

## **HOW ATTITUDES OF GIRLS TOWARDS SCIENCES AND MATHEMATICS AFFECT THEIR PERFORMANCE IN RURAL AREAS OF ZAMBIA.**

Robert Muchimba Mundia

Flora Ngoma Moono

University of Zambia School of Education p.o box 32379, Lusaka Zambia

**E-mail:** robertmuchimba@ymail.com

florangoma@ymail.com

### **ABSTRACT**

While gender differences in science and mathematics achievement and attitudes overall have been declining during the past two decades, there still exists a disparity in advanced science and mathematics achievement and upper level science and mathematics course taking patterns that contribute to fewer females than males choosing professions in mathematics, Science and technology field.

The research attempts to investigate how attitudes of girls towards sciences and mathematics affect their performance in rural areas.

A case study design was used to gain insight into girls' attitudes towards sciences and mathematics. The population of the study included both school girls and science/mathematics at Moomba Secondary school in Chibombo District of Central Province.

The findings of the study indicated that because girls are considered less capable in science/mathematics parents, many teachers and the girls themselves do not expect them to excel at these subjects. There is therefore, conscious and unconscious discouragement of girls' participation in these subjects both from the school and home. Many teachers not only believed that girls were less capable in science/mathematics; they also believed that girls were less interested in these subjects and more easily distracted.

The study recommended that: in view of the poor performance of a girl child in sciences and mathematics the teachers should encourage a "can do" attitude; teach students to give themselves credit. Encourage all students to take additional science and mathematics courses. Help girl students value themselves (girls often have a severe drop in self esteem during the middle school years. Women teachers need to model a healthy self respect and male teachers need to have respect for both girl students and female colleagues).

**Key Words: Girls Performance in Science and Mathematics**

## INTRODUCTION

Attitude towards science and mathematics plays a crucial role in the teaching and learning processes of mathematics. It affects students' achievement in science and mathematics. The teaching method, the support of the structure of the school, the family and students' attitude towards school affect the attitudes towards science and mathematics. Usually, the way that science and mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in an authentic and context dependent way stands to alienate many students from science and mathematics (Barton, 2000; Furinghetti and Pekhonen, 2002).

Researchers concluded that positive attitude towards science and mathematics leads students towards success in mathematics. Attempt to improve attitude towards science and mathematics at lower level provides base for higher studies in mathematics. It also causes effect in achievement of science and mathematics at secondary school level (Ma and Xu, 2004).

Attitude is based on value and belief, as well as varying degree of factual knowledge. Still the consequences about the gender differences in subject of mathematics are not conclusive because there are so many other factors which contribute towards achievement. Poor attitude towards mathematics has often been cited as one factor that has contributed to lower participation and success of girls in mathematics. Interest and attitude in the subject are the special predictors for the students' participation and success in the subject. Gender based differences are due to the individual's perception of own abilities and the sex role.

Underachievement in girls is a national trend, developing particularly in rural schools. Disaffection with many girls in mathematics may be linked to the way girls perceive themselves as learners, learning styles and attitudes and perceptions. Goleman (1996) found girls to be perfectly capable of logical and rational thought. Girls may not be engaged by a subject which they perceive as void of context and reality and lacking the inclusion of emotional intelligence.

Confidence is critical in determining mathematical success. Anxiety and attitudes inhibit learning and this has been found to be exacerbated for girls, particularly in top sets (Boaler, 1997). Girls tend to seek perfection, needing to be able to understand and explain the maths. This can leave them behind in fast-paced lessons, where, Boaler suggests, exercise completion often takes precedence over consolidation of understanding. The body may translate this into a negative emotional response, for example, fear or trepidation. Therefore, mathematical problems may be associated with dislike rather than stimulation.

The most striking differences between boys and girls are not in achievement or opportunities to learn, but in their attitudes toward science and mathematics. Even when girls have similar exposure to courses and similar achievement levels, they are less confident of their ability and less interested in science and engineering careers. These differences in attitude may be due to subtle messages females receive from their families, schools, and society.

Studies have shown that the abilities of boys and girls are the same - the difference is in attitudes and in opportunities.

Negative attitudes and disillusionment of girls regarding science and Mathematics education can be traced to their early contact with these subjects at primary level. Primary science teaching, divorced as it is from the environment, tends to be uninspiring and conceptually weak. Hence it destroys the

natural curiosity and the desire of children to know. Both boys and girls are turned off at an early age but the effect is strongest with girls who have already been conditioned by society to think that science education is for boys. This perception is oftentimes reinforced by the teachers' attitudes towards girls.

Science and mathematics teaching must help to remove the self censure and cognitive self-discrimination. These subjects should be more closely related to the interest of girls and should offer an early learning environment which allows for concept building and the development of positive attitudes through enjoyable experiences.

## **METHODOLOGY**

### **Research Design.**

A research design is a scheme of action for answering the research question problem. The research design that was used in this study was a case study. The research was conducted through the use of both qualitative and quantitative methods. The combination of both qualitative and quantitative is called triangulation. The triangulation approach increases the reliability and viability of the research that will be conducted (Bless ,1997).

### **Population and Size.**

The population was composed of the science/mathematics teachers and girls at Moomba Secondary in Chibombo District of Central province in Zambia. The sample size consisted of sixty eight (68) respondents comprising of 50 girls and eighteen (18) teachers of science and mathematics. Teachers were used to provide the required information because of their educational and teaching experiences, frequent interaction with the pupils and their views on the participation of girls in Science and Mathematics in Zambia particularly at Moomba Secondary in Chibombo District of Central province while the pupils (girls) were the direct respondents.

### **Research Instruments**

Structured questionnaires and interviews were used to collect data from the respondents for a period of two weeks in order to capture wider information from them. The data collection instruments were collected. The responses and observations from all the respondents were analysed thereafter.

### **Findings and Discussion**

During discussion and interviews with science/mathematics teachers it became clear that for many there was a commonly held view that girls performed poorly due to their attitudes towards these subjects. This attitude has a negative effect on girls' participation in science/mathematics. Eighteen percent (18%) of the girls whose performance was bad attributed it to their personal problem, this is due the negative attitude that the girls in rural areas have in sciences/mathematics. Anderson has incorporated a range of components in their measures of attitudes to science. These include the

perceptions of the students, and teacher, anxiety towards sciences, attitudes of peers, Attitudes of parents, the nature of the classroom environment, and achievement in sciences and fear of failure (Anderson, 1985).

Students' personal factors contributing to poor performance in Mathematics were found to be gender, economic factors and attitude towards mathematics. Mwamwenda (1995) argued that the achievement of students in a subject is determined by their attitudes rather than inability to study. Haimowitz (1989) indicated the cause of most failures in schools might not be due to insufficient or inadequate instruction but by active resistance by the learners. This argument suggests that favourable attitudes towards Mathematics should be developed for achievement in the subject to improve.

Another aspect of this that was highlighted during discussions is that, because girls are considered less capable, they often receive less encouragement and are rarely challenged at home or school to strive to succeed in sciences/mathematics. Because less was expected of them they also in turn expected less of themselves and were less confident of their academic abilities. Data collected from students and teachers indicate that science and mathematics are generally considered to be the most difficult subjects.

Because girls are considered less capable in science/mathematics parents, many teachers and the girls themselves do not expect them to excel at these subjects. There is therefore, conscious and unconscious discouragement of girls' participation in these subjects both from the school and home. Many teachers not only believed that girls were less capable in science/mathematics; they also believed that girls were less interested in these subjects and more easily distracted. It was pointed out that in some cultures, after a certain age, girls are not expected to look at men 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 friends. These were identified as some of the attitudes that deterred girls from participating and performing well in these subjects.

Fifty four percent (54%) of the girls expressed that they like working with their classmates, this exhibits that positive attitude towards the any subject like in the case of science/mathematics can improve their performance. The relationship between poor results by girls in sciences and their attitudes outlines that; having a positive attitude towards science/mathematics means generally enjoying working with science/mathematics and having confidence in one's own ability to do it but it does not mean that a student will display this positive attitude towards the whole area of science/mathematics all the time. The families of pupils have an effect on the science/mathematics attitudes. The school administrators and the teachers should give the information to parents about their children's attitudes and behaviors' at school. Obtaining information about children from their schools, bridges the gap of communication between the parents and their children. If teachers encourage the pupils in science/mathematics class by giving them self-confidence, the pupil's attitudes towards science/mathematics will increase. The positive attitudes that are formed in the

early childhood and early school years should be continued in the next school years. Maintaining the level of positive attitude towards science/mathematics in early years is easier than transforming the negative attitudes to positive in the following years.

Christa (2001) in the argument reveals that attitudes dictate individuals' perception of the world and their social interaction. Attitudes, behaviour and feelings are found by some researcher to be liked such that people's attitudes and that people's attitudes determine their behaviours towards objects and people they meet and influence even the relationships that exist among these with themselves.

Students' success in science/mathematics depends upon attitude towards science/mathematics. It also influences the participation rate of learners. Attitude towards science/mathematics plays a crucial role in the teaching and learning processes of science/mathematics. It effects students' achievement in science/mathematics.

The measures that can encourage the girls to participate in science/mathematics. In achieving pupil's attitudes towards science/mathematics teachers also play an enormous role because they are great models for children. The more pupils enjoy school science/mathematics, the higher the improvement in the pupil's attitudes towards science/mathematics. Keeping this in mind, the pupils should be motivated and are elapsed alienation behaviours by science/mathematics teachers. The science/mathematics should be instructed by means of introducing the other alternative and effective teaching methods. The school atmosphere and features improve the pupil's attitudes. Today by using films and the other training teaching materials the pupils actively participate in learning in science laboratories and mathematics classes in school. Serious efforts should be made to develop and gauge the positive attitude towards science/mathematics. Student's confidence is another ingredient for education of science/mathematics.

Challenges that girls face in studying science/mathematics originate from so many sources like families and school administrators and teachers. Disaffection with many girls in science/mathematics may be linked to the way girls perceive themselves as learners, learning styles and ways of working, as well as teachers' attitudes and perceptions. Confidence is critical in determining mathematical success. Anxiety inhibits learning and this has been found to be exacerbated for girls, particularly in top sets.

Twenty eighty percent (28%) of learners did not like to try problems without the teacher doing an example first. This shows that learners do not have confidence in themselves. Self-confidence in learning Mathematics is very crucial according to the study. Teaching students a number of "learning-to-learn" skills that help students teach themselves can enhance their self-confidence. Also they can be presented with a wide range of "life skills" that can help them think, communicate, and solve problems better. When students master these skills, they report a rise in self-confidence. An honest relationship among students and between students and teachers is critical to get the most out of them learning experience. Studies of learning process demonstrate that without rapport in the classroom, students never experience respect and trust, however, in an environment with plenty of respect and trust students will develop self-confidence in significant levels (Caleb, 1996)

Girls tend to seek perfection, needing to be able to understand and explain the science/mathematics. This can leave them behind in fast-paced lessons, where, exercise completion often takes precedence over consolidation of understanding. In challenging situations, heart rate and perspiration increases. The body may translate this into a negative emotional response, for example, fear or trepidation. Therefore, mathematical problems may be associated with dislike rather than stimulation.

Ten percent (10%) of the pupils attributed their poor performance in science/mathematics to poor teaching methods. The teaching method, the support of the structure of the school, the family and students' attitude towards school affect the attitudes towards mathematics. Usually, the way that science/mathematics is represented in the classroom and perceived by students, even when teachers believe they are presenting it in authentic and context dependent way stands to alienate many students from science/mathematics.

### **Conclusion of the Study**

The poor performance of a girl child in science/mathematics has been attributed to their attitudes towards these subjects. The high negative attitudes exhibited by both the learner and teacher have a bearing on the poor performance of a girl in science/mathematics in rural schools. The reasons why girls' performance is poor in science/mathematics are as such factors outlined; Girls are often discouraged from science/mathematical work in their primary years. They therefore dislike it in the secondary years. So they drop it at high grade levels in far greater numbers.

Poor attitude towards science/mathematics has often been cited as one factor that has contributed to lower participation and success of girls in science/mathematics. Interest and attitude in the subject are the special predictors for the students' participation and success in the subject. Poor science/mathematical skills in women deprived them from a large number of professions because in some countries mathematical background knowledge is the pre requisite for entrance in any profession.

The challenges that girls face in studying science/mathematics are that in most of the time girls are preoccupied with overwhelmed household tasks hence they are always tired to hinder them from concentration. Challenges that girls face in studying science/mathematics originate from so many sources like families and school administrators and teachers.

### **Recommendation of the study**

1. Encourage a "can do" attitude; teach students to give themselves credit. (Girls tend to credit their achievements to luck rather than to their ability.)
2. Encourage all students to take additional science and mathematics courses (teacher encouragement has been shown to be a major factor in students' decision-making processes).
3. Encourage girls to take risks. Judge what girls say, not how they say it (don't assume that if they hesitate or apologize, they don't know the answer).
4. Help girl students value themselves (girls often have a severe drop in self esteem during the middle school years. Women teachers need to model a healthy self respect and male teachers need to have respect for both girl students and female colleagues).

5. Sensitize students, teachers and parents to realization of the difficulties and constraints faced by girls in the study of science and mathematics subjects through small scale interventions at Primary and Secondary school level. These interventions will be used to develop innovative girl friendly approaches to the learning of science and mathematics, to promote girls' interest in science and mathematics based careers.

### Tables

#### THE EXPRESSION OF PUPILS AFTER ATTENDING A SCIENCE /MATHEMATICS LESSONS

RESPONSE	FREQUENCY	PERCENTAGE(%)
I agree strongly	16	32
I agree	17	34
I do not care whether I have to try first or whether the teacher explains first	3	6
I do not like to try problems without the teacher doing an example first.	14	28

Thirty four per cent (34%) of the girls agree that they enjoy science/mathematics lessons where they try out problems before the teacher explains or show how to do it. Twenty eight percent (28%) did not like to try problems without the teacher doing an example first. While six per cent (6%) of the pupils did not care whether they have to try first or whether the teacher explains first and thirty two percent (32%) strongly agreed attending to science/mathematics lessons.

#### ATTITUDES OF PUPILS TOWARDS SOLVING SCIENCE/MATHEMATICS PROBLEMS.

RESPONSE	FREQUENCY	PERCENTAGE(%)
I agree strongly	20	40
I agree	13	26
I get confused when I make mistakes, the teacher must show me the right answer.	15	30
I cannot carry on with problems when I make mistakes.	2	4

Forty percent (40%) of the girls strongly agree that they do not mind making mistakes when trying science/mathematics problems, because they think that they can learn from mistakes. Twenty six percent (26%) of the learners agreed that they do not mind making mistakes when trying science/mathematics problems, because they think that they can learn from mistakes while thirty percent (30%) get confused they make mistakes, the teacher must show them the right answer and four percent (4%) think they cannot carry on with problems when they make mistakes.



**THERE PERFORMANCE IN SCIENCE/MATHEMATICS**

<b>RESPONSE</b>	<b>FREQUENCY</b>	<b>PERCENTAGE(%)</b>
Excellent	0	0
Very good	7	14
Good	15	30
Fair	14	28
Fair/Bad	14	28

Thirty percent (30%) of the girls expressed that their performance was barely good. Twenty eight percent (28%) had their performance fair/bad while twenty eight percent (28%) performed fairly and only fourteen percent(14%) and zero percent had excellent performance in science/mathematics.

**THE REASONS GIVEN FOR POOR PERFORMANCE**

<b>RESPONSE</b>	<b>FREQUENCY</b>	<b>PERCENTAGE(%)</b>
Teaching method	5	10
Fellow pupils	0	0
Personal problem	9	18

Eighteen percent (18%) of the girls whose performance was bad attributed it to their personal problem. Ten percent (10%) of the pupils attributed their poor performance in science/mathematics to poor teaching methods and none attributed to fellow pupils.



## REFERENCES

Anderson, L. W. (1985) **Attitude and their measurement**. In I. Husen, and T.N. Postlethwaite (eds). *The International Encyclopedia of Education* vol. 1. Cpp 352 -358) Oxford pergamon press.

Barton, A. C. (2000), **Crafting multicultural science education with preservice teachers through service-learning**. *Journal of Curriculum Studies*, Volume 32(6), pp. 797-820.

Bless, C, and Higson - Smith C. (1995). **Fundamentals of Social**

### **Research Methods:**

An African perspective Juta and Co. ltd.

Bless, M. (1997). **Special Project: Report on Equal Opportunities**. Coventry

Boaler, J. (1997) **Experiencing school mathematics Buckingham**, Open University Press.

Caleb B. (1996): **A Study of the factor influencing students' Attitudes towards Mathematics in Junior Secondary Schools**.

Christa ,L. (2001): **Teacher attitude in computer Education**. Retrieved October, 2004 from [www.cikgu.net.my/English/classtech](http://www.cikgu.net.my/English/classtech).

Furinghetti, F. and E. Pehkonen (2002), **Rethinking characterizations of beliefs**. In: G.

**Leder, E. Pehkonen, and G. Toerner**(eds.),

*Beliefs: A Hidden Variable in Mathematics*

*Education?* Kluwer Academic Publishers, pp. 39-58.

Goleman, D. (1996), **Emotional Intelligence: Why it can matter more than IQ**,

London, Bloomsbury

Haimowitz, M. L. (1989). **Human Development**. New York: Thomas Y. Crowwell. Kenya

National Examination Council, (2008). KCSE. *Examination Candidate*

**Mathematics Education.**