do better than boys?

In this study the researcher will request parents to recall events from their child's first school year in which the child succeeded and failed in mathematics. The researcher will then ask them to explain these events by rating the importance of three potential causes: the child's mathematical or verbal talent, effort, and task difficulty. The researcher expects talent to be emphasized in explanations of boy's math success and effort in the explanation of girl's mathematics success.

2.3.2 To find out whether there is gender differences in mathematics performance.

The following are some of the differential factors for gender differences in mathematics performance.

2.3.2.1 Safety and Security of Girls

Recent research underscores the salience of safety factors in keeping girls out of the school. Parents may want their daughters in school but worry about their safety away from home, traveling to and fro school.

Sexual harassment is downplayed in most communities. However, sexual harassment of girls by males in the community including family members, teachers and boys can have a drastic effect on the girls' education and result in her dropping out of school. Very often complain of sexual harassment of girls is ignored and many girls do not report incidences which occur. Some girls withdraw and become reclusive when they are disturbed by sexual harassment. Once girls start withdrawing from people, their performance in school goes down. When the person sexually harassing the girl is along the way to school or in school, she begins to skip school and ultimately drops-out of school.

Research has shown that most schools in Africa do not always guarantee the security of the students especially girls (Chimombo et al., 2000; Maluwa-Banda & Lunguzi, 2002; Kadzamira & Chibwana, 1999). Unlike in urban areas, most of the rural schools do not have a protective fence around the perimeters. There are reports that in some schools girls were subjected to different types of abuse and harassment from male students followed by male teachers. Although there is insufficient data or documented evidence at present, there are anecdotal data that there are instances of sexual harassment in form of male teachers propositions, impregnating and marrying school girls, and flirtation between school boys and schoolgirls (Maluwa-Banda & Lunguzi, 2002).

A recent study on improving Girls Education in Under-Resourced Community Day Secondary Schools (CDSSs) in Malawi revealed that sexual abuse was one of the most pertinent problems girls were facing. The main perpetrators ranged from male teachers, male students to members of the community (sugar daddies). The so-called sugar daddies ranged from priests and businessmen to those working in different government and non-governmental departments. The prevalence of sexual abuse by teachers in some rural CDSSs was very disturbing. For example, in some CDSSs up to half of the male teachers were reported to have had sexual relations with their school-girls in exchange for better grades or extra tuition. These practices often lead to poor performance of girls in mathematics.

2.3.2.2 Home and Community Based Factors

Community participation has received increased attention in international and national policy in recent years. It is considered important as an end in itself (as a democratic right), as well as a means to the achievement of sustainable development and poverty alleviation (Stiglitz, 1997). The interest in community participation has occurred simultaneously with an intensified focus on achieving gender parity in education, and community participation may be seen as one of the means to achieve this goal. One of the potential outcomes of community participation as an end in itself is the transformation of gender relations, allowing the opportunity for women to participate alongside men in decision-making, for example. As a means to an end, community participation in education is seen as a way to increase resources, improve accountability of schools to the community they serve, ensure a more cost-effective use of resources and, importantly, be responsive to local needs. As a result, it intends to improve equitable access, retention, quality and performance of schooling.

Community schools involve the community in construction and management of schools, although the extent to which the community is involved can vary considerably. The establishment and support of schools by communities has always been evident in many SSA countries, often as a response to the failure of government provision. In Kenya, for example, the secondary system evolved largely as a result of community support through *Harambee* schools. These are seen as one of closest examples in SSA to 'spontaneous grassroots initiative for the delivery of education' (Rugh & Bossert, 1998). However, over time, the lower quality of these schools compared with government schools became increasingly apparent, given the limited time and resources communities were able to provide. Although there was almost a gender balance in secondary enrolment overall (girls' enrolment was 46% of the total), boys benefited more from the better-resourced state schools while girls were over-represented in the poorer quality community schools (Rugh & Bossert 1998). *Harambee* schools became merged into the government system in the mid 1980s, when all non-private schools began to receive the same per student government subsidy, although their structures and facilities remained of poorer quality. Locally-supported community schools at both the primary and secondary level have also been in existence elsewhere. For example, urban Zambia as overflow 'state' schools, differing from government schools only because they are completely funded by local contributions and fees (Hyde, 2003).

Community participation in government schools: As mentioned, construction of government schools has always been supported by community contributions in many Sub- Saharan African countries. In Malawi, for example, from the commencement of formal education, self-help was recognised as important by both the Missions and the colonial administration, predominantly with the aim of supplementing the insufficient resources available for education, as well as of making people more involved in their children's education. At this time, a deliberate policy of government resources favouring urban areas, while rural areas were expected to develop education facilities through self-help projects, on the assumption that self-help was more difficult in urban areas. Prioritisation of public resources towards urban areas continued post-independence, despite recognition that self-help projects in rural areas often failed due to limitations on the time and resources of poor members of these communities. This has contributed to the uneven development of schooling opportunities which have continuously favoured urban areas (Rose, 2002).

Traditional belief of a woman as a wife and mother: This traditional belief still prevails in society. Hence the attitude that it is more beneficial to formally educate a boy than a girl and that girls only need to be educated and trained in house chores to prepare them for marriage still persists.

Family size: Large families at times face problems in educating their children. When faced with economic hardship, a great number of parents, even those aware of the importance of girls' education, are forced to educate boys at the expense of girls. It is still argued that the man is the "bread winner" and hence boys need more education than girls who will get married and will have a man take care of them. Some parents send their girls to school later in the school term when they have acquired some money but because the girls have missed out so much by then, they do poorly and eventually drop-out of school.

Masculine fallacy of mathematics: Society generally believes that SMT subjects are difficult and a boys' domain. Since SMT subjects are compulsory in primary school, girls have no alternative but to participate in class. However, concentration is poor and participation and performance low. This affects the grades in SMT subjects and determines the ability to continue and perform well in SMT subjects in secondary school.

Parental education: Most parents are aware of the benefits of sending their daughters to school. However, when situations arise which prevent them from educating all their children; girls are usually the ones who are not enrolled.

Household chores: There is a greater need for girls' rather than boys' labour at home. Many parents keep their daughters at home whenever there are some chores (cooking, selling, farming, taking care of other siblings or sick members of the family, laundry, etc.) to do.

Early Marriage: In some communities, religious and traditional norms dictate that girls are to be married at a certain age and when they are still in school with no prospects of marriage when they mature, it puts the family in disgrace. The girls are therefore pulled out of school as soon as they reach maturity to prepare them for marriage. Some men do not like very educated wives who may challenge their authority. When such men, especially the rich, want to marry a girl, the parents prefer to pull her out of school since marriage would also solve some of the family's financial problems.

2.3.2.3 Distance to and from School

Research has shown that there is a differential impact on the likelihood that boys and girls enter school at the correct age and stay there. Long distances discourage girls from enrolling in school, and parents are even reluctant to send young girls to distant schools to prevent them from being molested (Burchfield & Kadzamira, 1996; Kadzamira & Chibwana, 1999; Maluwa-Banda & Lunguzi, 2002). In Uganda, there is no official policy to have schools within a walking distance of some few kilometres. On average children tend to travel shorter distance to schools in urban than in rural areas. Though there is no definitive data, estimates stand at average of 4-7 kilometres between home and nearest school in rural areas.

The number of schools in most districts in Uganda has not kept pace with population growth. Pupils and students sometimes have to travel long distances before they get to school.

In primary schools and in secondary schools when girls are day students, traveling long distances before arriving in school decreases their productivity since they arrive in school already tired. Participation and performance in any subject, mathematics included is then hampered.

Where boarding schools have opened up admission for day students, traveling long distances is still an issue, however, and girls arrive in school late, missing the first lessons of the day (usually mathematics or science), or get back home too tired for any meaningful studies. When they live long distances from school, girls are not able to participate in private tuition classes held after school hours or discuss homework assignments as they are expected to leave the school compound by a certain time or they need to hurry back home before darkness falls. In some cases where girls live a long distance from school, they are forced to take up lodgings in the town where the school is located which gets them exposed to many unscrupulous and harassing situations. Some families allow their daughters to lodge with relatives who may not necessarily be the right people to select as guardians. When schools are at some distances from home, parents tend to worry about the safety of their daughters and often are unwilling to let them go to school. All these hardships frustrate the girls who may then drop-out of school (Bray 1996; Kattan & Burnett, 2004).

Long distances from school promote lateness and truancy among students. In some schools, especially in the primary sector, lateness to school guarantees punishment which is usually by caning. Girls would rather skip school for the entire day than risk this form of punishment which is painful and embarrassing. Lateness also results in missing the early morning lesson which in many primary schools is mathematics. Mathematics is a hierarchical subject and when lessons are missed, it is difficult to join in at a later stage. Unfortunately, most schools are unwilling to change the time table to remedy the situation.

Besides, reaching isolated groups in most societies tends to be costly, and as a lower public priority, the supply of schools and teachers tends to lag, which reinforces low demand.

The direct costs of secondary school—in the form of school fees, family contributions, and unofficial fees—can represent a high share of poor families' disposable income (Bray 1996; Kattan & Burnett, 2004). These expenses can prevent families from enrolling their children in school. For the excluded, who typically have low incomes and limited demand, such charges can prove insurmountable.

Other costs of education (school uniforms, textbooks, transportation) can also represent significant barriers. These costs may be particularly high for girls because of their lost household labor and the costs associated with safety en route to and at school (Birdsall, Levine, & Ibrahim 2005).

Families may have a preference for educating boys over girls, given better labor market opportunities for boys and the fact that girls in many societies are "married away," joining the husband's family and no longer providing for or living with their own families. The general preference for boys found among most excluded groups in developing countries adds to the disadvantage experienced by girls.

Most excluded groups are poor, in part because of lower economic returns to education. Excluded groups' educational attainment remains well below that of the majority population. Exclusion and gender discrimination lead to lower returns to almost all investments in comparison with similar investments aimed at the majority population, for several reasons (Bray 1996; Kattan & Burnett, 2004). First, excluded groups tend to suffer multiple forms of discrimination. This lowers their economic and social status, which in turn shapes their attitudes toward education and reduces their motivation to learn. Second, expectations of limited economic returns to education among excluded groups reduce demand for education, particularly for girls, because women face greater labor market discrimination than do men. Third, the quality of public programs, including education, directed at marginalized groups tends to be inferior to those aimed at majority populations.

Fourth, lack of role models and preschool preparation place excluded children at a distinct disadvantage when entering school, further reducing their motivation. Poor progress, high costs of schooling, and higher opportunity costs of sending children to school also make these children more likely to drop out. Thus even in countries where there are few structural barriers to girls' schooling, girls from excluded groups face clear disadvantages in enrollment and completion.

2.3.2.4 Poor Facilities and Physical Inputs.

Undoubtedly, school facilities have a direct affect on teaching and learning. It is unreasonable to expect positive results from students, teachers, and principals who are forced to work in an adverse environment. "In dilapidated buildings teachers felt despair and frustration while teachers in renovated buildings voiced 'a renewed sense of hope, of commitment."(Corcoran et al., 1988). School buildings reflect pride, attitude, and expertise of the district trustees, staff, and students. Buildings in poor repair and students and faculty in overcrowded conditions reflect just the opposite.

In many American schools, students and teachers find themselves in a physical environment that adversely affects their morale, and, in some cases, their health.

"Research shows that a facility's physical and environmental quality directly affects the health of building occupants and academic performance" (Weiss, 2000). Poor school conditions make it more difficult for teachers to deliver an adequate education to their students, adversely affect teacher health, and increase the likelihood that teachers will leave their school and the teaching profession.

It has been firmly established that people are influenced and affected by their environment. The impact of crumbling school buildings, sub-adequate maintenance, and overcrowded conditions has been well documented as it relates to student learning (Edwards, 1991, Lewis, 2000, Weiss, 2000). For example, the hypothesis that there is a correlation between student achievement and building conditions was tested in the Washington, D.C., school system. After controlling for other variables, such as a student's socioeconomic status, Edwards (1991) found that as a school's condition improved from one category to the next, for example, from poor to fair-students' standardized achievement scores rose an average of 5.45 percentage points. If a school improved its condition from poor to excellent, an increase of 10.9 percentage points in average achievement scores could be expected.

Good facilities are an important precondition for student learning and a growing body of research has linked student achievement and behavior to the conditions of the physical building. The evidence of impact on teachers is harder to find, but important nonetheless. "Recent studies offer compelling evidence that teacher quality is one of the most critical components of how well students achieve. For instance, studies in both Tennessee and Texas found that students who had effective teachers greatly outperformed those who had ineffective teachers. In the Tennessee study, students with highly effective teachers for three years in a row scored 50 percentage points higher on a test of math skills than those whose teachers were ineffective" (US Government, 2002).

The quality of the physical environment affects the performance of teachers as well as that of students. The difficult and demanding job of a teacher is made more pleasant if she is allowed to work in aesthetically pleasing surroundings. Teachers need a designated place to relax and plan during the school week (Thomson & Ashton-Lilo, 1983). Environmental factors such as temperature, light, color, sound absorption, ventilation and spatial arrangements can either facilitate or hinder teachers in carrying out their jobs. Lack of space affects the way teachers plan and organize instruction. Overcrowded conditions require teachers to adjust teaching style and techniques, which ultimately impact student learning.

When classrooms are small and cramped, with poor lighting and few electrical outlets, a teacher will often give up the active learning strategies she knows to be effective, and fall back into straight-rowed, teacher-centered teaching. While this is obviously detrimental to student learning, it is also detrimental to teacher morale. The inability (or perceived inability) of a teacher to provide the appropriate instruction for her students is a significant factor in teacher burnout.

Besides, many teachers still use the non-gender sensitive traditional approaches to teaching with minimal participation of their students, especially girls. In the classroom, non-gender sensitive traditional approaches would include stereotyping girls as intellectually weak, lazy and passive, girls not being given any opportunity to participate in class activities, questions being predominantly directed to boys, group discussions are dominated by boys including the group leadership, boys doing the experiments while girls passively watch, no deliberate effort to motivate female students to develop interest in mathematics and science subjects, etc. According to Kadzamira and Chibwana (1999), teachers are reported to be giving more special attention to boys than girls. Boys are called more often than girls to answer questions in class.

2.3.2.5 Time use by Girls in mathematics activities.

FEMSA report (1996) identified that; time is inefficiently used by many girls at school and at home. At home time needed for homework and studies is used for household chores, playing, chatting and visiting friends. In school, while boys may spend the hours outside the class time discussing academic problems, girls may be found in clusters gossiping.

Teachers ask girls to baby-sit and run errands for them during and outside school hours. Girls sometimes volunteer for these jobs to gain favours from the teacher or to enable them get out of participation in some lessons or school activities.

Girls also use their school time inefficiently by not participating fully in class discussions. Unfortunately, this attitude of girls is partially based on African traditional practices where girls and women are not supposed to enter into discussions with men but are only to listen. Since some teachers do not make the effort to pull students into discussions when they do not participate, the girls then lose out on so much and are also not able to share with the rest of the class ideas they may have.

2.3.3 Girls Participation in SMT subjects

In Uganda mathematics is compulsory in the lower secondary while science has only recently been also made compulsory in the lower secondary. Many lower secondary schools in Uganda offer biology as a compulsory subject. Physics and chemistry are compulsory until the third year when students may drop them. Each science subject is given a minimum of 4 forty minutes lessons per week. A qualifying examination, the Uganda Certificate of Education (UCE) is taken at the end of the lower secondary for admissions to the upper secondary. The table below gives a summery of girl's participation in SMT subjects in Uganda.

Table 2.1 : Level of participation of students in Mathematics and Sciences at the Uganda Certificates of Education (UCE) in 1995.

Subject	Boys	%	Girls	%
Physics	16474	(70.5%)	6907	(29.5%)
Mathematics	34985	(60.8%)	22540	(39.2%)
Biology	31288	(59.7%)	211549	(40.3%)
Chemistry	16177	(63.2%)	9427	(36.8%)
Additional mathematics	125	(92.6%)	10	(7.4%)
Agriculture	17840	(65.6%)	9359	(34.4%)
Technical drawing	492	(92.3%)	41	(7.7%)

Source: FEMSA report number 9 (1996)

With exception of additional mathematics where the few girls who participate do well, boys out perform girls in the SMT subjects. The table below gives the summery.

Table 2.2: Performance of students in the 1995 Uganda Certificate of Education (UCE) examination (expressed as percentage of total which participated)

Subject	Sex	no. of Students	Grade 1-2	Grade 1-6	Grade 1-8	Grade 9
Physics	F	6907	0.9	36.2	63.4	36.6
	M	16474	2.1	46.0	74.2	25.8
Mathematics	F	22540	0.5	12.4	33.2	66.8
	M	34985	1.7	18.4	42.4	57.6
Biology	F	21154	0.6	23.2	55.9	44.1
	M	31288	0.7	32.0	65.6	34.4
Chemistry	F	9427	0.5	16.8	39.4	60.6
	M	16177	1.5	35.4	-	-
Add math	F	10	0.0	30.0	50.0	50.0
	M	125	3.4	32.8	60.0	40.0
Tech. drawing	F	41	2.4	4.0	51.2	48.8
	M	492	0.8	34.5	67.9	32.1

Source: FEMSA report number 10 (1996)

GAP IN THE REVIEW OF THE RELATED LITERATURE

Much as the review of the related literature clearly explains some of the factors that lead to differentials in mathematics performance; the parents explanations on their child's performance; the relationship between SMT subjects and the henceforth recommendations, the literature needed to develop strategies for interventions aimed at changing students' conceptions of intelligence in order to improve their academic achievement and interventions to reduce stereotype threat.

The goal of this research was to find out the causes of gender differentials in mathematics performance and formulate specific and coherent evidence-based recommendations that educators including parents can use to encourage girls in the fields of math and science.

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.0 *Chapter Overview*

This research chapter deals with the design, sampling procedure, the sample population, the instruments that were used in the research process, the procedure involved in data collection and data processing. The techniques used include the frequency tables and computation of correlation coefficient of the variables involved in the distribution of the sample population.

3.1 Research Design

Both qualitative and quantitative research approaches were used. The quantitative approach used was where traits and situations were expressed in numerical values for further analysis. This was done by categorizing the reasons for the gender differentials in mathematics performance from both students and teachers/parents. The qualitative research technique like the interviews and Focus Group Discussions(FGD) was used objectively by the researcher to express these reason's applicability and magnitude in terms of percentages or otherwise.

3.2 Sampling Procedure

The researcher's intention to have the students, the teachers and the parents as the respondents to the research was a success. Random sampling of the respondents was used to select the required sample of the population while the parents specifically were selected using Purposive sampling technique.

3.3 Population

This is a smaller representation of the wider targeted population. The researcher conducted the research work in five mixed day and boarding secondary schools targeting 20 respondents (students) from each school making a total of 100. The perceptions of the students, teachers and parents of the difficulties and constraints faced by girls in the learning of mathematics and science and the reasons for these was of paramount importance during this process. Ten (10) teachers from each school responded through the questionnaire provided to clearly show how SMT subjects are presented in class, with special reference to how girls are treated in SMT classes. The parents (8 from each school area) were separately interviewed on their explanation of their child's performance in mathematics. The table below of samples guided by Morgan (1970) as provided by Amin (2005) shows the sample size for this research activity.

Table 3.1: Shows the Population Sample Size for the Study.

Sample group	Population	Samplesize	Technique used	No. interviewed
Parents	80	40	Questionnaires Interviews and FGD's	40
Teachers	80	50	Questionnaires Interviews and FGD's	50
Students	160	100	Questionnaires, Interviews and FGD's	100
Total	320	190		190

3.4 Research Instruments

The data collected were derived using a variety of instruments:

3.4.1 The Questionnaires

Questionnaires were administered to teachers and students from upper classes in secondary schools; and teachers and students from both examination and non-examination classes in secondary schools which included both open ended and closed ended questions. The open ended questions was used to extract hidden data from the respondents since they express their feelings outside what the questionnaire required. The open ended questionnaires were deliberate to allow the respondents to give precise information on what they really thought and believed, rather than presenting the designers' own pre-conceived views. Thus it was decided to leave the open-ended style questions for the pre-testing stage.

While the closed ended questions was used to ascertain information which is in line with the research objectives. .

All the questionnaires were pre-tested and modified to suit the unique requirements of each school. A strict requirement of the whole study was that, while the overall framework of the study and the instruments were designed centrally by the researcher, each school was given maximum freedom to adapt these instruments to suit their own individual needs. A total of 100 students and 40 teachers filled and completed the questionnaires.

Special questionnaires (Appendix A) were completed by 40 parents on the explanation of their child's performance in mathematics.

The questionnaires for the teachers (Appendix C) mainly sought information on the reasons why girls generally perform less well than boys in Mathematics and Science in primary schools and on the ways in which the performance of girls could be improved. In addition the questionnaires attempted to document the academic and teaching qualifications of the teachers, their teaching experience and work load.

While the questionnaires for the school students (Appendix B) mainly sought information on their perceptions regarding the importance of Mathematics and Science, the ability of girls and boys to learn these subjects. Information was also elicited regarding the level of help that pupils' had access to in the learning of Mathematics and Science in terms of whether they had access to private tuition, who helped them with their homework and from whom they sought assistance if they had difficulty in understanding what was being taught in Mathematics and Science.

3.4.2 Focus Group Discussions (FGD)

Separate guided discussions were successfully held with students, teachers and parents using the Focus Group Discussion (FGD) methodology. This methodology involved intensive brain-storming, first with female and male only groups, and then in mixed groups of participants, to unearth the reasons for the poor participation and performance of girls in mathematics and science, and thereafter to come up with solutions which might alleviate these problems. The FGD methodology provided the richest data of the whole study and was particularly effective in enabling the researcher to give considered priorities to the causes of the problem and the solutions which might be used to address them. It is therefore of considerable importance that these discussions, while unearthing reasons and causes, were extremely effective in creating awareness of the seriousness of the problem and sensitizing the participants to the fact that they themselves, and their traditional and at times attitudes, were the principal cause of the situation and to the fact that the solution lay largely in their own hands.

3.5 Validity and Reliability of the Instruments

The validity of the instruments was checked by the responses acquired and the content validity index. Consequently, modifications to the instruments as a result of the pre-testing was made to ensure that they are relevant, accurate and precise., while at the same time keeping as many common questions and issues as possible to make a cross-school comparison of the results feasible. The content validity index calculated by the research supervisor and other specialists in SMT subjects was found on average to be 0.85, which is a greater percentage for the administration of the instruments (Amin, 2005). This was calculated from the formula below

$$\text{Content Validity Index} = \frac{\text{Number of items declared valid in the questionnaire by judges}}{\text{Total number of judges}}$$

Similarly, the coefficient of reliability was estimated using Kuder-Richardson formula KR_{21} because it is of value primarily because it provides a very easy method of determining a reliability coefficient. It also requires so much less time than other methods for estimating test reliability that is highly appreciated for use. It usually results in a more than one trait being measured (Amin, 2005). The formula is given below:

$$KR_{21} = \frac{k}{k-1}\left(1 - \frac{\mu(k-\mu)}{k\sigma^2}\right)$$

where $\mu = mean\ on\ thetest$

$\sigma = s\tan dard\ \ deviation$

$k = number\ of\ items$

The reliability coefficient was determined to be 0.825(See Appendix D).

3.6 Research Procedures

The researcher obtained an introduction letter from Kampala International University the awarding institution which introduced him to the institutions from where the research was conducted.

The relevant authority and officers from the municipal divisions were fully briefed by the researcher and formal permission and clearance was received for the activities to be conducted in the schools. The close contact with the division was essential, not only for reasons of protocol, but for the future utilization of the findings of the studies in attempting to improve the participation and performance of girls in mathematics and science subjects through meaningful interventions in the schools.

As schools were identified and selected to become part of the study, the activities to be carried were explained to the Head teacher and the school's consent to conduct these activities was sought. Care was taken to have the researcher explain to both students and teachers the reason for the researcher's presence in the school, so as to allay fears that they might be mistaken for School Inspector.

3.7 Data Analysis

The quantitative data from the field were analyzed using Pearson correlation coefficient to establish the relationship between the variables mathematics and science, frequency tables were also developed for further analysis of the raw data. The results were tabulated for easy interpretation such that one could easily visualize the various results given by the respondents during the study. While for qualitative data, thematic analysis was used to analyze the data collected to strengthen the quantitative data analyzed.

3.8 Ethical Considerations

Bearing in mind the ethical issues, the researcher provided the respondents the main purpose of the research, expected duration and procedures to be followed, and be in position to keep utmost confidentiality of respondents.

3.9 Limitations of the Study

Pre-testing of the research instruments took place in Kampala between June and July 2008. The initial trials revealed serious problems, especially with the questionnaires for students and teachers. The questionnaires were simply too ambitious and some questions sought information which the students did not have. For example, in response to questions asking '*which were the most difficult topics in Mathematics and Science*', students simply listed the topics which they were currently studying. The analysed results produced a list of all the topics on the syllabus! As anticipated, all of the open-ended questions produced a list of options that would have been virtually impossible to analyse in any meaningful way. Even where the questionnaires were administered in the medium of instruction of the school, language proved a major stumbling block, among teachers as well as pupils, and many questions were intelligible to the respondents. This was partly overcome by oral translation of the questions into the vernacular language of the area and by detailed explanations of the intent of the questions. Questionnaires for parents were generally found to be satisfactory.

The study had some limitations which were to warn the researcher but did not affect the out come of the findings although much time was consumed. For example, the questionnaire was quite long and took more than an forty five minutes to administer. Many teachers had very low morale and were lacking in enthusiasm for anything they regard as extra work without remuneration. The questionnaire was long and was regarded as extra work. Consequently teachers were reluctant to fill it out.

A number of separate questions were in fact eliciting similar responses. For example, questions relating to why mathematics and science were more difficult for girls than boys, why the performance of girls and boys is different, and the differences in behaviour of girls and boys in learning mathematics and science, all produced similar responses. Likewise, the questions What have you done to make girls more interested in mathematics (and science) and List five things that can be done in your school to help girls improve their performance in mathematics (and science) produced similar responses.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 *Chapter Overview*

It was realized at the outset that there already existed much quantitative data on the problem of girls' relatively poor performance in SMT subjects compared to that of boys. Therefore this project concentrated on gathering data from those most intimately affected by the problem: the girls themselves, their fellow male students, their teachers and parents. The data collected were set in the context of the overall educational philosophy of each school and of the national policy related to the education of girls.

Objective one was to find out parents perception on the performance of their children in mathematics; objective two was to find out whether there is gender differences in mathematics performance in secondary schools; and objective three was to find the significant relationship between SMT subjects.

Back ground Characteristics of Respondents.

Table 4.1: Gender Back ground of Respondents

Gender	Frequency	Percentage
Female	33	33%
Male	67	67%
Total	40	100%

The over all percentage ratio of female to male respondents to the study was 33:67 .This clearly showed the low level of participation of female in the education sector (Table 4.1).

While the students' response towards the education level of their parents showed that the uneducated parents were 23% while 30% of them were more than the secondary level education (Table 4.2).

Table 4.2: Level of Education of Parents of Students

Gender	Frequency	Percentage
No schooling	23	23%
Primary school	35	35%
Secondary school	07	7%
Beyond secondary school	30	30%
Don't know	5	5%
Total	100	100%

Table 4.3 shows that the male teachers participated with 64% of the overall number of teacher respondents.

Table 4.3: Teacher's Background

Gender	Frequency	Percentage
Female	22	44%
Male	28	64%
Total	50	100%

84% of the teachers had qualification for secondary level while 0% was for higher level (Table 4.4).

Table 4.4: Teacher's Academic Qualifications

Qualification	Frequency	Percentage
Primary teacher	00	0%
Secondary school	42	84%
Higher secondary school	08	16%
Others	00	0%
Total	50	100%

4.1 Is there Gender Differences in Performance in SMT Subjects?

Respondents gave their subjective opinions about the level of gender disparity in Science, Mathematics and Technology (SMT) at all the schools administered with the questionnaires. The majority held the general belief that more girls than boys were disadvantaged. As shown in Table 4.5 below , 70% of the parents, 66% of the teachers and 76% of students accepted that there was gender differential in SMT education in favour of boys in their communities(Table 4.5).

Among the household heads who accepted that there was some disparity, the majority were from low performing schools of the municipality.

Table 4.5: Responses of Respondents on Awareness of Gender Differential in SMT.

Gender differentials	Response	Frequency	Percentage
Parents	Yes	28	70%
	No	12	30%
Teachers	Yes	33	66%
	No	17	34%
Students	Yes	76	76%
	No	24	24%
Total		190	100%

The respective score of 30%, 34% and 24% of the respondents corresponding to 'no' response to the existence of gender differentials in performance believe that girls are not underrepresented in these courses. This showed lack of awareness of the significance of the problem (Table 4.5).

4.2 The Causes of Gender Differentials in Science Mathematics and Technology

The causes of gender differential in education are widely known from the existing literature. In Arua municipality, economic, socio-cultural and religious factors have been highlighted. Poor infrastructure, the poor quality of education, and geographical factors are also considered significant. However, most studies have not examined whether these factors can also lead to disparity in the choice of subjects among boys and girls and the particular set of factors relevant to specific groups, which need to be manipulated through policy as well as the extent to which there are changes in these set of factors. These causes of gender disparity resounded in this study but only differed slightly between the different groups of respondents (Table 4.6)

As far as the students were concerned, the causes of gender disparity in SMT were related to women's traditional roles and their personal attitudes, which may also stem from their religious orientation. This is apart from financial problem, which was emphasized in the three schools of Oli division.

Table: 4.6: The Reasons for Gender Differentials in Mathematics Performance in Secondary Schools.

Reasons	1	2	3	4	5	Total
Distance to and from School	3	1	8	43	45	100
	3%	1%	8%	43%	45%	100%
Time use by girls in math is less	2	5	3	57	33	100
	2%	5%	3%	57%	33%	100%
Masculine fallacy of Mathematics	0	14	0	48	38	100
	0%	14%	0%	48%	38%	100%
Natural talents	3	6	4	53	34	100
	3%	6%	45%	53%	34%	100%
Safety and security of girls	0	2	0	64	34	100
	0%	2%	0%	64%	34%	100%
Household chores for girls	5	8	10	41	36	100
	5%	2%	10%	41%	36%	100%
Home and Community based factors	6	4	17	38	435	100
	6%	45%	17%	38%	49%	100%
Could not identify any reason	6	9	55	21	9	100
	6%	9%	55%	21%	9%	100%
Total	25	49	97	365	264	800
	3.1%	6.1%	12.1%	45.6%	33%	100%

Note Rating scale: 1. Strongly disagree 2.Disagree 3.Undecided 4.Agree 5.Strongly agree

In all the schools visited, a significant proportion of the children (45.6%) believed that Distance to and from School, less time use by girls in math, Masculine fallacy of Mathematics, Natural talents, Safety and security of girls, Household chores for girls Home and Community based factors, parents' negative attitude towards female participation in science and technology education, in particular and education in general, was responsible for the differences in performance in SMT (Table 4.6).

lack of interest in SMT by the female children was the important factor. Teachers' attitude and the belief that gender determines who pursues SMT education were also mentioned by significant proportion of both male and female children during a focus group discussion for male and female respondents in all the secondary schools visited.

In both the divisions, the most frequently cited reasons given by household heads were financial constraints, cost of education materials, poor attitudes of government and parents to female participation in SMT, the negative attitude of girls and cost related factors in that order..

The negative attitudes of girls to SMT were considered a major problem and attitude of parents to female participation in SMT. The poor attitude of parents probably stemmed from the bias of the Islamic population in the municipality who prefer taking children to Islamic religious education against female involvement in formal education and the choice of SMT courses in particular.

The causes of disparity at the household level, as emphasized in the focus group discussions and in-depth interviews, were much more specific and were related to personal experiences and community characteristics. Among the less literate and that "female education ends in marriage" was a major disincentive. Thus corroborating earlier findings that: "*it is more beneficial to formally educate a boy than a girl and that girls only need to be educated and trained in house chores to prepare them for marriage*" (FEMSA Report No. 9). Female education was also believed to be destabilizing as many educated women now agitate for change in traditional roles and decision making process (FEMSA Report No.10). In this study area, girls marry early and most of them attend Islamic schools, which help to preserve traditional gender roles.

Mothers also presented a wider range of explanations. Financial constraint was the most emphasized factor in this local government area followed by attitudinal factors. They believed that women participation in SMT education was a waste. This perception stem from the erroneous belief that SMT courses take longer time to complete and girls, according to one participant in a focus group discussion have very limited time before marriage.

"It is like taking a big risk to allow girl-child to stay in school for so long. This is even more dangerous now that matured girls roam about the street without job and could even miss their chance of getting husbands".

4.3 Parent's Explanation of Their Child's Performance in Mathematics.

65% of the parents were male (table 4.7) and 75% of them were employed (table 4.8).

Table 4.7: Gender of Parents

Gender	Frequency	Percentage
Female	14	35%
Male	26	65%
Total	40	100%

Table 4.8: Occupation of Parents

Occupation	Frequency	Percentage
Employed	30	75%
Unemployed	10	25%
Total	40	100%

Research has determined that parental attitude and support has a great deal of influence on girls' participation and level of success attained in SMT education. Parents and community attitudes are mainly influenced by traditional beliefs regarding the ideal roles of women and girls in society. Traditionally, the only roles available to women were those of wives and mothers. Women were thus seen as nurturers and mainly as providing support for men who worked to provide for the family. Being physically weaker, women were therefore also perceived as being less capable and requiring the protection and guidance of men. These attitudes have prevailed even in current times when socio-economic changes have resulted in changes to roles women are now expected to undertake. Socio-economic changes have made education necessary, not just for the purposes of providing income earning opportunities, but also for the potential to contribute to the improvement in the standards of living of individuals, families and communities. These traditional beliefs have been found to foster negative attitudes which limit family and community support for girls' education. Identification and examination of these attitudes is necessary before any decisions can be made on what should and can be done to bring about change. However, it is an indisputable fact that without parents and community support, any efforts to improve girls' participation in education and SMT education in particular will be greatly hampered.

Table 4.9: Parent's Explanation of Their Child's Performance in Mathematics.

Reasons	1	2	3	4	5	Total
Mathematical talent	2	3	8	20	7	40
	5%	7.5%	20%	50%	17.5%	100%
Child practiced alot	10	7	1	19	3	40
	25%	17.5%	2.5%	47.5%	7.5%	100%
Easy task	13	6	5	15	1	40
	32.5%	3%	12.5%	37.5%	2.55	100%
Lacks mathematical talent	18	8	2	7	5	40
	45%	20%	5%	17.5%	12.5%	100%
Had not practiced enough	3	5	10	15	7	40
	7.5%	12.5%	25%	37.5%	17.5%	100%
Difficult task/test	2	5	3	18	12	40
	5%	12.5%	7.5%	45%	30%	100%
Total	48	34	29	94	35	240
	20%	14.3%	12.2%	39.4%	14.7%	100%

Note Rating scale: 1. Strongly disagree 2.Disagree 3.Undecided 4.Agree 5.Strongly agree

.3.1 Parents' Assessments of Their Child's Competence in Mathematics.

The child's gender had a significant main effect on the parents' assessment of their child's competence in mathematics, The parents' gender did not relate significantly to the parental assessment of the child's competence, nor did the interaction between the parents' and child's gender.

The distributions of parental attributions of the child's competence in mathematics was quite skewed toward the positive end of the scale, as only about 12.5% of the parents rated their child's proficiency in mathematics below average.

The parents (50%, table 4.9) regarded their child's mathematical talent as the prime cause of his/her success in mathematics, whereas the impact of task difficulty and the child's lack of talent were seen as less important (see table 4.9). Task difficulty and insufficient effort by the child were rated as the most notable causes of the child's failure in mathematics, whereas his/her lack of talent was the least preferred explanation for failure. In interviews conducted with the parents, the parents of boys rated their child's mathematical talent as a more important reason for his mathematical success than did the parents of girls. In contrast, the parents of girls rated their child's effort as a more important reason for her mathematical success than did the parents of boys.

The parents considered talent a more important reason for the mathematical success of the highly competent child than that of the less competent child, and task easiness was regarded as a more important reason for the mathematical success of the highly competent child than for the less competent one. The latter effect was further manifested by a significant interaction with the child's gender which suggests that the effect only concerned the boys. The parents of a highly competent child appraised the lack of mathematical talent as a less important reason for mathematical failure than did the parents of a less competent child.

4.4 Relationship between Mathematics, Science and Technology.

Teachers, during interviews, indicated that one of the reasons for girls' poor participation in SMT subjects was the lack of parental interest, support and involvement in their daughters' academic work (Table 4.10). Teachers felt that if parents were more involved in their daughters' school work, and in particular in SMT subjects, in which most girls do not perform well, then girls might be motivated to work harder in those subjects.

Teachers attributed this lack of involvement to a number of factors. One was that most parents have the attitude that academic work is the preserve of the school and in particular the teacher and were therefore reluctant or unwilling to become involved. Another reason was that many parents often have little time to spare from their daily schedules to devote to helping or following up on their children's school work. Other parents, on the other hand, have little or no education themselves and therefore do not have the knowledge or skills required to help or monitor their children's academic work. Teachers complained that there was lacking in many communities a 'culture' of parental monitoring of children's school work. They felt that this type of culture and practice should be established and nurtured. The table below explains the detailed relationship between mathematics and SMT.

Table 4.10: The Relationship between Mathematics, Science and Technology.

Subject Identification number		Mathematics(x)	Science and Technology(y)
1	Individual perception	38	40
2	Intelligence	29	33
3	Teaching approaches	38	28
4	Question approach	33	40
5	Backgrounds	43	46
6	Practical work	39	50
7	Relevant syllabus	45	43
8	Encouragements	50	50
9	Give opportunities	48	45
10	Train teachers	45	47
11	Show usefulness of subject	50	48
Total N= 11		458	470

Computation of Correlation analysis between the two variables x and y using Pearson product-moment correlation coefficient(r) to find the strength of the relationship between Mathematics and Science and Technology that have been measured in interval scales showed that the correlation is 0.73 which is a high correlation(David & Ronald ,1987).

CHAPTER FIVE

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.0 *Chapter Overview*

In this chapter, the researcher gets basis of expressing his ideas on the findings related to the literature reviewed. This includes presenting a brief summery of the field work and its interpretations in relation to the literature reviewed. Research conclusions and recommendations shall also be presented under this chapter to discover the knowledge gap in the research to allow future researches to continue from where the researcher left.

5.1 DISCUSSION OF RESEARCH FINDINGS

The researcher started his exploration of the data by examining the parents' assessments of their child's competence in mathematics and to see whether differences exist in regard to the child's gender. The parents' gender was included in the analyses because Yee and Eccles (1988) and others have found some differences between mothers' and fathers' erceptions of their child's ability (see table 4.9).

uring group discussions and interviews with students and teachers, low enrollment and igh dropout rates for girls at all levels of education were stated as some of the main easons for the relatively low numbers of girls participating in SMT subjects. It was the pinion of many of those who participated in the study that one of the main reasons for is low enrollment and high dropout is the negative attitude that many parents have wards the education of girls. This agrees with Eccles-Parson et al. (1982). This negative attitude was attributed to traditional socio-cultural beliefs regarding gender roles and abilities. In African tradition and culture, women were expected to exclusively assume the roles of mothers and wives. Women were seen as nurturing beings and as such were expected to be the home makers and take care of the children. They were also expected to be obedient and subservient to the men. Women were seen as less capable, physically, mentally and in all areas outside their accepted roles, than men. This attitude directly and indirectly has a negative effect on girls' participation in education in general and SMT in particular in a number of ways.

The information gathered from this study, specifically from discussions and interviews with parents, students, and teachers, has underlined the fact that these traditional views of women's ideal gender roles and the perceptions of their abilities has a negative effect on parents' attitudes towards educating girls(Eccles-Parson et al. ,1982).

Following are some examples of negative attitudes that act as barriers to girls' enrollment and retention in school:

The perceived ideal roles and characteristics of women and girls influence how girls and boys are socialized in the home, community and school. Because girls and women in general are considered physically weaker and less capable than men, they are often overtly protected and supervised to keep them from what is considered threatening to their safety i.e. physical, sexual, mental and emotional safety.

ome parents were reported to be reluctant to send their daughters to school because of ie belief that education and school could be a corrupting influence. In some communities, there was the view that in co-educational schools, as most primary schools are, girls' morals would be corrupted because of the amount of time they would spend with boys. There was also fear for the physical and sexual safety of girls in school due to cases of physical and sexual harassment and abuse from peers and teachers in the school. Where schools are situated long distances away, parents also worried about their daughters' safety while traveling to and from school, this is in accordance with Maluwa-Banda (2002). This view was also the reason why many parents were reported to be reluctant to allow their daughters to attend extra-tuition after school as in most cases the teachers involved are men and as these sessions are usually held in the evening, parents are also reluctant to let their daughters travel late.

Perceived gender roles and characteristics influence the way children are expected to behave, the kind of work they do and even the way they play (FEMSA report no. 9, 1996). Girls are, for example, rarely the ones sent to the shops to do shopping, neither are they allowed to play outside the home for long periods of time as boys often do. This denies girls the opportunity to explore and experiment with diverse activities and situations outside the home which could be useful to them within the SMT curriculum: e.g. boys when they go shopping get to practically use the knowledge and skills acquired in mathematics, they get to see various related activities first hand, e.g. playing with various tools, constructing things etc. Being outside the home also allows them to develop their socializing skills to a better degree than girls, and they are therefore more at ease outside the home environment. Boys therefore develop the confidence to work with tools and to have an advantage in the use of exploratory and participatory methods advocated for in teaching SMT subjects.

It was pointed out that in some cultures, after a certain age, girls are not expected to look men directly in the eye and are expected to appear humble and respectful before their elders. This attitude and the subsequent socialization of girls, has a number of effects. One is that it makes it difficult for girls to fully benefit from the participatory, discovery methods that are recommended because they will be reluctant to ask questions, participate fully in discussions or work in groups with members of the opposite sex. This has a negative effect on their performance in SMT subjects. Another issue is that because girls are expected to be obedient and socialized to feel that boys and men are in some ways their superiors; many are vulnerable to physical and sexual harassment and abuse and lack the confidence, skills and knowledge of such situations. This exposes them to the risk of pregnancy and STD's and the resulting consequences, including school drop out. This harassment has also been proved through research to have a negative effect on girls' attitudes towards school and their ability to focus on and perform well in their academic activities.

According to many of the parents in the study, it is expected that girls will in adulthood only take on the roles of wives and mothers. Many parents and community members believe that a formal education is not necessary in order for girls to prepare for these expected roles as they can be learnt from their mothers and others in the community. As a result many parents do not enroll their daughters in school or withdraw them before completion. This denies these girls an opportunity for formal education in general and participation in SMT subjects in particular.

Many parents and community members also have the attitude that educating girls is a waste of time and money, because they will eventually be married off and their education would therefore only benefit their husbands and the families they marry into. Money spent on the girl's education would thus be considered lost to the girls' family.

Since there was also the expectation that boys will become the "breadwinners" of their future families, many parents and community members felt that boys should for this reason be provided with the every advantage to help them fulfill this role, this includes educating them as far as possible. Girls, on the other hand, it is expected, will have husbands who will provide for them and an education is therefore not essential for them.

Some statements made by parents during group discussions clearly point to the negative attitudes that many parents and community members in general have towards educating girls.

Many parents also expressed the belief that boys would take care of them in their old age, thus providing them with a sense of security about their future while girls once married would be expected to take care of those in the families they married into. Thus in order to ensure that their sons will be able to carry out this responsibility, parents feel that they should provide their sons with education so that they can in turn get employment.

Girls were also considered a risk to educate because they were likely to get pregnant or married and drop out of school and any money spent on their education would therefore be wasted. For this reason some parents expressed the opinion that given a choice, they would prefer to educate boys.

Teachers, during interviews, indicated that one of the reasons for girls' poor participation in SMT subjects was the lack of parental interest, support and involvement in their daughters' academic work. Teachers felt that if parents were more involved in their daughters' school work, and in particular in SMT subjects, in which most girls do not perform well, then girls might be motivated to work harder in those subjects.

Teachers attributed this lack of involvement to a number of factors. One was that most parents have the attitude that academic work is the preserve of the school and in particular the teacher and were therefore reluctant or unwilling to become involved. Another reason was that many parents often have little time to spare from their daily schedules to devote to helping or following up on their children's school work. Other parents, on the other hand, have little or no education themselves and therefore do not have the knowledge or skills required to help or monitor their children's academic work. Teachers complained that there was lacking in many communities a 'culture' of parental monitoring of children's school work. They felt that this type of culture and practice should be established and nurtured.

Girls are expected to take up the roles of wives and mothers in adulthood and their socialization at home, in the community and school is geared towards providing them with experiences that will prepare them to carry out these roles effectively. These expectations determine the division of labor within the household, with girls being assigned the home making household chores like food preparation, cooking, cleaning, fetching firewood and water, washing clothes and, caring for younger siblings. In addition to this in some areas girls are also expected to participate in farming activities.

This was seen to affect girls' education in a number of ways (i) The number of hours spent performing house hold chores and other tasks means that girls have little time and energy left to devote to their academic work (ii) Girls also had an added disadvantage in that while the types of chores that boys do, allow them time and opportunity to study, the chores that girls do are difficult to combine with study, i.e. preparing food, washing clothes, etc. and (iii) Girls are often late for school in the morning as a result of having to complete their household chores. Apart from the punishment incurred for this lateness, there is also the added disadvantage that Science and Mathematics are often taught in the morning, because it is at this time that students are thought to have the most energy and are thought to be able to concentrate best. Girls who are chronically late thus tend to miss these morning lessons. Since Science, and especially Mathematics, are hierarchical subjects in that concepts are learnt in a sequential manner, with the one concept building on the knowledge of those learnt previously, missing lessons in these subjects makes it difficult for girls to comprehend many topics or to catch up. Because the teacher to student ratio is high, it is sometimes very difficult for teachers to give such students the individual attention they require during class time to help them catch up.

Because girls are responsible for such a diverse number of household tasks, some parents prefer to keep their daughters at home. Many parents therefore find that the opportunity cost of education is too high.

It is also important to note that as the girl becomes older, she is often expected to take on more responsibilities in the running of the home and this takes more of her time during a period when she is probably at an educational level when learning is more involving and intense and requires more focus. This is likely to affect her performance, leading to loss of morale. Poor performance often leads to repetition and the resulting frustration could lead to school dropout.

Parents were also of the opinion that there was a serious shortage of employment opportunities in SMT and that the majority of these careers, especially the technical ones, were poorly paid. They were therefore reluctant to encourage their children to further their education in these subjects. Parents also believed that the Arts based careers paid more and therefore encouraged their daughters to work harder and carry on with these subjects at higher levels of education.

Because the curriculum taught in schools is rarely sensitive to the practical needs of the communities it serves, what is learnt is mainly theoretical and can rarely be practically applied at home in the pupils' daily life and activities. For this reason many parents felt that there was no immediate need for their children to be in school and considered time spent in school as time wasted, which could be put to better use on domestic chores.

The same sentiment was also expressed about the curriculum for the SMT subjects. Some parents felt that the curriculum was too theoretical and did not take into account the context of the pupils' environment. Parents felt that the lessons learnt were not practical enough and did not relate what was learnt to real life. Pupils therefore rarely learnt anything that would be immediately useful to them and their families and to some parents this was an indication that these subjects were irrelevant to the quality of the lives of their children and families. These parents did not encourage their children to perform well in school and sometimes even withdrew their children from school.

Thus this study partly agrees with FEMSA project Towards Girls' Participation in and Access to Education and Science, Mathematics and Technology (SMT) Subjects.

5.2 CONCLUSIONS

Despite being aware of the lack of adequate resources and facilities in some of their schools, parents and students, during focus group discussions and interviews with the project personnel, strongly condemned the methods teachers use to teach mathematics and science subjects. They saw this as the major cause for the poor participation and performance of girls in SMT. Teachers were blamed for their unimaginative teaching methods and for not using practical approaches for teaching SMT and for not relating the approaches to life experiences and the environment of the student.

The teachers, on the other hand, being aware that adequate resources and facilities are crucial for a qualified teacher to engage students in an exciting, captivating and enriching mathematics or science lesson, strongly recommended that the governments should make or enforce policies on the minimum physical facilities and teaching resources in all schools at each level.

The researcher, however, noted that although there appeared to be great goodwill from all who participated in the study towards finding solutions to the problems of facilities and resources facing most of the schools, the solutions they suggested were almost all pointing at the government or some NGO, who it was hoped would come to their aid. A change of attitude among teachers and head teachers was considered crucial for them to begin to seek their own solutions to some of these problems.

This conclusion is intended to provide an insight into the extent to which the availability and quality of Resources and Facilities for Teaching and Learning of Mathematics and

Science in Schools can be a factor in girls' participation and performance. Through this understanding, it is hoped that the school administrators - head teachers and officials in the Ministry of Education, as well as classroom teachers, will start to appreciate the schools' intrinsic deficiencies that inhibit academic performance and will gradually develop a reasonable degree of alertness needed for improvements in their respective schools and enhance their innovativeness in deriving solutions to these problem areas. A school system that is consistently responsive to teaching and learning needs has a positive impact on the personal and collective efficiency and effectiveness of the teaching staff and ultimately high academic performance of its pupils.

To conclude further, let us revisit our recommendations. What do we recommend that teachers do to encourage girls and young women to choose career paths in math- and science-related fields? One major way is to foster girls' development of strong beliefs about their abilities in these subjects—beliefs that more accurately reflect their abilities and more accurate beliefs about the participation of women in math- and science-related careers. The first two recommendations, therefore, focus on strategies that teachers can use to strengthen girls' beliefs regarding their abilities in math and science: (i) Teach students that academic abilities are expandable and improvable; and (ii) Provide prescriptive, informational feedback. Our third recommendation addresses girls' beliefs about both their abilities and the participation of women in math- and science-related careers: (iii) Expose girls to female role models who have succeeded in math and science.

In addition to beliefs about abilities, girls are more likely to choose courses and careers in math and science if their interest in these fields is sparked and cultivated throughout the school years.

The fourth recommendation focuses on the importance of fostering both situational and long-term interest in math and science, and provides concrete strategies that teachers can use to do so.

In addition to beliefs and interests, a final way to encourage girls in math and science is to help them build the spatial skills that are crucial to success in many math- and science-related fields, such as physics, engineering, architecture, geometry, topology, chemistry, and biology. Research suggests that spatial skills, on which boys have typically outperformed girls, can be improved through specific types of training. Thus, the resaerchers's final recommendation is that teachers provide students, especially girls, with specific training in spatial skills.

5.3 RECOMMENDATIONS

- **Teach students that academic abilities are expandable and improvable.** To enhance girls' beliefs about their abilities, the researcher recommends that teachers understand and communicate this understanding to students: Math and science abilities—like all abilities—can be improved through consistent effort and learning.

- **Provide prescriptive, informational feedback.** The researcher recommends that teachers provide students with prescriptive, informational feedback regarding their performance in math and science courses.
- **Expose girls to female role models who have succeeded in math and science.** The researcher recommends that teachers expose girls to female role models who have succeeded in math and science. Research demonstrates that triggering negative gender stereotypes can create problems for girls and women on tests of mathematics and spatial reasoning. Exposure to female role models who have succeeded in math has been shown to improve performance on math tests and to invalidate these stereotypes.
- **Create a classroom environment that sparks initial curiosity and fosters long-term interest in math and science.** To encourage more girls to choose careers in the fields of science, technology, engineering, and math, it is recommend that teachers use strategies designed to generate initial interest in specific math and science activities and build on this initial interest to foster sustained interest in math and science content.
- **Provide spatial skills training.** The researcher recommends that teachers provide spatial skills training for girls. Researchers have found that spatial skills are associated with performance on math tests and that spatial skills can be improved with practice on certain types of tasks.

SUGGESTIONS FOR FURTHER READING

Though this intensive study looked at the gender differentials in mathematics performance in secondary schools, for sure, it did not look at

- Finding out the difference in the problem solving performance of male and female students when exposed to Procedural Learning Strategy of acquiring problem solving skills.
- Examining the difference in the Problem Solving Performance of male when exposed to Conceptual Learning Strategy of acquiring problem solving skills.
- Assessing the difference in the problem solving performance of males when exposed to Conceptual Learning Strategy and when exposed to Procedural Learning Strategy.

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APPENDICES

APPENDIX A

Questionnaire for parents

(Title: Success and failure of children in mathematics)

Dear respondents,

I am a final year Masters of Education in Educational Management and Administration student at Kampala International University. I am conducting a study to explore the opinions of several important actors who are interested in finding the causes of gender differences in mathematics performance in secondary schools.

After this study, I will write a draft policy on gender differential in mathematics performance to be submitted to Kampala International University in Partial Fulfillment of the Requirements for Masters' degree in Education.

As an important actor in this cause, it is crucial for me to elicit your opinion and that of your institution for it will be aggregated with that provided by your peers to generate suggestions for improvement. Please respond to these questions as objectively and correctly as possible.

I plan to conduct this investigation to produce a general report on the opinions on the gender differential in mathematics performance in secondary schools. The information elicited through these interviews will be treated with utmost confidentiality, no names will be indicated and will also be for the direct use of the investigator and will be presented in a general report to the school of Education, Post Graduate Studies, Kampala International University without identifying individual opinions.

Thank you in advance

Mundu Mustafa

Researcher.

Please tick appropriate option in the box provided

1. Gender

   ( ) male

   ( ) female

2. Occupation

   ( ) unemployed

   ( ) employed

3. Parish (ward) of the school

   ( ) Tanganyika

   ( ) Pangisha

   ( ) Kenya

   ( ) Others

4. Location of the school where your child goes to.

   ( ) rural

   ( ) peri-urban

   ( ) urban

5. Type of the school where your child goes to.

   ( ) government

   ( ) NGO

   ( ) private

( ) Moslem foundation

( ) church foundation

ii. ( ) mixed (coeducational)

( ) boys

( ) girls

Please for the following questions, use the rating scale given below and tick in the box whose rating scale you think is objective to you about the performance of your child.

Strongly disagree	Disagree	Undecided	Agree	Strongly agree
1	2	3	4	5

Please recall a test or a task in mathematics in which your child succeeded better than normally. Please assess the impact of the subsequent factors in the positive outcome

Factor 1: The child has a mathematical talent.

( ) strongly disagree

( ) disagree

( ) undecided

( ) agree

( ) strongly agree

Factor 2: The child had practiced a lot of mathematics task

( ) strongly disagree

( ) disagree

( ) undecided

( ) agree

( ) strongly agree

Factor 3: The task/test was an easy one.

( ) strongly disagree

( ) disagree

( ) undecided

( ) agree

( ) strongly agree

How about a test/task in mathematics in which your child had less success than was normally the case? Please assess the impact of the subsequent factors in the negative outcome.

Factor 1: The child lacks mathematical talent.

( ) strongly disagree

( ) disagree

( ) undecided

( ) agree

( ) strongly agree

Factor 2: The child had not practiced enough.

( ) strongly disagree

( ) disagree

( ) undecided

( ) agree

( ) strongly agree

Factor 3: The task/test was a difficult one.

( ) strongly disagree

( ) disagree

( ) undecided

( ) agree

( ) strongly agree

What are your general comments on your child success or failure in mathematics?

(i) --

(ii) --

APPENDIX B

Questionnaire for students

(Title: The reasons for gender differential in mathematics performance)

Dear respondents,

I am a final year Masters of Education in Educational Management and Administration student at Kampala International University. I am conducting a study to explore the opinions of several important actors who are interested in finding the causes of gender differences in mathematics performance in secondary schools.

After this study, I will write a draft policy on gender differential in mathematics performance to be submitted to Kampala International University in Partial Fulfillment of the Requirements for Masters' degree in Education.

As an important actor in this cause, it is crucial for me to elicit your opinion and that of your institution for it will be aggregated with that provided by your peers to generate suggestions for improvement. Please respond to these questions as objectively and correctly as possible.

I plan to conduct this investigation to produce a general report on the opinions on the gender differential in mathematics performance in secondary schools. The information elicited through these interviews will be treated with utmost confidentiality, no names will be indicated and will also be for the direct use of the investigator and will be presented in a general report to the school of Education, Post Graduate Studies, Kampala International University without identifying individual opinions.

Thank you in advance

Mundu Mustafa

Researcher.

1. School-- Class------------------

2. Sex:

( ) Female

( ) Male (tick one)

3. What work does your mother do? --

4. What work does your father do? --

5. Indicate what level of education your mother and father has by putting a tick in the right place.

Level of Education	mother	father
No Schooling	( )	( )
Primary School	( )	( )
Secondary School	( )	( )
Beyond Secondary School	( )	( )
Don't know	( )	( )

6. *Below are several items that provide information on your assessment of the gender differential in mathematics performance. Tick in the appropriate box against the number that best reflects how you rate it. The numbers range from 1 to 5.*

1. Strongly disagree 2.Disagree 3.Undecided 4.Agree 5.Strongly agree

No	Research Aspect Under Study	1	2	3	4	5
A. REASONS FOR GENDER DIFFERNTIAL IN MATHEMATICS PERFORMANCE						
A_1	Distance to and from school					
A_2	Time use by girls in math is less					
A_3	Masculine fallacy of mathematics					
A_4	Natural talents					
A_5	Safety and security of girls					
A_6	House hold chores for girls					
A_7	Home and community based factors e.g. traditional belief of a woman as a wife and mother					

B.RELATIONSHIP BETWEEN MATHEMATICS AND SCIENCE AND TECHNOLOGY

		YES	NO
7.	Do you like Mathematics?	( )	( ).
8.	Do you like Science?	( )	( )
9.	Do you get private tuition in Mathematics?	( )	( )
10.	Do you get private tuition in Science?	( )	( )

11. *Read the following statements about Mathematics. Put a tick in the box under YES if you think the statement is true and under NO if you think the statement is not true.*

	YES	NO
I. Mathematics is more important for girls than for boys.	( )	( )
ii. Mathematics is easy to learn.	( )	( )
iii. Mathematics is interesting.	( )	( )
iv. Mathematics is important for farmers.	( )	( )
v. Mathematics is important for housewives.	( )	( )
vi. Mathematics is important for doctors.	( )	( )
vii. You must be intelligent to learn Mathematics.	( )	( )
viii. Boys are naturally better at Mathematics than girls.	( )	( )
ix. Mathematics is useful in life outside school.	( )	( )
1x. You need to be good in Mathematics to study Science.	( )	( )

12. Put a tick in the box opposite the three activities you DO NOT LIKE in Science.

Learning scientific names	( )
Drawing diagrams	( )
Handling living things	( )
Doing experiments	( )
Interpreting results of experiments and observations	( )

Measuring accurately ( )

Writing reports after experiments and observations ( )

Other (Say what these are)

13 *Read the following statements about Science. Put a tick in the box under YES if you think the statement is true and under NO if you think the statement is not true.*

	YES	NO
i. Science is more important for girls than for boys.	( )	( )
ii. Science is easy to learn.	( )	( )
iii. Science is interesting.	( )	( )
iv. Science is easier for boys than for girls.	( )	( )
v. Science is important for doing business.	( )	( )
vii. Science is important for housewives.	( )	( )
viii. You must be intelligent to learn Science.	( )	( )
ix. Boys are naturally better at Science than girls.	( )	( )
x. Science helps in solving problems outside school.	( )	( )
xi. Science is responsible for the destruction of the environment.	( )	( )

4. Who usually helps you with your homework in Mathematics and Science?

ick the appropriate)

	MATHEMATICS	SCIENCE
i. Class teacher	( )	( )
ii. Tuition teacher	( )	( )

iii. Mother	( )	( )
iv. Father	( )	( )
v. Sister	( )	( )
vi. Brother	( )	( )
vii. Other relative	( )	( )
viii. Friend/Age mate	( )	( )
ix Nobody	( )	( )

15 *If you have a difficulty in understanding what is being taught during a Mathematics or Science class, what do you do? Tick any THREE boxes.*

i.	Ask the teacher a question during class	( )
ii.	Read your textbook or notes	( )
iii.	Ask a classmate	( )
iv.	Ask another friend	( )
v.	Ask the teacher after class	( )
vi	Keep quiet	( )

APPENDIX C

Questionnaire for Teachers

(Title: The Relationship between Mathematics, Science and Technology)

Dear respondents,

I am a final year Masters of Education in Educational Management and Administration student at Kampala International University. I am conducting a study to explore the opinions of several important actors who are interested in finding the causes of gender differences in mathematics performance in secondary schools.

After this study, I will write a draft policy on gender differential in mathematics performance to be submitted to Kampala International University in Partial Fulfillment of the Requirements for Masters' degree in Education.

As an important actor in this cause, it is crucial for me to elicit your opinion and that of your institution for it will be aggregated with that provided by your peers to generate suggestions for improvement. Please respond to these questions as objectively and correctly as possible.

I plan to conduct this investigation to produce a general report on the opinions on the gender differential in mathematics performance in secondary schools. The information elicited through these interviews will be treated with utmost confidentiality, no names will be indicated and will also be for the direct use of the investigator and will be presented in a general report to the school of Education, Post Graduate Studies, Kampala International University without identifying individual opinions.

Thank you in advance

Mundu Mustafa

Researcher.

1. Name of school---

2. Gender:

( ) Female

( ) Male (Circle one)

3. Number of years teaching experience ( )

4. Your academic qualifications: (tick the appropriate number)

1. Primary ( )

ii. Secondary school ( )

iii. Higher secondary school ( )

iv. Other (Specify) ( )

5. Your teaching qualification---

Name of institution where you obtained this qualification--------------------------------------

----

----

6. What classes do you teach? --

7. What subjects do you teach? --

8. Number of periods taught per week:--

----

9. In what language do you teach Science and Mathematics?----------------------------------

10. *Girls generally score lower marks in Mathematics in National Examinations than boys. By ticking the appropriate boxes indicate the FIVE most important reasons for this.*

Girls fear Mathematics ( )

Girls do not think Mathematics is important for their future ( )

Because of household duties girls do not have enough time for homework ( )

Girls are less determined than boys in solving difficult problems ( )

Girls are less intelligent than boys ( )

Girls do not ask questions when they do not understand ( )

Girls cannot solve difficult problems on their own ( )

Girls are brought up to believe that Mathematics is for boys ( )

Girls do not pay attention during Mathematics lessons ( )

The teaching approaches used do not help girls to understand Mathematics ( )

Other (Specify) --

----

1. *Girls generally score lower marks in Science in National Examinations than boys. By ticking the appropriate boxes indicate the FIVE most important reasons for this.*

Girls fear Science ( )

Girls do not think Science is important for their future ( )

Because of household duties girls do not have enough time for homework ( )

Girls don't like doing experiments ( )

Girls don't like writing reports after experiments and observations ( )

Girls do not ask questions when they do not understand ( )

Girls are not very good at practical work ( )

Girls are brought up to believe that Science is for boys ( )

Girls do not like setting up experiments ( )

The teaching approaches used do not help girls to understand Science ( )

Other (Specify) ---

----

12. *Below are 10 statements on how the performance of girls in Science could be improved. Rank the statements in order of importance by writing the numbers 1 to 10 in the boxes. For example, write 1 for the statement you think is the MOST IMPORTANT and 10 for the LEAST IMPORTANT.*

Make the content of the Science syllabus more relevant to the needs of girls ( )

Make Science teaching related to the everyday experiences of girls (cooking, farming, etc) ( )

Encourage girls to do more experiments ( )

Give girls more exercises, homework and tests ( )

Group girls with boys when teaching Science ( )

Give girls opportunities to take part in Science Fairs, Exhibitions and Competitions ( )

Give girls more information on how Science will useful in their life after school ( )

Use more teaching aids when teaching Science ( )

Make teachers appreciate the differences that girls and boys bring to the learning of Science ( )

Train teachers to cater for the needs of girls in the learning of Science ( )

13. *Below are 10 statements on how the performance of girls in Mathematics could be improved. Rank the statements in order of importance by writing the numbers 1 to 10 in the boxes. For example, write 1 for the statement you think is the MOST IMPORTANT and 10 for the LEAST IMPORTANT.*

Make the content of the Mathematics syllabus more relevant to the needs of girls ( )

Make Science teaching related to the everyday experiences of girls (buying, measuring,) ( )

Give girls more opportunities to solve problems on their own ( )

Give girls more exercises, homework and tests ( )

Use a problem-solving approach when deriving formulae and methods of working questions ( )

Give girls more practice in drawing diagrams and constructions ( )

Give girls more information on how Mathematics will be useful in their life after school ( )

Provide more individual diagnostic and remedial help for girls ( )

Make teachers appreciate the differences that girls and boys bring to the learning of Math ( )

Train teachers to cater for the needs of girls in the learning of Mathematics ( )

APPENDIX D: MATHEMATICAL CALCULATIONS FOR DATA ANALYSIS

Questionnaire for Parents: Calculation of the Mean and Standard Deviation for ungrouped data.

x_1(items)	$(x-\mu)$	$(x-\mu)^2$
1	-5	25
2	-4	16
3	-3	9
4	-2	4
5	-1	1
6	0	0
7	1	1
8	2	4
9	3	9
10	4	16
11	5	25
$\sum x = 66$		$\sum (x-\mu)^2 = 110$

The mean is given by

$$\frac{\sum x}{n} = \frac{66}{11} = 6$$

The standard deviation is given by

$$\sigma = \sqrt{\frac{\sum (x-\mu)^2}{n}} = \sqrt{\frac{110}{11}} = \sqrt{10} = 3.16$$

Using Kuder-Richardson formula **KR_{21}** below we've

$$KR_{21} = \frac{k}{k-1}\left(1 - \frac{\mu(k-\mu)}{k\sigma^2}\right)$$

Where $\mu = mean \ \ on\ thetest$

$\sigma = s\tan dard\ deviation$

$k = number\ of\ items$

Substitution:

$$KR_{21} = \frac{11}{11-1}\left(1 - \frac{6(11-6)}{11\,x\,(3.16^2)}\right)$$

$$= 1.1\left(1 - \frac{30}{142.56}\right)$$

$$= 1.1(1 - 0.21)$$
$$= 0.869$$

Questionnaire for students: Calculation of the Mean and Standard Deviation for ungrouped data.

x_1(items)	$(x-\mu)$	$(x-\mu)^2$
1	-7	49
2	-6	36
3	-5	25
4	-4	16
5	-3	9
6	-2	4
7	-1	1
8	0	0
9	1	1
10	2	4
11	3	9
12	4	16
13	5	25
14	6	36
15	7	49
$\sum x = 120$		$\sum (x-\mu)^2 = 280$

The mean is given by

$$\frac{\sum x}{n} = \frac{120}{15} = 8$$

The standard deviation is given by

$$\sigma = \sqrt{\frac{\sum (x-\mu)^2}{n}} = \sqrt{\frac{280}{15}} = \sqrt{18.667} = 4.32$$

Using Kuder-Richardson formula $\mathbf{KR_{21}}$ below we've

$$KR_{21} = \frac{k}{k-1}\left(1 - \frac{\mu(k-\mu)}{k\sigma^2}\right)$$

$\mu = mean\ \ on\ thetest$

Where $\sigma = s\tan dard\ deviation$

$k = number\ of\ items$

Substitution:

$$KR_{21} = \frac{15}{15-1}\left(1 - \frac{8(15-8)}{15\,x\,(4.32^2)}\right)$$

$$= 1.07(1-0.2)$$
$$= 0.857$$

Questionnaire for Teachers: Calculation of the Mean and Standard Deviation for ungrouped data.

x_1(items)	$(x-\mu)$	$(x-\mu)^2$
1	-6	36
2	-5	25
3	-4	16
4	-3	9
5	-2	4
6	-1	1
7	0	0
8	1	1
9	2	4
10	3	9
11	4	16
12	5	25
13	6	36
$\sum x = 91$		$\sum (x-\mu)^2 = 182$

The mean is given by

$$\frac{\sum x}{n} = \frac{91}{13} = 7$$

The standard deviation is given by

$$\sigma = \sqrt{\frac{\sum (x-\mu)^2}{n}} = \sqrt{\frac{182}{13}} = 3.74$$

Using Kuder-Richardson formula **KR$_{21}$** below we've

$$KR_{21} = \frac{k}{k-1}\left(1 - \frac{\mu(k-\mu)}{k\sigma^2}\right)$$

Where $\mu = mean\ \ on\ thetest$
$\sigma = s\tan dard\ deviation$
$k = number\ of\ items$

Substitution:

$$KR_{21} = \frac{13}{13-1}\left(1 - \frac{7(13-7)}{13\,x\,(3.74^2)}\right)$$

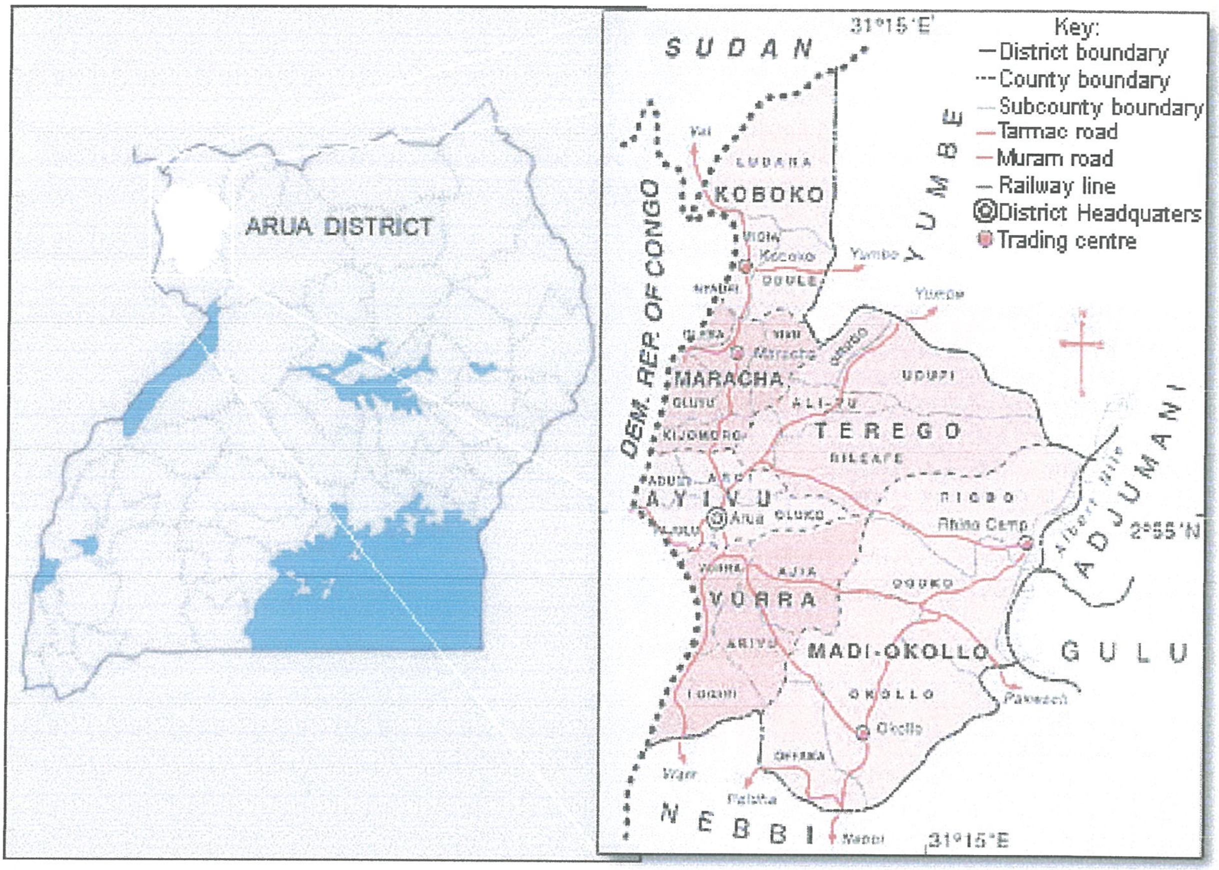
$$= 0.69\ x\ 1.083$$
$$= 0.746$$

Pearson product-moment correlation coefficient (r) was used to find the strength of the relation ship between two variables that have been measured on interval scale. This formula is given below:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left[n\sum x^2 - \left(\sum x\right)^2\right]}\sqrt{\left[n\sum y^2 - \left(\sum y\right)^2\right]}}$$

Where x is a subject's score on variable x, and y is the subject's score on variable y. n is the number of paired observations (number of participants measured on both variables)

APPENDIX E: MAP OF UGANDA SHOWING ARUA DISTRICT, THE STUDY AREA.



KAMPALA
INTERNATIONAL UNIVERSITY

P.O.BOX 20000
KAMPALA- UGANDA,
TEL:-041-266813

OFFICE OF THE DIRECTOR
SCHOOL OF POSTGRADUATE STUDIES AND RESEARCH

4th August, 2008

TO: WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: INTRODUCTION FOR MR. Mustafa Mundu

The above named is our registered student in the School of Post Graduate Studies and Research, pursuing a Master of Education Development and Management. With Registration number MEDMGT/3998/62/DU.

He wishes to carry out a research on **"Gender Differential in Mathematics Performance in Secondary Schools in Arua Municipality"**

Any assistance accorded to him regarding research will be highly appreciated.

Yours faithfully,

Prof. Owolabi. O. Samuel
Director SPGS&R

EDUCATION DEPARTMENT

ARUA MUNICIPAL COUNCIL
P O BOX 27
ARUA – UGANDA

Our ref: COU/106

Your ref:

28th July 2008

TO WHOM IT MAY CONCERN:

Dear Sir/Madam,

MR. MUSTAFA MUNDU (MED mgt/3998/62/DU)

This is to introduce to you Mr Mustafa Mundu, He is for Post Graduate Studies in Kampala International University, P. O. Box 20000, Kampala. He would like to carry a research in your school.

Please accord him the needed attention.

Yours sincerely,

MUNICIPAL EDUCATION OFFICER
ARUA

Abele Florence Anguzu (Mrs)
SENIOR EDUCATION OFFICER/
ARUA MUNICIPAL COUNCIL

ST. NOA GIRLS' SEC SCHOOL-ZANA.

"NOTHING WITHOUT LABOUR"

Tel : 200763 | P.O.BOX 15273
4Km Kla-Entebbe Rd | Kampala-Uganda.

Our Ref.:....................
Your Ref.:....................
Date.................

1st -07 2008

THE DIRECTOR FOR
THE SCHOOL OF POSTGRADUATE
STUDIES AND RESEARCH,
KAMPALA INTERNATIONAL UNIVERSITY,
P.O.BOX 20000 K'LA (U)

Dear Sir/ Madam,

RE: ACCEPTANCE

I do here by approve, confirm and acknowledge the receivership of your candidate introductory letter.

On behalf of the school Administration, I have pleasure to inform you that **MR. MUSTAFA MUNDU (MED / 3998/ 62/ DU)** has been accepted to conduct his practicum in Education management (MED 1205) from **ST NOA GIRLS' SECONDARY SCHOOL – ZZANA**.

We are willing to co-operate with him during his time of study in order to enhance his managerial skills and full realization of his dream.

Yours in service,

KAVUMA RICHARD
HEAD TEACHER