

**Girls and Science in the Lesotho Secondary Schools: A Study of the  
reasons for low participation rates by girls in the Mohale's Hoek district**

BY

**Mamorakane Moletsane**

Submitted in partial fulfilment of the requirements for the degree of

**Masters of Education**

in the

School of Education

University of Natal

**Durban**

December, 2002.



## **DECLARATION**

I, 'Mamorakane Moletsane, declare that the work presented in this document is my own, and that reference to the work by other people has been duly acknowledged.

Signed .....

I declare that this dissertation has been submitted with/without my approval

Signed .....

Supervisor

Signed.....

Co-supervisor

Durban

December 2002.

## TABLE OF CONTENTS

CONTENTS	PAGE
ABSTRACT.....	i
DECLARATION.....	ii
ACKNOWLEDGEMENTS.....	iii
TABLE OF CONTENTS.....	iv
APPENDICES.....	vii
LIST OF TABLES.....	viii
LIST OF ABBREVIATIONS.....	IX

### CHAPTER ONE

#### Background of the study

1.1. Introduction.....	1
1.2. Aim of the study .....	2
1.3. Motivation of the study.....	2
1.4. Approach of the study.....	3

## **CHAPTER TWO**

### **A review of literature**

2.1. Introduction.....	4
2.2. The influence of teachers on girls' choice of science.....	4
2.3. Girls perception of science.....	5
2.4. Teachers' qualifications.....	7
2.5. Classroom participation.....	8
2.6. Teaching methodology.....	9
2.7. Teachers as role models.....	11

## **CHAPTER THREE**

### **Research Methodology**

3.1. Introduction.....	13
3.2. Design of the study.....	13
3.2.1. Sampling.....	13
3.2.2. The research instrument.....	15
3.2.3. Validity and reliability.....	17
3.2.4. Pilot study.....	17
3.3. Procedure used in administering a questionnaire.....	18
3.4. Limitations of the study.....	9
3.5. Summary.....	20

## **CHAPTER FOUR**

### **Presentation of findings**

4.1. Introduction.....	21
4.2. Teacher respondents' profile.....	21

4.3. Teachers' Responses.....	23
4.3.1. Gender distribution of learners opting for science.....	23
4.3.2. Curriculum contents and sequence.....	24
4.3.3. Teaching methods.....	24
4.3.4. Participation of girls in theory lessons.....	25
4.3.5. Participation of girls in practical lessons.....	26
4.3.6. Teachers' reactions towards students who get answers wrong.....	27
4.3.7. Teachers' suggestions on how to encourage girls to do science.....	27
4.4. Girls responses.....	27
4.4.1. Science teachers' gender.....	28
4.4.2. Girls participation in science classes.....	28
4.4.3. Girls' perception of science.....	29
4.4.4. General performance in the lower classes.....	29
4.4.5. Reasons for opting out of science.....	30
4.4. Summery of students' and teachers' responses.....	30

## CHAPTER FIVE

### Analysis, Implications and recommendations

5.1. Introduction. ....	32
5.2. Summary of research findings.....	32
5.3. Low rates of girls' participation in science.....	33
5.4. Girls' perception of science.....	35
5.5. Strategies for improving science teaching for girls.....	36
5.6. Recommendations.....	37
5.7. Implications for further research.....	38
Bibliography.....	40

APPENDICES		PAGE
Appendix A	Excerpt from ECOL	<b>41</b>
Appendix B	Questionnaire for science teachers	43
Appendix C	Questionnaire for girls doing science	<b>44</b>
Appendix D	Questionnaire for girls not doing science	48
Appendix E	Letter to the respondents	<b>49</b>
Appendix F	Letter to the principals	<b>50</b>

## **ABSTRACT**

It has been discovered that in many countries, both locally and internationally, girls have low participation rates in science at secondary school level. This thesis examines the factors that underscore the persistence of girls' low participation rates in schools. The major reason for this examination is to establish ways in which secondary school teachers, interested individuals or groups of people, and the ministry of education in Lesotho can manage this problem.

Kelly (1981) argues that causes of girls' negative attitudes towards science are multifaceted. Thus, in attempting to understand these causes and to develop strategies to manage this behaviour, a single approach, which focuses on student-teacher classroom interaction, was considered. This thesis therefore, seeks to investigate the responses of girls and science teachers in schools with least numbers of girls having opted for science in the last five years. Due to less numbers of science teachers in schools, I involved in this study, all those found in schools surveyed. To survey girls' responses to this problem, I drew a random sample of both those who have opted for, and those who have opted out of science. I then used a self-administered questionnaire as the research instrument for this study.

Basing myself on my judgement's analysis, I therefore concluded that gender discrimination is the major source of girls' negative attitudes towards science in Lesotho, the country that condones female subordination. The unfavourable learning atmosphere that male teachers create for girls in science lessons, such as, the harassment, the harshness, deprivation of opportunity to participate in class, to use the laboratory equipment and other ways and means of ill-treating and frustrating girls are all a result of male domination. A number of recommendations to manage this problem have therefore been proposed.

## **ACKNOWLEDGEMENTS**

I am grateful to the supervisor of this dissertation, Dr. Ige and the co-supervisor, Professor Robert Morrell for their constructive criticism, expert guidance and patience.

I should also like to thank the senior education officer, Mhahles' hoek district, Mr. Eden Tau, the principals, science teachers and students of the four secondary schools surveyed, for their willingness and cooperation, and also for making this study a success.

Lastly, my profound gratitude goes to Professor and Mrs. Moletsane, for their encouragement and support throughout the study.



<b>LIST OF TABLES</b>	<b>PAGE</b>
Table 1: Total population and selected sample for the study (Students).	14
Table 2: Total population and selected sample for the study (Teachers)	14
Table 3: Distribution of teachers	21
Table 4: Gender distribution	22
Chart1: Academic qualification of teachers	22
Table 5: Teaching experiences	22
Table 6: Attitude of teachers towards girls who get answers Wrong	26

## **LIST OF ABBREVIATIONS**

<b>ECOL</b>	Examinations Council of Lesotho
<b>J.C</b>	Junior Certificate
<b>COSC</b>	Cambridge Overseas School Certificate
<b>T.C</b>	Teachers Certificate
<b>Dip. Ed.</b>	Diploma in Education
<b>Undergrad. Deg.</b>	Undergraduate degree
<b>Postgrad. Deg.</b>	Postgraduate degree

# **CHAPTER ONE**

## **Background of the Study**

### **1.1 Introduction**

In my professional capacity as a secondary school teacher, and presently an education officer whose main duty is to inspect schools, I have met many science teachers, science examiners and science subject advisers from different parts of Lesotho in seminars, workshops and meetings. During such encounters, the topic of the problem of under- representation of girls in secondary schools has arisen frequently. Differences in perceptions of people often engender endless debates and quarrels, over the factors that contribute to girls' reluctance to choose science subjects. Some teachers still adhere to the old belief that Mulemwa (1987, cited in Wamburu, 2000) called 'the fallacy of the masculine nature of science subjects, whereby science and technical competence are associated with men and masculinity, while lack of competence is associated with women and femininity.'

Contrary to this position, other teachers argue that science is a subject for talented people regardless of gender. To support their argument, they point to the truth that in class, boys participate more than girls, but during the examinations, the performance of both gender types is the same, that is, no gender performs better than the other. The other factor that most teachers like to raise is that girls prefer reading books to working in the laboratory, where according to teachers, effective learning of science takes place. In opposition to this also, other teachers, mostly females, argue that it is not because girls prefer to read, but that teachers do not make girls feel settled in the laboratory.

The main argument of this thesis is that teachers have a greater influence on students' choices of subjects, especially science subjects in secondary schools. To help teachers, students, parents and the department of education, (those mostly affected by the prevailing situation), the study looked into student-teacher classroom interaction patterns that are considered to be discouraging girls from doing science in schools.

## **1.2 Aim of the Study**

The aim of the study was to explain why relatively few girls choose to take science in secondary schools in Lesotho (science in secondary schools is a combination of physics and chemistry). As a student in one of the secondary schools in Lesotho in the early 1970s, I was among the few girls who took science. It is distressing to see that girls still shy away from science even today. The study examined some of the factors underlying the persistent under-representation of girls in school science. It focused on the views of science teachers and perception of girls in secondary schools in the Mphahle's hoek district. The Mphahles' Hoek science teachers and girls were chosen for the study because of my knowledge of the area and familiarity with principals and teachers, which would make it easier for me to obtain access to schools.

## **1.3 Motivation of the study**

In Lesotho, there are three levels of education, which are the primary level (Standard 1-7) or Grade 1-5 in the South African system, the secondary/ high school level (Form A-E) or Grade 6-10 in the South African system, and tertiary level, which is the post secondary level. At primary level, the curriculum is largely the same throughout the country, and as stated in the educational policy, all subjects are compulsory, whereas at secondary and tertiary levels, students are able to opt for particular subjects. It is at these levels that differences in choices of subjects between males and females become pronounced.

It has been observed that in Lesotho, male students dominate science, while female students are prominent in other subjects, particularly languages and social sciences. An excerpt from the Examinations' Council of Lesotho (ECOL) confirms that the proportion of male sitting Cambridge Overseas School Certificate (COSC) or Secondary School

Certificate in science continues to outnumber that of female students. **(See appendix A for data and interpretation).**

According to Sjoberg (1996), It is an accepted truth that in education, science and technology are the most important areas of curriculum to enable people to make sense of the world, and to use the resources at hand, and yet it is in both areas that girls and women have the lowest access. The four schools in this study therefore confirm this statement. Since this problem does not only affect schools, but goes further to hinder the district's progress, it was considered important to establish reasons offered by female students and science teachers to explain this gender bias in the choice of science in schools, as this might end up bringing some solution to this problem.

#### **1.4 Approach to the study**

Chapter two of this study consists of a review of literature. It provides a theoretical framework for the study. It looks at different explanations that both local and international research has put forward as reasons for the low participation rates of girls in science in schools. Knowledge of adolescents' behaviour and attitudes towards science are explored.

Chapter three provides an account of how the study was designed and conducted. Research methodology employed, sampling method and instruments are described. Limitations and problems encountered in collecting data are also explained.

Chapter four presents research findings from the responses of both science students and teachers while chapter five provides analysis, implications, personal interpretations based on themes of the literature that was reviewed in chapter two, conclusions and recommendations drawn from the study.

## **CHAPTER TWO**

### **Literature Review**

#### **2.1 Introduction**

This chapter looks at the different explanations that local and international scholars have put forward as reasons for low participation rates of girls in science in schools. Current state of research in this area, reveals that girls' lack of interest in science is due to the following factors: early socialisation, stage of adolescence, nature of the subject (science), family and school influence, teachers and their interactive approaches with students, lack of guidance and career advice and option choice processes (Measor & Sikes, 1992; Dalamba, 1999; Staberg, 1994; Thomas, 1990; Roger and Duffield, 2000; Wolpe et al, 1997). Literature suggests that teachers have a great influence on students' participation in class, especially science.

Therefore, this chapter will deal more with those factors that literature refers to as teachers' influences towards girls' participation in science. It will also look into how girls perceive science. The chapter will employ a theoretical review, which implies organising studies into theories that purport to explain reasons for girls' low participation rates in science. Since there is sparse literature on gender and education in Lesotho, I will integrate my discussion of both local and international literature.

#### **2.2 The Influence of Teachers on Girls' Choices of Science: Classroom Situation.**

Teachers are leaders, managers and facilitators of the learning processes in their classrooms (Bull and Solity, 1987). As such, teachers have a greater influence on students' choices of subjects, performance and behaviours.

Cele (1994 cited in Wamburu, 2000) points out that the interaction between students and teacher, and also that between students and students, does influence their learning, and performance.

Zietsman (1996, cited in Wamburu, 2000) and Beyer (1996) argue that, a democratic classroom experience is the most influential factor that encourages girls' choices of science in schools. Based on the arguments stated above, the following section will now examine how teachers influence girls' participation in classroom situation, and also how girls perceive science.

### **2.3 Girls' Perception of Science**

Results of studies and views that relate to girls' perception of science indicate that girls view science as tough, complex and masculine/male domain. Wolpe, Quinlan and Martinez (1997) conducted a study on gender and equity in education, focusing primarily on girls and pursuance of mathematics and science in the South African schools. Their interviews were carried out with top officials in different provincial educational departments, universities, technikons and training colleges. Their findings were that most girls tend not to pursue mathematics and science in schools.

Of the many reasons that were raised, the major one was that girls see the image of science as male domain. Jovanovic & Dreves (1995), who conducted a study on how male-female gender gap in mathematics and science can be closed, support this study. In explaining how the gap was created, they quoted other researchers' findings, which revealed that most girls are afraid of taking science, because of cultural beliefs that science is masculine, complex and difficult for girls.

Looking deeply into the gendered nature of science, Hudson (1972, cited in Thomas, 1990) discovered that long before his study, students had already associated science with masculinity and arts with femininity. He points to the fact that not only do students apply the above terms to arts and science, but also the psychologists apply them as well.

He explains that in psychology, higher status (in this case associated with science) is accorded to 'hard' tradition, which forms the core, the centrality or the most important part of the discipline. The lower status (in this case associated with the arts) is accorded with the 'soft' tradition that is apparently of very low value to the discipline.

Their studies, Wolpe Quinlan and Martinez (1997) and Hudson (1972 cited in Thomas, 1990) have both similarities and differences. In their findings the similarities are firstly, that their findings reveal that girls perceive science as male domain, and secondly, that they both employed conversational interviews. The difference is that the population of Wolpe, Quinlan and Martinez's study included top officials in different provincial educational departments, while that of Hudson included his schoolboys.

My criticism to both researchers is that they have not involved science teachers and girls in their studies, yet they are the people who are directly affected by the problem of science in schools. Moreover, I blame them for having used conversational interviews, as such interviews may allow for the interviewer effects and bias.

To avoid the above-mentioned discrepancies, the present study employed open-ended and closed-ended questionnaire to gather information from girls and science teachers in schools.

The results of the present study, regarding this particular issue of girls perceiving science as masculinity, slightly differ on two levels from those already discussed, since firstly, the study involved different groups of people, and secondly, because the students dealt with come from a country which is trying its best to remove the fear of science from students, by introducing many science programmes which are aimed at encouraging students to do science, by training science teachers on modern ways of teaching the subject, by improving school laboratories and by awarding prizes to students who perform well in science at COSC level.



## 2.4 Teacher' Qualifications

There is copious evidence to suggest that most girls shy away from science because most teachers fail to explain concepts in great detail, especially for the understanding of girls (Whitehead, 1996; Thomas, 1990; Jewits et al, 1998). According to the study conducted by Wolpe, Quinlan and Martinez (1997), most science teachers in South Africa are not qualified to teach the subject.

They held interviews with different provincial educational authorities where more than two million learners were represented. Their findings were that out of 84 percent of science teachers that are professionally qualified as teachers, only 42 percent have specialist training in science. Wolpe, Quinlan and Martinez (1997) further pointed out that professionally qualified teachers are being deployed to teach science, although some of these teachers do not have appropriate science qualifications. These then are the people who fail to explain the scientific concepts to students; hence the girls' sustained perception that science is difficult.

A recent study by Roger & Duffield (2000) confirms this finding. In their study, they focussed their attention on factors underlying the persistent gendered option choices in school science and technology in Scotland. The study revealed that few secondary school science teachers have solid grounding in science, which is a serious disadvantage, especially considering the curriculum developments of recent years. Harlene (1997 cited Roger & Duffield, 2000) reports that in most secondary schools in Scotland, 90 percent of female teachers who have limited confidence in the subject teach science. Such teachers, she argues, result in failure to communicate knowledge to students, who end up developing negative attitudes and doing away with science.

A claim made by Wolpe, Quinlan and Martinez (1997) and confirmed by Roger & Duffield (2000), that most teachers teach science without proper qualifications is a possibility even in Lesotho. As reflected by the Examinations Council of Lesotho (ECOL) on the table of statistical records for students who sit Cambridge Overseas School Certificate (COSC) examinations, male students outnumber females.

Most males in the country prefer careers such as medicine; engineering and other science related fields. They come into teaching only as an afterthought when they have failed to get what they wanted in other vocations.

Also, from a limited number of girls who succeed in science courses, only a few decide to take up a teaching profession. This therefore, suggests that there is a high possibility of arts teachers being deployed to teach science in schools.

## **2.5 Classroom Participation**

Patterns in teacher-pupil interaction are gender biased with teachers using sex-stereotypes and giving extra attention to boys in the classroom (Acker, 1986; Clarricoates, 1987; Wolpe, 1977 cited in Truscott, 1994). In her report to 'Women Edu' 1999 on the subject 'Secondary and Vocational Education', Dalamba argues that at these levels of education in South Africa, boys are privileged and are given the opportunity to participate fully and freely in classroom activities and discussions, while girls are intentionally deprived of that right. This behaviour of teachers neglecting girls, she argues, emanates from the African culture, which dictates that girls are not to speak loudly in public.

In a study on the influence of teachers on girls' performance in science subjects, Wamburu (2000) found that students of different sexes are treated in different ways that affect their performance in class. Teachers have prolonged dialogues with boys, as they involve them in classroom discussions and deliberately allow them to freely ask and answer questions, while girls, who will even be given limited time, are expected to follow the rule of raising up hands before they either ask or make attempts to answer questions. Wamburu also has a feeling that this unequal opportunity that is given to students might be a result of culture or socialisation, which expects girls to speak less in public.

Other researchers (Clarricoates, 1978; Stanworth, 1981 cited Thomas, 1990), also found that most teachers tend to spend more of their teaching time talking to boys, and that worse still, teachers go to an extent of not even remembering girls' names. Even further, Clarricoates (1978 cited in Thomas, 1990:84) observed that:

teachers feel that boys need to be pushed... as they see them as having the 'real imagination', in fact true creativity, while girls are good at 'tagging along, lacking reasons and clear logic.

Clarricoates found that some teachers even go to an extent of gearing their lessons more towards the interests of males so as to give them the opportunity to participate, and also to avoid disruption they make when they lose interest in class. Jovanovic and Dreves (1995) are also aware that in classrooms, teachers call on boys more, praise boys more for correct answers, and are more likely to ask boys for help in science demonstrations, while girls get the message that they are not as good as boys. Their feeling is that teachers are unaware of their biases.

Jovanic and Dreves (1995) further assert that teachers deliberately allow male students to dominate discussions, and that surely this act is an obstacle in girls' way of understanding science. Dalamba (1999) and Wamburu (2000) differ from Clarricoates (1978) and Stanworth, 1981 (cited in Thomas, 1990), when it comes to teachers' reasons behind the act. Dalamba and Wamburu feel that teachers are forced by culture to act the way they do, whereas Clarricoates and Stanworth maintain that teachers are trying to avoid disruptions made by male students on failure to understand concepts in class. Assumingly, the element of boys participating more than girls does exist in schools in Lesotho, since male teachers do have gender discrimination.

## **2.6 Teaching Methodology**

For students to understand theories and concepts in a class, there has to be both effective teaching and effective learning. For teachers to effectively communicate knowledge, and for students to absorb knowledge, appropriate teaching methods should wisely be selected (Bull and Solity, 1987).

A Canadian study ([www.carleton.ca/~mfrize/wise/webmtjnen/chap3.html](http://www.carleton.ca/~mfrize/wise/webmtjnen/chap3.html), August, 2002) confirms that science teachers use lecture method (which is not appealing to girls) to teach science. This study shows that teachers' failure to teach science practically is due to the fact that most schools lack resources, while at the same time teachers lack training on how to teach science.

The study goes further to argue that some teachers avoid teaching science practically because they have a belief that understanding theory is more important than seeing practical applications, and that students who leave science do not do so because they need practical lessons, but because they fear hard work.

Wamburu (2000) argues that one of the barriers to girls in the learning of science is the lecture method that is employed by most teachers in their classrooms. In carrying out her study, Wamburu (2000) observed 32 science lessons, where the teachers used 'chalk and talk method' and dictated notes. Worse still, many teachers, 42 percent of male teachers and 71.4 percent of female teachers were aware that even though they avoided practical lessons, female students need them to understand science.

In opposition to these arguments, Staberg (1994) conducted a study investigating on how students meet chemistry, physics and technology in compulsory schools, and also exploring girls' and boys' actions and thoughts about these subjects. Using interviews, Staberg explored experiences of students in class through their perceptions. Girls expressed their interests in doing exercises in books, and also expressed boys' interests in doing experiments in the laboratory. Staberg also observed that girls preferred reading, which is a theoretical and unsuccessful way of doing science, while boys liked playing with apparatus, which is a very easy way of understanding science. Studies by Wamburu (2000),

([www.carleton.ca/~mfrize/wise/webmtjnen/chap3.html](http://www.carleton.ca/~mfrize/wise/webmtjnen/chap3.html), August, 2002) and Staberg (1994) are agreed on the fact that science teachers employ lecture method to teach science. This is also what is hypothesised by this study.

The difference in the three studies is seen when it comes to the group of people who are affected negatively by this method. A study by Staberg found that girls' understanding of science is facilitated more by reading text books than doing practical

work while studies by Wamburu and

([www.carleton.ca/~mfriize/wise/webmtinen/chap.html](http://www.carleton.ca/~mfriize/wise/webmtinen/chap.html), August, 2002) showed that this lecture method is more of a hindrance than a help to girls in learning science because girls like and understand science better in the laboratory. From my own point of view, girls dislike manipulating apparatus in the laboratory, because of a fear of handling dangerous chemicals' in Lesotho. During practical lessons, most girls in Lesotho prefer to be paired or grouped with boys, so that while boys will be performing the task, girls will be recording the results or outcomes of experiments. In a nutshell, this is a way of agreeing with Staberg that, because of negative attitudes girls have towards practical lessons, most girls do not gain much from them. They prefer reading to practising.

## **2.7 Teachers as Role Models**

Male teachers dominate the school subjects that girls do badly in' Measor & Sikes (1992). In support of their statement, Measor and Sikes have identified two problems girls encounter due to lack of suitable female science teachers in schools. The first is that girls have few science teachers as role models in this particular curriculum area. The second is that male teachers give more attention to boys, prioritise boys' interests and encourage them more in the classroom, thereby ignoring and leaving girls demotivated and without any support.

Contrary to this, in a study that was carried out in Scotland, Roger (2000) argues that although the presence of female science teachers as role models has often been suggested as significant, that has not been proved true. Roger based his argument on the results of two Scottish studies of physics and technology by Sparks (1997) and Murdoch (1995) respectively. In his study, Sparks (1997 cited Roger, 2000), had a sample of 313 physical science teachers, among whom 14.7 percent were females, who were almost identical to Scottish office statistics for the whole country. When analysing gender patterns of uptake, he found that the presence of female teachers in physics had no impact on girls' choices.

There is a strong feeling of disagreement with the argument that girls shy away from science because of a limited number of female science teachers in schools. There is also a disagreement that male teachers are biased against female students in science classes. Teachers are professionals, and would not be so weak as to deliberately force students out of a subject. As has been suggested earlier, female students have no confidence in their ability to perform well in science, and as a result, do not put much effort in the study of science.

The literature review has raised questions and suggested a possible framework for the exploration of reasons for the gendered patterns of science in secondary schools. Kahle and Meece (1994, cited in Sjöberg, 1996) relate the difficulties associated with girls and science to teachers' negative attitudes and lack of support to girls who opt for science in schools. The survey has revealed clear gaps in our knowledge. There are no studies in Lesotho, which is an indication that the issue of girls' negative attitudes towards science is neglected or ignored completely in the country.

However, a few studies have been traced in South Africa, and some neighbouring countries such as Uganda and Tanzania. While it may be true that some studies have addressed the issue of gender equity in schools, with particular reference to science, a possible influence of teachers on girls' participation in science in classroom situation, particularly in Lesotho, has been omitted. Indeed, much of the debate around current under representation of women in science has been couched in general terms, but a few studies of actual reasons for low participation of girls in science have been undertaken.

The work of Wamburu (2000) is a noteworthy exception. In her study in four schools, she found that teachers have a great influence on girls' performance in science subjects, and this finding acted much as a guide to the present study. A questionnaire, intended to get teachers' explanations for the gender bias in choice of science in schools and girls' perception of science, was therefore made.

## **CHAPTER THREE**

### **The Research Methodology**

#### **3.1. Introduction**

This chapter provides an account of how this study was designed and conducted. In describing the research design, emphasis was laid on the method of investigation that was employed, where I indicated the research instrument used, reasons for choosing it, the size of the sample, the sampling procedure, the method of data collection and data analysis. Under conduct of the study, the procedure followed in carrying out the study was examined.

#### **3.2. Design of the Study**

##### **3.2.1 Sampling**

I made use of a descriptive survey design in four secondary schools in the Mophale's Hoek district in Lesotho. Surveys involve studying populations based on data gathered from a sample drawn from the population. They rely on large-scale data either from questionnaires, test scores, attendance rates and results of public examinations (Cohen, Manion and Morrison, 2001). They generally, serve the purpose of describing characteristics, opinions, attitudes, or behaviours that exist in population (McMillan and Schumacher, 1989). In this study, the population consists of all the secondary school science teachers and forms 4 and 5 female science and non-science students in the 4 secondary schools in the Mophale's hoek district.

Based on Cohen, Manion and Morrison, (2000) method, a random sampling was used to obtain a sample of 12 female science students and 14 science teachers out of a population of 74 students and 14 teachers. Because the district is divided into the lowlands, foothills, and highlands, schools chosen covered those three areas.

All the selected schools were accessible by buses, and this made it easy for me to administer questionnaires.

For the selection of subjects, a sampling frame was developed for each school using a list of all female science students. The numbers were put in the box and thoroughly mixed. The random sample was selected by withdrawing numbers one at a time, until the required number was obtained.

**Table 3.1: Total Population and Selected Sample for Study (Students)**

SCHOOLS	TOTAL POPULATION	SELECTED SAMPLE
Lowlands x	27	3
Lowlands y	19	3
Foothills	15	3
Highlands	13	3
TOTAL	74	12

**Table 3.2: Total Population and Selected Sample for Study (Science Teachers)**

SCHOOL	TOTAL POPULATION	SELECTED SAMPLE
Lowlands x	6	6
Lowlands y	3	3
Foothills	3	3
Highlands	2	2
TOTAL	14	14

All subjects had an equal chance of being selected in the sample.



### 3.2.2 The Instrument

A survey method was selected in order to investigate the two central questions: (a) What are teachers' explanations of girls' negative attitudes towards science and (b) What are students' perceptions of science. Cohen, Manion and Morrison, (2000) state that whether the survey is large-scale or small-scale, it involves one of the following data-gathering techniques: structured or semi-structured interviews, self-completion or postal questionnaires, standardised tests or attainment or performance, and attitude scales.

In this study, self-completion questionnaires were administered to both teachers and learners. (See Appendices B, C and D). Due to the sensitivity of the following issues that concern teachers: behaviours, practices, habits, and attitudes towards female science students, I assumed that teachers would not be in a position to engage in in-depth interviews on student–teacher classroom interaction, which would be used to generate research themes. As a result of this, a more traditional approach, where concepts to be tested and explored were predetermined by the researcher from personal knowledge of the context and a study of relevant literature was adopted.

The research themes in this study were generated from relevant literature on issues of gender and science in schools (Staberg, 1994; Roger, 2000; Wamburu, 2000; Measor and Sikes, 1992). From the body of literature that was reviewed in chapter two, the following themes emerged:

Girls' negative attitudes towards science are due to, among many:

- \* Teachers influence in classroom teaching, where girls are deprived of their rights to freely and fully participate through asking and answering questions.
- \* The manner in which curriculum content is sequenced and the way the teaching methods are selected in the teaching of science.
- \*The fact that the nature of science as perceived by girls is masculine, hard, and can only be done by male students.

These themes that emerged from literature were used to generate open-ended and closed-ended questionnaire. Among the advantages of the questionnaire as a research instrument is that it is more reliable than other instruments since it assures anonymity. Because it can be administered to a whole group at a time, it is easier to obtain the larger sample size that is needed, and is therefore relatively economical. It has disadvantages though. There is less depth in the questions asked. When answering closed-ended questions, there is often no opportunity to ask for clarity of questions, especially in the case of a posted questionnaire, where the researcher is absent (Neuman, 2000).

### **Questionnaires**

Three questionnaires were developed. One for science teachers, and the other ones for female science and non-science students (see appendices B, C and D). A letter to respondents accompanied all questionnaires (see appendix E). Teachers' questionnaire consists of two sections while each of the students' questionnaires consists of only one section.

### **Teachers' Questionnaire**

**Section A** was designed to obtain the biographic data that required information regarding the respondents age, gender, sex, qualifications, and teaching experience. It also focused on percentages of students who are currently doing science in those schools.

**Section B** focused on student-teacher interactions in classroom teaching. Teachers were invited to indicate who, between boys and girls, participate more in class and also how they do that. They were also to indicate causes of the differences between students' participation in class, their reactions towards such differences, and how possibly that can be discouraged, so that equality in science is promoted.

**Science Students' Questionnaire** sought to establish whether or not girls perceive science as a male domain, also to hear their views on their participation rates, and reasons for their being either high or low.

**Non- Science Students Questionnaire** was intended to find out from those girls who opted out of science, what actually were their reasons for doing that.

### **3.2.3 Validity and Reliability**

In order to validate the instrument it was given to 4 university students, who were once teachers, 3 teachers who are currently teaching at junior secondary schools and an education officer. All these people evaluated the instrument and recommended changes, which were effected by the researcher. They then agreed that the instrument had face validity. Since the instrument was used for the first time, then reliability was not established.

### **3.2.4 Pilot Study**

The instrument was tested on a group of seven form 5 students and 2 science teachers from schools not participating in the study. The results of the pilot study helped me to rephrase and clarify questions that lacked clarity. I also established that it took respondents 15-20 minutes to complete the questionnaire.

### 3.3 Procedure

Firstly, the department of education, University of Natal, Durban, wrote a letter seeking permission from the senior education officer of the Mohale's Hoek district, to allow me to conduct research in the 4 identified secondary schools in the area. The senior education officer informed principals of the concerned schools, and wrote a letter that introduced me to them (see appendix F). At the first meeting with the principals, I provided them with information regarding the nature, the purpose and the relevance of the study to current developments in education and the society at large. All principals were satisfied and appointments for data collection dates were made.

Despite the fact that a postal questionnaire is considered the cheapest and the best form of survey in carrying out educational enquiry (Cohen, Manion and Morrison, 1989), I decided to use a self-administered questionnaire. The reasons for opting for this type of questionnaire are that it takes a shorter time to carry out, yet it ensures all schools receive the required number of questionnaires. The availability of the researcher in schools also ensures clarity of questions, as whoever encounters problems in understanding questions will refer to her.

To avoid inconveniencing and rushing respondents, especially as they were busy with the September trial tests, the researcher left questionnaires in schools for completion, and collected them after four days. On the 4<sup>th</sup> day, when the researcher went back to schools to collect the forms, some teachers had still not completed them. Some indicated that they had been too busy with the September trial tests, while others had misplaced the questionnaires. I had to wait for those who were willing to complete the questions while she was there, and also replaced those that were lost. A promise was made that those that were left uncompleted would be posted to her.

The principals volunteered to supply envelopes and stamps to teacher who will be willing to post completed questionnaires. To the researcher's surprise, only a few of those that were left were posted to her. Messages to remind teachers of their promise were made in vain. However, the overall response rate was 92%.

All the principals, together with the district senior education officer were thanked for courtesy, cooperation and support.

From my own experience, there are some science teachers who lack efficiency. As a result, such teachers take anybody who gets to their schools with anything that concern science as a threat to them. Such teachers always show reluctance and unwillingness to contribute towards the development of educational research.

### **3.4 Limitations of the study**

Cohen, Manion and Morrison, (2000) point out that triangulation, which is the use of two or more methods of data collection in the study of some aspects of human behaviour, is the most powerful way of demonstrating validity.

They go further to show that the '[e]xclusive reliance on one method, therefore may bias or distort the researcher's picture of the particular slice of reality she is investigating'.

However, one of the limitations of this study is the employment of a single-method approach to collect data. As has been pointed out earlier, time and economic constraints led to the avoidance of the use of other methods such as interviews, since they are labour-intensive in terms of interviewing time, travel time and transport costs. As a result, a more reliable and valid instrument of data collection, a self-administered questionnaire was to be more appropriate.

The other limitation is the omission of the principals. Principals as administrators provide leadership to science teachers and influence their role in the effective teaching of science. Another limitation is that the study surveyed four schools in one district. This means that the results cannot be generalised to all schools in the district, let alone all schools in Lesotho. Further studies involving larger samples of schools, teachers and learners are needed if the problem of low girls' participation in science is to be understood fully.

### **3.5 Summary**

In this chapter explanations on the research methodology and procedures were made. Aims of the study were discussed. The population, the sample, the sample size and the sample procedures were all described. Data collection instrument, questionnaires and procedures for data collection were thoroughly dealt with. Finally, the chapter was concluded with a consideration of some limitations of the study. The next chapter will provide data analysis of the respondents of both students and teachers.

## CHAPTER FOUR

### Presentation of Findings

#### 4.1 Introduction

This chapter presents research findings from four secondary schools in the Mphahle's hoek district in Lesotho. As indicated in the last chapter, the main data collection method was a questionnaire, administered to science teachers and learners in the four secondary schools. Data from these two groups is organised first into teachers' responses and then into learners' responses.

#### 4.2. Teacher Respondents' Profile

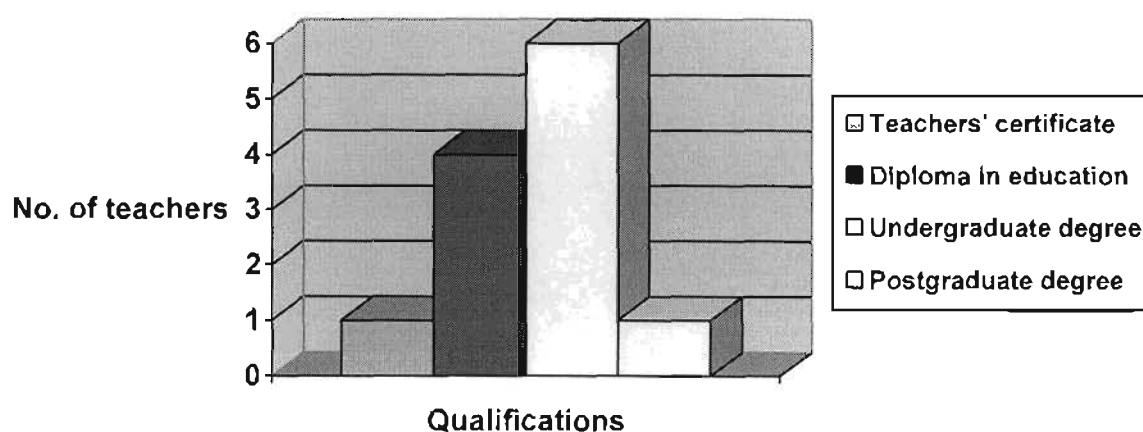
This section provides a description of the demographic profile of the teachers who responded to the questionnaire across the four schools studied. Firstly, from the schools, a total of 12 teachers (92%) responded to the questionnaire. Of these, three were from school A, three from school B, four from school C and two from school D. However, the findings in this report are aggregated across the four schools and are presented in one report rather than four case studies. Secondly, tables 4.1 and 4.2 present the age and gender distribution of the teachers across the four schools, while chart 4.1 presents their qualifications.

**Table 4.1. Age Distribution of the teachers**

Age Group	No.	%
1.1 20-29	5	42
1.2 29-39	5	42
1.3 39-49	2	16
Total	12	100

**Table 4.2. Gender Distribution**

2. Gender	No.	%
2.1 Male	7	58
2.3 Female	5	42
TOTAL	12	100

**Chart 4.1. Academic qualifications of teachers****Table 4.3. Teaching experience**

This table presents the teachers' teaching profile.

4. Experience	No.	%
4.1 Less than 1 year	2	16.6
4.2 1-5 Years	5	41.6
4.3 6-9 Years	-	-
4.4 10+ Years	5	41.6
TOTAL	12	99.9



Out of the total population of 12 teachers, seven of them (58%) are males while five (42%) are females. 10 (83%) are young, below 39 years, with less than five years teaching experience. 11 (92%) teachers have the academic university qualifications with science as the area of their specialisation, while only one teacher is an art specialist. This therefore means that in schools in question, science is in the hands of the appropriate teachers.

### **4.3. Teacher Responses**

This section presents findings from the teachers' responses to the questionnaire. These are organised into themes informed by the questionnaire items and responses.

#### **4.3.1. Gender distribution of learners opting for science**

Of the 12 teachers surveyed in this study, seven (58%) indicated that in their schools, more boys than girls tend to opt for science in their schools, while five (42%) experience a lesser number of boys than girls in science. While the difference is not so significant, it is clear that more boys than girls opt to do science in the four identified secondary schools in the Mohale's Hoek district.

Research has shown that planning of content and selection of methods of the science curriculum influence (negatively) girls' inclination to opt for science, as well as their success in the subject (Wamburu, 2000). Thus, the following section describes the various content and approaches that these teachers of science use in their classrooms.

### **4.3.2. Curriculum Content and Sequence**

In response to the question, 'in preparing for the effective teaching of science, how do you arrange the topics?' six respondents (50%) out of 12, stated that they identify and group topics according to themes, from the simplest to the more complex and abstract. Four respondents (33%) indicated that they follow the sequence of the topics in the national syllabus, while two (17%) start with the most difficult. Thus the majority of these teachers seemed to start from the simplest to the complex, and from the concrete to the more abstract, principles encouraged by most science educators Schwab (1969).

In order to enhance the effectiveness of their lessons, six of the 12 teachers (50%) pointed out that before they present their lessons, they find out through questioning, how much subject content students know, so that they start teaching from there, three (25%) said that they start first by asking students to read the chapter and familiarise themselves with the concepts, three (25%) said that they arouse students' interest by for example, telling a very short but interesting story that is related to the day's topic, while only one indicated that he/she starts by demonstrating the lessons. Teaching from what students know, to what they do not know is one of the best techniques in the effective teaching, which according to teachers' responses, most of the sampled teachers are aware of, and do practice in their teaching.

### **4.3.3. Teaching methods mostly used**

All teachers interviewed agreed that a variety of teaching methods should be used in the teaching of different science topics. In their responses, teachers listed teaching methods such as discussion, demonstration, observation, discovery, question and answer, lecture and practicals.

When asked to indicate which of the above methods they thought were more appealing and effective to girls, only two (17%) of the respondents responded to the question. The first one indicated theory method while the other one stated lecture method (the two of

which researchers such as Wamburu (2000) and Staberg (1994) discourage in the teaching of science). For so many teachers to have not responded to this question may mean that teachers are either not aware that students of different gender prefer different teaching methods, or that teachers do not vary the teaching methods in class, so that they know which suit girls and which suit boys.

#### **4.3.4. Participation of girls in theory lessons**

In response to the question, 'how would you rate the participation of girls in theory lessons,' seven teachers out of 12 (58%) indicated that the participation rate in their classes is low, four teachers (33%) stated that in their classes it is medium, while only one teacher (8%) pointed out that in his/hers, girl participation is high. According to the majority of respondents, girls' participation in science theory lessons is low.

When asked to suggest reasons for rating the participation of girls the way they have done, in theory lessons in science, the only teacher who stated that the participation rates of girls in theory lessons are high, pointed out that it is because in most cases girls who choose science are intelligent, so they never have any problem understanding, asking or responding to questions. Teachers, who stated that the participation rates are medium, argued that girls participate very well in topics that are related to things that they are familiar with, such as in teaching how electricity works in the house. They also participate poorly when topics relate to things that they are least interested in, such as in teaching electricity in machinery. Those teachers who indicated that the participation rates of girls are low supplied reasons that can be summarised as follows:

- \* Male teachers whom girls are scared of in most cases dominate science.
- \* Girls naturally feel inferior to men and have developed that attitude too.
- \* Girls tend to be shy to make mistakes in class, as male students laugh at the mistakes that they make.
- \* Sometimes girls fear to make grammatical mistakes as science is taught in english.
- \* Girls are silly; they do not want to work.

#### 4.3.5. Girls Participating in Practical Lessons

In response to a question, how would you rate the participation of girls in practical lessons? 10 teachers (83%) rated girls' participation as low in practical lessons, while two teachers (17%) rated the participation as medium. None rated the participation of girls as high. When asked to suggest reasons for the low participation of girls in practical lessons in science, teachers who rated the participation of girls in practical lessons as medium, pointed out that girls who opt for science are intelligent, active, enthusiastic and ready to experiment, while teachers who indicated that the participation is low, gave the following as causes:

- \* Girls do not like to manipulate apparatus. They like to sit back, watch and benefit from what boys do, as culture dictates.
- \* Girls are not given enough opportunity to participate. Some teachers always frighten and warn them not to break apparatus. Some male teachers even go to an extent of forbidding girls to handle apparatus; they actually encourage them to watch and record while boys perform the experiments.

**Table 4.4. What teachers do to students who get answers wrong in class**

Responses	Frequency	%
9.1 I beat them	5	42
9.2 I arrange extra hours for them	1	8
9.3 I insult them	1	8
9.4 I encourage them so that they can do better in future	5	42
<b>TOTAL</b>	<b>12</b>	<b>100</b>

#### **4.3.6. Teachers' reaction towards students who get answers wrong**

The results suggest that while some teachers conform to the rule that teachers should seek means, other than corporal punishment, of encouraging students to work hard, others still stick to the old belief that students work hard when they are harassed and given corporal punishment. These methods may serve to alienate and frighten learners, particularly girls, from the subject.

#### **4.3.7. Teachers' suggestions on how to encourage girls to do science**

- \* The government should supply schools with more well-equipped laboratories, so that no students share equipment during practical lessons.
- \* Science should be compulsory in all schools so that number of girls in science classes increases. Girls are easily teased because of their small numbers in class.
- \* The government should award girls scholarships to further studies in science.
- \* The government should build girls only schools for science, in order to avoid male students and teachers domination of classes.
- \*The government should create well paying science related jobs for girls.

#### **4.4. Girls' Responses**

The purpose of this section is to present girls' responses on how the interaction between students and teachers influences students' participation and learning in classroom situation. The number of respondents to the questions is 12, (7 girls who have opted for science and 5 girls who have opted out of science). I thought it worthwhile to include even those girls who do not do science, so that we can also hear from them why they decided not to take science.

#### **4.4.1 Science Teachers' Gender**

The girls' responses to the question, 'what is the gender of your science teacher?' confirmed that male teachers dominate science. Of the seven girls who responded to this question, four (57%) indicated that their science teachers are males, one girl (14%) pointed out that his/hers is a female while two (29%) showed that theirs are a male and a female. It is clear from the responses that there are more males than females who teach science in the four schools in question. This was confirmed by the teachers' responses in the previous section, which indicated that out of 12 teachers, there are seven males and five females.

#### **4.4.2. Girls' participation in science classes**

In response to the question of how girls rate their own participation in science, five (71%) out of seven girls indicated that their participation rates as low, while two (29%) indicated that the participation rates as medium.

This being the case, it therefore means that the perceptions of low girls participation in science were the same as those of teachers in the last section.

When asked why they have rated the participation of girls the way they have done, girls who considered their participation rates as medium in science, argued that teachers do not give them enough time to exercise their potentials, otherwise they would still participate well. Those who considered girls as having low participation rates in science classes argued in the following manner:

\* Science teachers, especially males, are too harsh on them. They give them corporal punishment (a few teachers indicated this too), they call them names such as 'fat cakes', 'lazy lots', nikampups and many others, especially when they get answers wrong in class.

- \* Science bores girls because male teachers who teach them do not wish them success in the subject.
- \* Some teachers tell them from time to time that science is for brilliant students, whom to teachers are boys.

#### **4.4.3. Girls' perception of science**

When asked how they perceive science, all girls pointed out that science is an interesting subject which male teachers deliberately make difficult for them. Some girls also mentioned that in as much as they like science, in Lesotho there are no female science related jobs.

The following section presents the responses of the five girls who had opted out of the science in the four schools.

#### **4.4.4. General performance in the lower classes.**

Firstly, according to the study, all the five sampled students (100%) who opted out of science in the sampled schools indicated that they performed poorly in science in their lower classes. This shows that the problem of girls and science lies not only with secondary, but also with primary schools. Secondly, according to them, the following are causes of their poor performance at lower primary schools:

- \* Teachers often told students that only brilliant students could afford science, as there is a saying in Lesotho that science is a subject for brilliant people.
- \* Teachers were impatient most of the time girls asked questions
- \* Girls were referred to as slow learners, and that discouraged them from doing science
- \* Girls were forced to do science regardless of their performance and interest.

#### **4.4.5. Reasons for opting out of science**

Most students clearly stated that they were so discouraged by their poor performance and the attitudes of teachers in lower classes that they found it unwise to continue with science. More so, when they got to secondary schools they found science still dominated by male teachers whom they thought would still treat them as those in primary schools.

#### **4.5. Summary of students' and teachers' responses**

The focus of this study has been to find out from female students and teachers, reasons for the low participation rates of girls in science in secondary schools in the Molepolole district in Lesotho. From teachers' and students' responses the following points emerged:

First, there are more boys than girls who opt for science in the four secondary schools in question. Reasons behind this are that male teachers, who do not wish girls success in the subject, dominate this subject, which is believed to be so difficult as not to be popular with girls.

Second, teachers are aware that in effective teaching, topics should be clustered into themes and taught chronologically, that is, from the simplest to the most difficult, while content should be presented in the order of known to unknown. Teachers are also aware that they have to employ a variety of teaching methods in their teaching of science.

Third, boys participate more than girls in both science theory and practical lessons. The major reasons as stipulated by teachers are that male teachers, whom girls are scared of, dominate science and make it difficult for girls to freely participate in class.



Reasons identified by girls show that science teachers, especially males, are too harsh on them. Upon making mistakes they beat, insult and call them names.

Further, girls who have opted out of science point to the fact that teachers used to discourage them from doing science, by always telling them how difficult the subject is, and that they would not manage it since they were not brilliant. As stated by girls, teachers were also impatient most of the time they asked them questions.

To address these, both teachers and girls felt that girls would participate better if female teachers taught them science, especially in girls' only schools.

The next chapter analyses these findings, identifies implications for curriculum policy and practice, and makes recommendations for the improvement of science teaching and consequently the increase in girls' participation in secondary science in Lesotho.

## **CHAPTER FIVE**

### **Analysis, Implications and Recommendations**

#### **5.1. Introduction**

This chapter relates the findings of this study to the expectations set up in the literature reviewed in chapter 2 and to the questions that informed this research. It identifies implications for the improved quality, equity and accessibility in science in schools in Lesotho. Finally, recommendations are made that will address the problem and direction for further research is suggested.

#### **5.2. Summary of the research findings**

The body of literature reviewed in chapter two sets up several expectations for the findings of this study. These expectations are a product of the theory that frames and directs this research. Firstly, in science lessons, teachers deliberately create a social setting that negatively influences girls. Secondly, adolescents perceive science as male domain, and would therefore not want to associate with it. These expectations informed the major questions that shaped the direction for my research, namely:

- \* In preparing for the effective teaching of science, how do you arrange your topics?
- \* In teaching science, which methods are most appealing to girls?
- \* How would you rate the participation of girls in your lessons?
- \* What would be the possible reasons for rating them that way?
- \* How do you perceive science to be? (girls)

Having been a science student in the early 1970's, and experienced the hardships of studying under pressure of male domination, and now working in the independent Lesotho, with its new strategies to remove students' fear of science, upon entry to this field, my hypothesis was that since teachers have been equipped with skills and knowledge of teaching and dealing with students, and that since the government has supplied schools with well equipped laboratories in schools, then the problem would remain with girls' natural laziness to learn and make full use of the laboratories and also with their negative attitudes towards science. This appeared to be challenged by the idea that girls themselves prefer to have more practicals than theories.

However, the data that were collected in chapter four reveals that the problem behind girls' negative attitudes lies mainly with male teachers' attitudes towards girls in the classroom situation, and the manner in which curriculum content is being prepared and presented to them.

### **5.3. Low rates of girls' participation in science**

The literature reviewed on reasons for girls and science in chapter two, particularly that of Wamburu (2000) and Roger and Duffield (2000), reveal that actually, teachers are responsible for the low participation rates of girls in schools. Their argument is that teachers give more of their time and concentration to boys in class, while they neglect girls. They allow boys to make frequent free comments while girls are expected to raise their hands up. Findings in this study reveal that sometimes teachers become too harsh on girls, thereby whipping, insulting and calling them names.

Worse still, teachers discourage girls from doing science and sometimes deprive them access to the laboratories. Although Wamburu (2000), (Claricoates (1978) and Stanworth (1990) cited Thomas, 1990) agree that teachers are a source of girls' low participation rates in science, they differ in that Wamburu feels that teachers are forced by culture to act the way they do, while Claricoates and Stanworth maintain that teachers are trying to avoid boys' disruptions upon failure to understand concepts.

My study finds that on the one hand, teachers blame girls for their inferiority complex that makes them feel shy to ask or respond to questions in class. On the other hand, girls attribute the low participation rates to teachers who treat them unfairly in class by giving them corporal punishment, calling them names and telling them that they are too soft for science.

The inferiority complex and shyness are typical behaviours of the Basotho girls that are a result of male domination. Sjoberg (1998) argues that the issue of equity in science education between boys and girls cannot be obtained without also addressing gender discrimination and stereotypes. This is very true. A very strong cultural characteristic in African societies such as Lesotho, is the place of women and girls in traditional society. Culture dictates that they should keep quiet even when men hurt them. Their roles get reduced to household chores and their contribution to community development become very limited.

While it is true that the society of the Basotho is patriarchal, teachers as professionals need to note that the social setting in which science is taught, positively influences all students, regardless of their gender. Cele (1994) and Sadker and Sadker, (1986 cited in Wamburu, 2000) caution teachers not to transfer their beliefs to classrooms, as those affect the learning process.

Actually, the purpose of education is to bring about change to people. So if teachers, instead of changing their attitudes they transfer the old ones to school, then, students, especially girls, will never trust that they can help them to solve their own problems, resulting in girls' sustained perception of science as difficult. I would therefore argue that, that which determines the direction, as well as the success of education and science, is the commitment of the people involved, that is, teachers and students. How does this commitment come about?

The starting point should be to do away with old beliefs and stereotypes in culture that defines science as male domain, as this acts as a barrier for girls' participation in science. Teachers should promote the confidence of girls by firstly, addressing shyness to participate in class. They can do this by simplifying concepts to the understandable level and by exercising patience when girls get answers wrong.

Nobody, whether a student or a teacher, should ridicule girls when they show that they do not understand. Further, teachers should not insult or scare girls when they ask questions. In short, the element of inferiority complex and shyness should by all means be dispelled among females. Teachers who teach culture-oriented subjects, such as history and development studies, should promote self-confidence in girls and reduce the attitude of feeling inferior to males, and always wanting to be sympathised with, so that they become confident and face challenges that confront them in the classroom.

Teachers should avoid treating girls like soft and tender sex, who cannot do hard subjects just because of gender. They should be encouraged to aspire for gender equality and be prepared to work hard like males, both mentally and physically.

The in-service training should be improved, so as to make teachers more sensitive to the dynamics of classroom interaction, and girls and boys' participation.

#### **5.4. Girls' Perception of science**

According to the literature that is raised in chapter two, girls view science as tough and male domain. Contrary to researchers' findings, my study finds that girls in Lesotho view science as a normal and interesting subject like other subjects which they enjoy doing.

The only problem that they perceive is that teachers who teach that subject, deliberately complicate it for them, so that they lose interest and do away with it. Of course it was mentioned earlier on that that teachers, among other things, scar girls by telling them that they are not brilliant enough to cope with science. The difference between these findings might be due to the fact that the Lesotho government is trying its best to encourage all students to do science by supplying schools with well-equipped laboratories, by training teachers on the modern way of teaching science and by giving incentives to schools and students who perform well in science at COSC level.

Some of the strategies to stop these behaviours would be as follows:

As some teachers have indicated, girls are shy to express their feelings to teachers, even when they are being oppressed. I think that through proper students' guidance, the idea of having suggestion boxes, in which students can put letters expressing their dissatisfaction and suggesting ideas for school improvement would work well.

The Ministry of education should include gender sensitisation in teacher training institutions, as this might make teachers aware of how to handle gender differences in teaching.

### **5.5. Strategies for improving science teaching for girls**

One of the issues raised by literature in chapter two is that in planning for effective teaching and learning of science, teachers should consider issues such as the order in which the curriculum content should be arranged and the way in which teaching methods should be selected, as these have a greater influence on girls' participation in science. The findings of this study suggest that grouping topics according to themes hierarchically facilitates students' understanding of concepts, thereby enhancing and improving their participation and learning. If teachers teach science according to the hierarchy of contents, then students will understand science better.

In support of this, Wamburu (2000:15) stated thus: 'Some teachers scare away students from taking science subjects by deliberately starting with very difficult topics'. She further points to the result of this as that of students giving up to join Arts or developing negative attitudes towards science. Coupled with a well-planned content, is the selection of relevant teaching methods. Some teachers make a mistake of using one method to teach all the topics in different subjects, as in the example of a teacher who uses lecture method to teach science, and yet science is a typical practical subject, which could need practical, demonstration, discovery or question and answer methods, depending on the individual topic. Teaching methods such as the practical, bring unreal concepts to reality, which results in improved learning and understanding of science.

As indicated by teachers in the study, teachers are aware that they have to prepare their lessons and select the relevant teaching methods, though it does not look like in practice that is what they do. My doubts are due to most teachers' failure to indicate in their responses, the teaching methods that are appealing to girls, while the few who responded indicated the theory and lecture methods, which are totally discouraged in the teaching of science.

As argued by Wamburu (2000), lecture method, though used by the majority of teachers, is a barrier to girls' understanding of science, while Starberg (1994) indicates that theoretical method is a very unsuccessful way of doing science. The implication of this is that as long as teachers are not serious in making use of the teaching methods, especially practicals in teaching science, girls will never develop a positive attitude towards science.

## **5.6. Recommendations**

Many factors contribute towards teachers' failure to prepare lessons and to select appropriate methods. The commonest are that most schools do not have laboratories and that most teachers lack skills and knowledge, as in some of the training colleges there is no time for teaching practice. The following recommendations would therefore be of some benefit to both the teaching and learning of science in schools:

During their preparations, teachers should emphasise step-by-step approach in problem solving, so as to gain the self-confidence of students.

To make sure that all teachers are skilled in planning lessons and selecting teaching methods, the inspectorate division of the Ministry of Education should workshop newly employed science teachers at least once every year.

The ministry of Education should include gender sensitisation in teacher training institutions as this might make teachers aware of how to handle gender differences in their teaching

Teachers' capacity should be through school-based in-service courses where teachers would be expected to develop their own learning programmes. This would be part of an on going and staged process of developing teachers, at the same time, contributing to the development of schools. It is only when the factors that impact on girls' choice of science in schools are fully understood and every effort is made to address them, that the problem can be curbed in the district and nationally.

### **5.7. Implications for further research**

Studies in South Africa, Sweden, Scotland, Canada, Tanzania, Uganda and USA have explored girls and science in a wide range of contexts, taking into consideration reasons for the under representation of women in the field of science. Such research has demonstrated that factors contributive to girls' shying away from science are: early socialisation, stage of adolescence, the image of science, family influence and less number of science teachers in the teaching force. Within these studies, classroom interaction between teachers and students has hitherto been omitted as a significant factor contributing to the low numbers of females in science. This study has therefore attempted to close that important gap, by investigating reasons for the low participation rates of girls in science in four secondary schools in the Mphahle's Hoek district in Lesotho.

By means of questionnaire, data were collected from a small group of girls and science teachers, and the findings have provided the following as answers to my identified research questions:

- \* Science teachers, especially males, have the greatest contribution to the low participation rates of girls in four schools in the Mphahle's Hoek district in Lesotho.



\* Due to the ill treatment from teachers, girls in the four schools in question, have low numbers opting for science.

\* Despite their low participation rates in schools, girls who have opted for science in the four schools in question are very positive about science, that is, they do not regard it as male domain. The only problem that they encounter is the attitudes science teachers have towards them, as they treat them very unfairly, with the purpose of discouraging them to opt out of science.

\* Science teachers still not use the appropriate methods in teaching science. Even those who use them, seem not use them appropriately, as in the case of someone who uses lecture method, the poorest of all the methods that could be used in teaching science.

To substantiate the findings of this study, a more comprehensive study needs to be carried out on factors that influence girls' negative attitudes towards science. The scope of the study should include other secondary schools for comparative purposes. It is only through such investigations that it is possible to validate the claims made in chapter four, that more boys than girls opt for science in secondary schools in the Molepolole district in Lesotho.

Research reviewed in chapter two identified school as the best place to make interventions that will benefit girls who do science. The results of this study confirm that science teachers contribute towards girls' negative attitudes towards science. This therefore calls for broader investigations into various school areas and activities that could also influence the attitudes of girls, school administration and school culture, are examples.

When discussing the survey on which this study draws and the methods of data collection, I pointed to the fact that questionnaire method was selected because it helps to gather more information from the respondents. At this stage, when there ought to have been a lot to ask and to discuss with students and teachers in order to be clear on causes of girls' under representation in science, long term comprehensive ethnographic research, where the researcher becomes part of the class, thereby observing, interviewing and recording, would have been the best method for this kind of study.

## BIBLIOGRAPHY

- Beyer, E. 1996. *Creating Democratic Classroom: The Struggle to Integrate Theory and Practice* (New York, Teachers College Press).
- Broster, P. & James H. 1987. *Successful Science 9: Physical Science* (Cape Town, University Press).
- Bull, L. & Solity, E. 1987. *Classroom Management: Principles to Practice* (New York, Croom Helm).
- Burgess, R.G. 1985. *Field Methods in the Study of Education* (London, The Falmer Press).
- Cohen, L. & Manion, L. 1994. 4<sup>th</sup> Edition. *Research Methods in Education* (London, Routledge).
- Cohen, L., Manion, L. & Morrison, K. 2000. 5<sup>th</sup> Edition. *Research Methods in Education* (London, Routledge).
- Dalamba, Y. 1999. 'Secondary and Vocational Schools.' Women Edu. October 2, United Nations.  
<http://www.sdnp.undp.org/www/women-edu/msg00032.html>  
 Accessed: 12<sup>th</sup> August 2002.
- Fink, A. & Kosecoff, J. 1995. *How to Conduct Surveys*, Sage.
- Jewitz, J. & Case, J. 1998. 'Exploring the Reasons South African Students Give for Studying Engineering'. *International Journal of Education*, 14, 235-240.
- Jovanovic, J. & Dreves, C. 1995. *Maths, Science, and Girls: Can We Close the Gap?* (Urbana, IL: University of Illinois Cooperative Extension Service).

Kelly, A. (ed.) 1987. *Science for Girls* (Milton Keynes, The Open University Press).

Marland, C. 1983. *Sex Differentiation and Schooling* (London, Heinman Educational Book).

McMillan, J. & Schumacher, S. 1989. 2<sup>nd</sup> Edition. *Research in Education* (London, Scott, Foresman and Company)

Measor, L. & Sikes, P.J. 1992. *Gender and Schooling* (London, Cassel Villiers House).

Mouton, J. 2001. *How to Succeed in your Masters and Doctoral Studies: A South African Guide and Resource Book* (Pretoria, Van Schaik).

Newman, W.L. 2000. 3<sup>rd</sup> Edition. *Social Research Methods: Qualitative and Quantitative Approaches* (London, Boston, Allyn and Bacon).

Roger, A. & Duffield, J. 2000. 'Factors Underlying Persistent Gendering Option Choices in school Science and Technology in Scotland'. *Gender and Education*, 12, 3, 367-383.

Schwab, J. 1969. 'The Teaching of Science as Enquiry' in Schwab, J. (ed): *The Teaching of Science* (Cambridge, Harvard University Press).

Staberg, E.M. 1994. 'Gender and Science in the Swedish Compulsory School'. *Gender and Education*, 6, 1, 35-44.

Thomas, K. 1990. *Gender and Subject in Higher Education* (London, SRHE and Open University Press).

Truscott, K. 1994. 'Case Study – Gender and Education in Tanzania'. *Gender and Education*.

Wamburu, R.K. 2000. *'Promoting Girls' Performance in Science Subjects at Secondary School Level in Uganda*, Makerere University.



Whitehead, J.M. 1996. 'Sex Stereotypes, Gender Identity and Subject Choice at A – Level'. *Educational Research*, 38, 147-159.

Whyld, J. 1983. *Sexism in the secondary school* (London, Harper and Row Publishers Ltd).

Wolpe, A. Quinlan, O. & Martinez, L. 1997. *Gender Equity in Education* (Pretoria, Department of Education South

[www.carleton.ca/~mfrize/wise/webmtinen.chap3.html](http://www.carleton.ca/~mfrize/wise/webmtinen.chap3.html)

Accessed: August 2002.

[www.nncc.org/curriculum/sac52-math.science.girls.html](http://www.nncc.org/curriculum/sac52-math.science.girls.html)

Accessed 14<sup>th</sup> October 2002.

## DATA COLLECTED FROM THE EXAMINATIONS COUNCIL OF LESOTHO

The following table consists of statistics collected from the examinations council of Lesotho showing the percentages of boys and girls who studied science in four sampled schools in the Mphahle's Hoek district. The record covers the period from 1997 to 2001. Symbols A,B,C and D will be used for schools for the sake of confidentiality.

	1997		1998		1999		2000		2001	
	M	F	M	F	M	F	M	F	M	F
SCHOOL										
A	29	15	31	43	43	27	17	15	36	22
B	43	33	20	18	43	36	31	25	46	41
C	31	34	27	35	25	18	25	23	38	32
D	28	21	27	25	19	29	42	34	28	25

**Source of information: The examinations council of Lesotho.**

### INTERPRETATION

According to the statistics from ECOL, it is clear that there are more boys than girls who study science in the Mphahle's district.

The table reflects the period of five years (1997-2001) and the four sampled schools from the

Mohale's Hoek district. According to statistics, it is only in four cases where in 1997 in school C, in 1998 in school A and in school D in 1999, females who sat COSC outnumbered males.

What is interesting now is to find out what causes this gender pattern, especially because it has a very negative impact on schools, since there is a critical problem of shortage of science teachers, hence a national dismay at what has been reported by Thoahlane (2001), to be the decline in students' performance in science.

**QUESTIONNAIRE FOR SCIENCE TEACHERS****INTRODUCTION**

*\* The purpose of this study is to explore reasons for gender bias in the choice of science in secondary schools in the Mphahlele district.*

*\* Please assist with this research on the persistence of girls in shying away from science*

*Your name as a respondent is not required*

<b>STRICTLY CONFIDENTIAL</b>
------------------------------

**PLEASE TICK THE APPROPRIATE BOX UNLESS OTHERWISE STATED**

**SECTION A                      PERSONAL INFORMATION****1. AGE**

<20 yrs.	20-29 yrs.	30-39 yrs.	40-49 yrs.	50+ yrs.

**2. GENDER**

Male	
Female	

**3. QUALIFICATIONS**

STC	TC	Dip. Ed.	Undergrad.deg.	Postgrad2.deg.

**4. What is your area of specialisation?**

Arts	
Sciences	

## 5. Teaching experience in terms of duration

<1yr.	1-5 yrs.	6-10yrs.	10+ yrs.

## SECTION B STUDENT-TEACHER CLASSROOM INTERACTION

### 6.what percentage of girls has opted for science in your class?

- 6.1 Less than10 .....[ ]  
 6.2 10-15 .....[ ]  
 6.3 16-20 .....[ ]  
 6.4 20-25 .....[ ]  
 6.5 25+ .....[ ]

### 7.What percentage of boys has opted for science in your class?

- 7.1 Less than10 .....[ ]  
 7.2 10-15 .....[ ]  
 7.3 16-20 .....[ ]  
 7.4 20-25 .....[ ]  
 7.5 25+ .....[ ]

### 8. In preparing for the effective teaching of science, how do you arrange the topics?

- 8.1 I follow the sequence as in the syllabus.....[ ]  
 8.2 I identify and group topics according to themes from the simplest to the most difficult.....[ ]  
 8.3 To avoid the strain of teaching under pressure towards the examinations,  
 8.4 I start with the most difficult concepts.....[ ]

### 9.In order to enhance the effectiveness of your teaching, what is the first step in your presentations?

.....  
 .....

### 10. Which teaching methods do you employ in teaching science?

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



11. Which of those methods are appealing to girls?

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

12. How would you rate the participation of girls in theory lessons?

- 12.1 Good ..... [ ]  
12.2 Medium ..... [ ]  
12.3 Poor ..... [ ]

13. What in your opinion is the cause of your answer?

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

14. How would you rate the participation of girls in practical lessons?

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

15. What do you think are the possible reasons for that?

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

16. In an attempt to answer questions. Students sometimes get answers wrong.  
What do you do to girls who get answers wrong?

- 16.1 I beat them ..... [ ]  
16.2 I arrange extra hours for them ..... [ ]  
16.3 I insult them ..... [ ]  
16.4 I encourage them so that they perform better in future ..... [ ]

17. What would you suggest schools, the Ministry of education, individuals or groups of people to do in order to encourage high participation rates by girls in science in schools?

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

18. Do you have any comments? (Please state them)

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

**Thank you for having responded to this questionnaire**

## QUESTIONNAIRE FOR GIRLS WHO HAVE OPTED FOR SCIENCE INTRODUCTION

- \* *The purpose of this study is to explore reasons for gender bias in the choice of science in secondary schools in the Mphahle's hoek district.*
- \* *Please assist with this research on the persistence of girls in shying away from science*
- \* *Your name as a respondent is not required.*

**STRICTLY CONFIDENTIAL**

**PLEASE TICK THE APPROPRIATE BOX UNLESS OTHERWISE STATED**

### **Student-Teacher Classroom Interaction**

1. Is your science teacher a male or a female?

Male ..... [   ]  
Female ..... [   ]

2. How would you rate your participation in class?

2.1 High ..... [   ]  
2.2 Medium ..... [   ]  
2.3 Low ..... [   ]

3. What could be the possible reason/s for your answer? (Please state) .....

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

4. How do you perceive science? .....

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

**Thank you for having responded to this questionnaire**

## QUESTIONNAIRE FOR GIRLS WHO OPTED OUT OF SCIENCE

### INTRODUCTION

- \* *The purpose of this study is to explore reasons for gender bias in the choice of science in secondary schools in the Mphahle's hoek district*
- \* *Please assist with this research on the persistence of girls in shying away from science*
- \* *Your name as a respondent is not required.*

**STRICTLY CONFIDENTIAL**

**PLEASE TICK THE APPROPRIATE BOX UNLESS OTHERWISE STATED**

1. How was your general performance in science at J.C. level?

Good .....[    ]  
Poor .....[    ]

If the answer to question '1' is 'good', proceed to question '2', but if it is 'no', then proceed to question '3'.

2. Why was your performance good? (Please state reasons) .....

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

3. Why was your performance poor? (Please state reasons) .....

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

4. Why have you opted out of science? (Please state reasons) .....

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

**Thank you for having responded to this questionnaire.**

Florence Powell  
Room B7  
UND  
4<sup>th</sup> September 2002

Dear Sir / Madam / Student

I am the Mohale's Hoek education officer, currently studying at the University of Natal-Durban. I am conducting a survey on reasons for the low participation rates by girls in the Mohale's Hoek district. I therefore, request that you offer me assistance by completing this questionnaire, which I shall collect from the principal's office on Friday, the 13<sup>th</sup> September 2002.

I assure complete anonymity and confidentiality of your responses.

Yours faithfully

.....  
Mamorakane Moletsane

**MOHALE'S HOEK DISTRICT EDUCATION OFFICE**

P.O. BOX 50  
MOHALE'S HOEK

19th September 2002

The Principal  
.....  
.....

Sir/Madam

This note serves to introduce Mrs. Mamorakane Moletsane, an Education Officer in Mohale's Hoek, who is persuing Master's Degree with the University of Natal.

Mrs. Moletsane is currently conducting a research in some of the local High Schools and your school is ear-marked for that exercise. She is intending to visit your school to request Science Teachers and Girls to fill Questionnaires on the.....  
therefore, my office humbly requests you to facilitate and assist accordingly.

Your Obedient Servant

  
R. Eden Tau

Senior Education Officer - Mohale's Hoek

