

# Why girls aren't fully participating in science and mathematics in Namibia

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## 1. Introduction

Formal education in Namibia was introduced by various missionary societies, whose education was aimed at 'civilising the natives' rather than educating them for self-reliance. This means before independence in 1990, education for black Namibians was meant to give them basic literacy and numeracy skills to prepare a few, especially males, for clerical jobs in the colonial government set-up.

The Bantu Education system was unfair, discriminatory and fragmented, and was used to further the interests of the colonial power in providing a semi literate black workforce for the labour market (Kasanda and Shaimemanya, 1998). Education for the Africans was under-funded and was characterised by a high drop-out rate. Subsequently, very few black learners, both boys and girls, were encouraged to take Science and Mathematics subjects, because the colonial government regarded them as inherently incapable of learning those subjects. The one time South African Prime Minister, H. F. Verwoerd, in justifying the implementation of apartheid education in 1945 in South Africa, said: *What is the use of teaching a Bantu child Mathematics when it cannot use it in practice? Education must train and teach people in accordance with their opportunities in life... It is therefore necessary that native education should be controlled in such a way that it should be in accordance with the policy of the state* (cited by Ramananandan, 1995).

The participation of black Namibians in education still lags behind that of many countries in Africa and particularly in the Southern African Development Co-operation (SADC) region. Prior to the apartheid rule, the education women received from missionary institutions was limited to "homemaking skills" and religious education (Cohen, 1994). As a result, only few learnt to read and write and as such, women's education lagged further behind that of their male counterparts. The trend continued unabated through the years of apartheid rule, where education provision was done along race, gender and ethnic lines. It has culminated in the problem that this paper will be addressing: the fact that girls are not partaking in Science and Mathematics education as much as they should.

## 2. Education in independent Namibia

At independence in 1990, the new Namibian government inherited an education system plagued with a plethora of problems such as separate systems run along racial, ethnic and gender lines, under- and non-qualified teachers, overcrowded classrooms, poorly equipped laboratory facilities where any existed and lack of library or resource facilities. The government, thus, had a lot of tasks to accomplish.

Firstly, it had to reform the whole country's education system to one that is open and equal to all races, and secondly it had to address and redress the visible and not so

visible patterns of differentiation based on gender. Next, it had to see to it that the problem of teacher education is tackled and new school buildings built in previously neglected areas. The first step the Namibian government took immediately after independence was to combine the 11 local educational authorities into one Ministry of Education and Culture (MEC). It was also stipulated in the constitution that education shall be a right of all persons in Namibia. Accordingly, the notion of 'education for all' was introduced, whereby all children of school-going age are to remain in school throughout their basic education. The new government was quick to add that education for all does not simply imply more schools or more children in school. It requires a new way of thinking about how the education system is developed as well as how best it can be organised in order for it to serve the needs of all citizens (MEC, 1993).

It is a known fact that educating girls as well as boys reduces infant and maternal mortality, encourages more widely spaced childbirth and improves the quality of life of families and the population as a whole (MEC, 1993). Female education and national development have been proven to be closely linked, and while education of both males and females is crucial to development, the failure to ensure equality in education between the sexes can reduce the potential benefits that educating men has on social welfare (World Bank, 1993). One of the Namibian government's challenges has been to ensure that, like their brothers, Namibia's girls are given a chance to develop their individual potential and use their abilities to equally contribute to national development.

Even though the government is striving to reverse the colonial legacy of under-representation of black Namibians in Science and Mathematics fields, their achievement in these subjects is still very low. With ensured access to education and the current understanding of parents and communities, the number enrolled in schools has increased dramatically. Girls constitute 50.1% and 52.7% of the total primary and secondary enrolment figures respectively. (Ministry of Basic Education and Culture, MBEC Annual Reports, 1997; 1998)<sup>1</sup>. However, all is still far from being well with girls' education in Namibia. Girls' numbers dwindle as they reach senior secondary level, they drop out of school at a high rate, and only few remain to complete. For instance, in the Rundu Education Region, girls make up 49.8% of primary enrolments, a figure which falls to 33.2% by grade 12. Of those that complete across the nation, not many choose to do science-related subjects or follow careers in science.

The 1991 Matriculation examination results showed that in the rural areas of Namibia only half as many girls were as successful as boys (MEC, 1993). Of the 35 science students who sat for the November 1998 International General Certificate of Secondary Education (IGCSE) at Outjo Secondary School (where I taught), only 9 were girls. This school is considered a better off school compared to most that are found in previously disadvantaged areas of the country. While the overall Science and Mathematics results of the school were not impressive, the girls' results left much to be desired. For instance, the highest grade any of the girls managed to get in that examination was a D in Biology. Of the 11 Home Economics girls, who did Biology as an additional subject, only one got F, five got G and the remaining were ungraded. In Physical Science and Mathematics the highest grade obtained by a girl was an E (Die Republikein). The boys did comparably better.

The participation of black Namibians in Science and Mathematics related programs in the university is even more distressing (Ndunda, 1999). The following table shows the enrolment statistics of students in the science faculty in comparison to another faculty at the University of Namibia (UNAM).

**Table 1 of Enrolment figures in the Faculty of Science versus another faculty**

Year	Science	Humanities and Social Sciences
1992	105	284
1993	124	377
1994	149	396

Source: First Five-Year Development Plan 1995-1999, p 21.

The figures in the table indicate slight annual increases in the enrolment of students in the Faculty of Science. Nevertheless, it is important to note that these enrolments are accompanied by an alarming drop-out rate as indicated in the table below.

**Table 2 showing the subject breakdown in the Science Faculty and the number of students enrolled by level**

Levels of study	Botany	Chemistry	Computers	Maths	Physics	Statistics	Zoology
Year I	15	19	42	45	21	40	18
Year II	4	6	11	10	5	8	9
Year III	4	1	10	1	2	6	4

Source: First Five-Year Development Plan 1995- 1999, p 27.

The high drop-out rate from courses in later years could be attributed to the inferior education in general, and particularly to the science and mathematics education Namibians have been receiving up till independence. Students are not prepared well to cope with the demands of tertiary studies in their chosen fields. While the participation of males and females has been low in the Faculty of Science, the participation of females in this faculty has even been lower. The table that follows shows the discrepancy in the enrolment by gender in the Faculty of Science over the three year period.

**Table 3 showing Male versus Female students in the Faculty of Science**

Year	Male	Female	Total
1992	73	32	105
1993	80	44	124
1994	103	46	149

Source: First Five-Year Development Plan 1995-1999, p 27.

The low participation of females in the Faculty of Science is a carry-over from secondary or high school. I also remember there being only one female student doing Physics as major in 1997. The impact of the low participation of Namibians studying science courses in high school and the university is reflected in very few Namibians in significant science-based careers such as engineering, medicine, computer sciences and technology (Ndunda, 1999). The question one is prompted to ask is “**What barriers prevent girls in Namibia from taking up science courses and completing school successfully, despite government efforts for them?**”

This paper discusses four of the factors I deem responsible for hindering provision of quality Science and Mathematics education for girls in Namibia: the hidden curriculum (school and classroom discourse), stereotyped attitudes about girls, lack of female role models, and socio-economic factors coupled with teenage pregnancy.

It is difficult to clarify the complexity of problems of social injustice and educational disadvantage that Namibians underwent at the hands of the past colonial governments. As Crebbin (1999) mentioned in her article on the Teacher Education Reform Project in Namibia, there is no adequate support from statistical data or qualitative data, analysis and critique for the complexity of those problems. As yet, not much in terms of research has been done in this field of education in Namibia, but the problem is very clear in schools and institutions of higher learning. Therefore in order to gain understanding of the complexity and background of the situation one needs to draw some information from historical perspectives and personal experiences.

In this paper, parallels will be drawn from research done in African countries such as Malawi, Botswana and Nigeria and elsewhere in the world where the situation for girls was or is still similar to what is happening in Namibia presently. I will also be drawing from my experiences as a student in Namibia during the Bantu Education system and now as a teacher in independent Namibia. Recommendations as to what could be done to address the factors that continue to steer girls from Science and Mathematics related careers, are given.

## **2. The hidden curriculum**

Children of school-going age spend much of their time at school. The reaction to and perception of their school and classroom experiences (teacher behaviour towards certain students) and what they see happening, coupled with the cultural experiences from home, govern their way of thinking and subsequent behaviour. The curriculum

(which is not only what is taught, but also the processes of teaching and learning it) at school presents directly or indirectly a form of gender discrimination. Science is used in schools and society to privilege some people over others, for instance, those who do Physics (mostly males) are valued more than those who do Biology (mostly females). Such a view, regarding the curriculum, is actively producing and reproducing social inequality. What I am referring to as the hidden curriculum is one in which students receive invisible lessons in sex role acquisition. Common forms of this seemingly invisible discrimination in Namibia are found in subject time-tabling, gender imbalance of textbook contents, classroom dynamics and the perceived masculine nature of science.

Subject time-tabling has contributed to fewer girls taking up science and technical subjects in Namibia. Previously, science and technical subjects were offered at the same time as Home Economics and more girls chose to do the latter, as was everyone's expectation. When Science and Mathematics are competing on the timetable with other subjects that are given a feminine image, girls may prefer those other subjects. In some schools during the Bantu Education system, as I gathered from a former colleague at the University of Namibia, girls in her school were practically ordered to join the Typing class, even though some had wanted to do Mathematics that was being offered at the same time. Whereas there was a general apathy towards all students' participation in Science and Mathematics from the colonial education system, no efforts whatsoever were made by the schools to encourage girls to enter that field. The writer had first-hand experience of a situation where from Standard 8 (an equivalent of year 10) students were given the option not to do Mathematics if they so wished. Most students saw this as a great gesture and with their poor background in the subject, many girls, like me, avoided it. It was common during the time to see one or two girls only in Mathematics classes beyond Standard 8. The only science subject that was offered in many secondary schools in the northern part of Namibia then was Biology. Physical Science could not be offered, because there were either no qualified teachers to teach it or there were no apparatus and books to make its teaching possible. It later turned out that I, who at one time got 2% in my Standard 4 mid-year Mathematics examinations, could do Science and Mathematics when I got a chance to continue my secondary education in Ghana. I attended a girls' only secondary school and was taught Mathematics by a female teacher from Forms 1-3. I enjoyed the subject for the first time and subsequently studied science during my GCE 'O' and 'A' levels. My case, clearly, shows that girls and boys can equally do well in Science and Mathematics, if conditions are conducive and the necessary support is given.

In the next paragraphs, I will explore some underlying factors presently occurring in schools, classrooms and to a certain extent homes, that make it difficult for girls to choose Science and do well. Firstly, classroom discourse is a powerful socialising agent for learners, because through it they learn and develop attitudes about their abilities and worth. The experiences that learners get from the classroom shape their way of thinking and identity. As teachers, we are agents of change and reform in the country, and the beliefs and expectations we have of our learners become self-fulfilling prophecies. Many teachers of Science and Mathematics in Namibia have low expectations of girls and generally believe that girls cannot do as well as boys in these subjects (Ndunda, 1999). At the school where I taught last year, one teacher

once told a girl that ‘You, being from such a tribe, will never pass my Mathematics,’ and since then the girl lost all interest in the subject. In her view, there is no use trying, because as she puts it ‘she will, certainly, fail.’ Some teachers encourage students who laugh at others when they give wrong responses, through the ways in which they react. Just to illustrate the point, during my school days, our French teacher often remarked ‘Could a more intelligent person give me an answer?’ after someone answered his questions wrongly. Even though there were only girls in the classroom, it was still very degrading and embarrassing to the students concerned, because others laughed, to the extent that no one was prepared to respond to the teacher’s questions any longer.

Little research into Science and Mathematics education in Namibia has been done yet, but the situation that I see operating in schools and classrooms is not very much different from what I experienced during the apartheid era in terms of teacher-student behaviour. Although the previous situation where girls were literally excluded from Science and Mathematics through time-tabling has been rectified today, most girls who choose Mathematics and Science still do not do well and others avoid it at senior secondary school, where it is still optional. But Woodwork is still offered at the same time as Home Economics and/or Typing in many Namibian schools. Duncan (1989) in her Botswana study, found subject gender-typing to be rife. The students she conducted the study on ranked Domestic Science, Setswana and Biology as the most important subjects for girls and Science, English and Mathematics as important for boys.

Many of the children at schools in Namibia come from low aspiration homes where their parents and community members have low expectations of them. The responsibility for teachers is to emancipate and empower these learners, through their teaching to make them critical beings. There are, however, teachers, especially those who were trained during the old dispensation, who are still rigid with old teaching and class handling methods. What we see today, nearly a decade after independence, is many teachers still ‘oppressing’ learners instead of ‘decolonising’ them.

In classrooms, boys dominate equipment. In mixed groups some teachers generally encourage boys to carry out the experiments and girls to ask boys to show them how it is done, and the boys are just too glad to render the assistance. It is true that peer tutoring is important in schools, but it needs to be carefully implemented, otherwise it will give both girls and boys the impression that the former are not expected to know much and that it is natural that boys should help them. Carol Shakeshaft, writing about science education in the US, argues that *this intervention with girls, though meant to be helpful, prevents girls from getting a real learning experience and makes them ‘learned helplessness in science’* (Shakeshaft 1995).

More attention is given to boys, because teachers call upon them more than girls, and to the delight of most teachers, boys are usually vocal enough to volunteer their answers and ask more questions than girls. Boys, subsequently, receive more reinforcing feedback. Research has it that boys tend to get more attention, both positive and negative, from teachers than do girls (Whyte, 1981). A large portion of classroom lessons revolves around boys, and many girls never raise their voices in class, they ‘have no voice’ in the curriculum of the classroom, because they are

picked less often to answer questions or give explanations. The male dominance in teacher–student interactions as part of the classroom dynamics simply teaches girls not to be involved (Johnston and Nicholls, 1995).

It is necessary for teachers not to take for granted the fact that when girls are quiet or seem content with an observer role, all is going well. In Namibian classrooms, many girls rarely speak out, because they feel less confident in using English, which is the medium of instruction.

Secondly, the traditional focus of Science is male biased. The masculine content of most science and mathematical problems affects the motivation of most girls who see the problems as irrelevant to their interests (Badger, 1981). Girls find themselves as outsiders to the science discourse, with little confidence in their abilities and not much to relate to in science classes. As outsiders, they do not identify as scientists, however, boys who are generally considered as science insiders are confident they will do well in science and mostly find the content familiar territory (Shakeshaft, 1995).

Males bring to school more informal experience of practical ‘science’ than do girls and this is what makes them insiders to the science discourse. Students in the Botswana study mentioned that girls are not good at science experiments, because they become ‘frightened’ (Duncan, 1989). Boys are more likely to have repaired bicycles or handled tools commonly found in science laboratories than are girls. These out-of-school experiences afford boys yet another added advantage, familiarity, for science learning. As youngsters, girls receive dolls as toys, while boys receive toy cars and other mechanical gadgets. Although girls too bring informal science learning to school, the curriculum operating on ‘socially constructed literacy’ disregards it as science. Girls use tools, such as scissors, and this knowledge could be expanded into using other tools in science practicals, but this is rarely done. One girl from the Botswana study raised a point that puts a question mark on the relevance of the science being presented to students in school in the following words: *Because of the social set-up, most of us want to be mothers and housewives. But most of the science which we are taught in our school is something which does not touch family life directly, or we don’t do these things at home e.g. like proteins dividing into amino acids. When we come to family construction you don’t have things like amino acids, and as a result we lose interest in it. So I think I have the ability to be the same as boys in science, but when we look at our future as mothers we don’t seem to fit in the science they teach us in school, and so we lose interest* (Duncan, 1989). Schooling is certainly a ‘gendered’ process and gender issues should be incorporated in its framework if equitable education is to become a reality. A sexually inclusive curriculum should be one that incorporates women’s experience and gives it equal status to men’s (Ballenden, Davidson and Newell, 1985). Using informal experiences of girls as a bridge to science in the classroom is a necessary step to increasing female participation in science. Rather than expecting girls to adapt to science, teachers must be aware of existing differences and adapt their teaching to cater successfully for all their students.

Next, much of textbook content reflects male experience. Gender bias has been found in Mathematics, Geography and English textbooks in use in Namibian secondary schools (Kasanda and Shaimemanya, 1998). When they go to school, boys continue to

see their type of 'experience'(the familiar scene) in schoolbooks, whereas girls' prior experience is nowhere to be seen. Illustrations in most science books portray males as having the central role to play. It is common for one to see pictures of boys holding test tubes, flasks or adjusting Bunsen burners in Science textbooks (Stanworth, 1984), consolidating the belief that is commonly held.

All the above mentioned factors that operate in schools, classrooms and the wider society create an impression that issues regarding women, and girls for that matter, are by no means important. They give the message to all learners that it is really okay if girls cannot do Science and Mathematics, because it is not their territory.

### **3. Stereotypic attitudes about girls**

Perhaps one of the worst problems facing girls world-wide in their quest for quality education is the stereotyped way in which they are regarded. The patriarchal order of the world divides home and work into masculine and feminine spheres, and into a hierarchy, with men in more powerful and prestigious positions (Kelly, 1981).

Girls live in a situation where they are perceived as less capable than boys in many areas of knowledge, science and technology being no exception. Girls receive daily cultural cues that reinforce the stereotype of science and technology as a male domain. The stereotypical gender depiction begin early in life, with book images of children, and carry through to the portrayal of adults.

The old messages are being carried by the new technology: print – based material, videos, and Internet advertisements continue to depict women as decoration, rather than as productive users of technology. Boys are shown in confident poses using computers to gain knowledge and win, while girls are shown sitting at computers for decorating purposes, as if to call attention to the computer beside them (Knupfer, 1998).

Knupfer has shown that even in developed nations women in advertisements have been most often portrayed in bathrooms, kitchens, living rooms and other homemaking roles. In contrast, the male central characters are depicted in authority roles and as gaining more power by using various types of technology such as laptops and mobile phones. These messages give different advice to students. To boys it is: *welcome to the club, your future may lie in the world of Science' and to girls: this is a male undertaking, you will be out of place, but you can look or even help a little* (Ives, 1984).

Generally in Africa, and in Namibia in particular, this problem goes deeper than stereotypical depiction of males and females. It is difficult for rural girls, especially, to pursue further studies and follow a career. Davison (1993) in his study on attitudes of Malawian parents towards educating girls came across a notion held by the wide society that males are more intelligent than females. Since girls were perceived as less intelligent, the usefulness of educating them was questioned by their parents. These stereotyped attitudes are not much different from what many rural parents and teachers have towards girls in Namibia. The role of women in a traditional African community is reduced to household chores including child bearing and rearing and providing labour on farms (Jegade, Agholor and Okebukola, 1996). Social theorists have suggested that in a society that differentiates roles in terms of gender, it follows

that individual behaviour will be influenced by what is considered to be sexually appropriate (Badger, 1981). The subjects gender-typed 'female' in Botswana are so labelled, because they are said to prepare girls for their future roles as mothers, homemakers, nurses, teachers and clerical officers. On the other hand, subjects gender-typed as male are said to be difficult and thus require high mental prowess and only boys can do them. It is no wonder that girls see Science as a male area of activity and as a result generally have less positive attitudes towards it (Duncan, 1989).

A study by Jegede et al (1996) in Nigeria, stated that there is a wide gap between males and females in formal school settings and achievement outcomes and that females, like children, are to be seen and not heard in the male-dominated society. These findings parallel what is happening in many parts of Namibia today. It is due to such a mentality that most women in Namibia and elsewhere grow up thinking that they are inferior to men. For girls this notion is carried further into schools, where they are oriented to conform, accept inequality without questioning and follow authority, in this case of parents and communities (Shor, 1993).

Grundy (1994), quoting Walkerdine, asserted that an individual could become powerful or powerless depending on the terms in which his/her subjectivity is constituted. I feel the suffering of Namibian women has inspired me to work hard at my studies. It was during my teacher preparation course that I became particularly interested in gender and Science and Mathematics education. A part of me urges me to work hard at my studies to prove that women are also capable of doing well, given the necessary environment and support. Most girls in Namibia are yet to learn to become powerful in the face of their community's construction of their subjectivity and turn it into a defensive weapon to fight for what is right for them. This should be understood in the light of the fact that many girls have accepted and practise the sex stereotype about them. Quoting from the work of Koch, Shakeshaft (1995) illustrates the fact that 'girl-expected' behaviour can get in the way of doing science in the US. For instance one girl said, *I did not mind dissecting a frog...though that was how I reacted...I screamed so that the boys would notice I was acting like a girl.*

Many Namibian girls always say "I am no good in Mathematics". In fact, at one time, I had also totally accepted, as did my parents, that I can never do Mathematics, because it was just too difficult, and because of that I never bothered to learn it. This perception affects students' expectations for success. Girls will show a persistent tendency to underestimate their performance, while boys will overestimate theirs. The main point here is that of self-esteem – the evaluation that an individual makes and customarily maintains with regard to himself or herself. It expresses an attitude of approval or disapproval, and 'indicates the extent to which the individual believes him/herself to be capable, significant and worthy (Kelly, 1981). Badger (1981) found this to be a significant factor that distinguishes between girls' and boys' attitudes towards Science and Mathematics. The concept of self-esteem must be seen as holding a central role as both antecedent and potentially as an effective outcome of the performance cycle, since students' views of self do not exist in isolation from the surrounding educational environment. Their self-evaluation is a response to attitudes of parents, school, peers, personal characteristics and ability.

A culturally relevant education, according to Ladson-Billings (1994), should be one that prepares all learners to question the inequality and the injustice that exists in society, thus placing the onus on the teachers to emancipate girls through their teaching. But at schools the situation is no better for the girls than at home, because as mentioned earlier, teachers (unconsciously or otherwise) continue to reinforce the notion of superiority for boys. As a teacher during the past year, I had many instances of boys complaining when they're paired up for a task with girls. In cases like those I had to spend some time explaining the usefulness of both sexes sharing different experiences. Many other teachers do not even make the effort to rectify this unfortunate situation.

Boys in Namibia need to be educated about partnership, so as to set the necessary foundation to enable girls to choose courses not previously open to them and to develop their self-confidence. When that problem is not corrected, the result is that girls withdraw, become less assertive and fail to gain from classroom teaching. Girls can do equally well as boys. For instance, in the IEA (International Association for the Evaluation of Educational Achievement) study, Hungarian girls achieved high scores which were found to be related to the major drive put into popularising science at all levels of education in that country (Kelly, 1981). Thus, what girls need, is encouragement from all sectors of society to persist with confidence and succeed.

#### **4. Lack of female role models**

Shakeshaft (1995) wrote that, as early as second grade, both boys and girls in the United States, imagine scientists as "white men who have unusual hair, wear glasses and lab coats". This stereotype may be a general barrier for all girls, but would have more serious implications for black girls in particular. To see themselves as scientists, girls must first be able to envisage a woman as a scientist.

Most schools in Namibia lack female Science teachers, let alone female scientists or mathematicians in the community to act as role models for the girls. Girls in Namibia need a range of female role models – to meet face to face and talk with women scientists who have successfully combined demanding science careers with parenthood. The more women scientists girls meet and the more they learn about these women's lives at home and at work, the less likely it will be for girls to think that scientists are white men in lab coats (Shakeshaft, 1995).

In my view, it is not only women working in science who can act as role models. I have been inspired by quite a lot of women in my life. From my mother, who unfortunately could not obtain much education, I have learnt to draw strength in the face of adversity. In my days at school at a girls' secondary school the presence of female teachers influenced me to go into science. My first female Mathematics teacher, my former Headmistress and my 'O' level Chemistry teacher, all in Ghana, were an inspiration. The many successful women academics in Science and Mathematics education fields have allayed my fears and have enabled me to continue my quest for a career.

#### **5. Socio-economic factors and teenage pregnancy**

This paper would be incomplete if I did not touch on the socio-economic context in which most girls find themselves in Namibia, and how it forces some into early

motherhood. The traditional role of an African woman has always been that of a future wife and mother, a notion that was sadly reinforced by missionary education. That view has succeeded in shaping society and girls' thinking. Firstly, the socio-economic status of rural parents has an impact on their choice of who goes to school, and it is normally the girl who suffers in the process. In their view, girls need not get quality education, after all they will get married one day and be provided for by a husband!

Faced by financial constraints to pay school fees and buy school uniforms it is not surprising that parents choose to send their sons to school rather than their daughters. The Namibian situation is not much different from Malawi's where rural girls struggle to go further than Standard 8 (year 10), because parents consider education unnecessary and, as the latter say, it might limit their daughters' matrimonial chances (Davison, 1993). I refer to this as a struggle in the sense that one needs to work hard to convince one's parents that it will pay off in the end to get an education.

Secondly, teenage pregnancy hinders the provision of quality education for girls, not only in Namibia, but also in other developing nations. In Namibia, girls as young as 14 drop out of school due to teenage pregnancy. The sad truth is that those responsible may be boys of their age or, in some cases, their teachers, some of whom are married. A law has since been put into effect to charge teachers who impregnate school girls with misconduct and even dismiss them from service (MBEC, 1997). Apart from befriending their teachers, some schoolgirls go out with old, married men who demand sex from them and give them money in return. That brings into discussion again, the question of poverty where the parents cannot provide for their children things that others, who are well off, take with them to school, especially those in boarding schools. The increase in teenage pregnancy among rural girls in Namibia can also be blamed on ignorance about and mistrust of contraceptives. There is a general belief among rural women that contraceptives cause sterility. Whether that is true or not, the fact is, this has caused a lot of damage already.

Things have begun to change, however, as most parents have come to see and realise the value of having their children educated. Many rural parents now see to it that their children are in school. But poor as they are, not many are able to accomplish that task, especially at high levels of education where a lot of financing is required. This is where the government and the private sector need to step in to help poor parents materially or financially to be able to keep their children, especially girls, in schools and to encourage them to go as far as they possibly can. DAPP (Development Aid from People to People), a Swedish NGO (non-governmental organisation) in my home area, identifies needy families and gives clothes and blankets to their children. The Namibian government has put in place a pilot feeding project for schools in the southernmost areas with little rain (MBEC, 1997). Some scholarships offer targeted 'promising' students who are needy, and women are actively encouraged to apply. These acts go a long way to ease the burden of needy parents and encourage all children to be in schools.

## **6. Summary and Recommendations**

Even though formal education in Namibia was developed along race, ethnic and gender lines, it is worth noting that gender inequality in Science and Mathematics

education in Namibia today, goes further than the days of missionary education. Women in Namibia have suffered from the traditional dominance of their menfolk, which is based on the patriarchal order. Furthermore, the Bantu Education system oppressed all, men and women alike, but the latter suffered more, because of lack of opportunities to advance themselves. Thus, it is not possible to single out one factor as the prime cause for such inequalities. Instead, there are constellations of factors that influence girls' participation in Science and Mathematics education in varying degrees. Obstacles have all along been erected in the path of girls' education either by the education system or by society. The hidden curriculum, operating in the form of school and classroom dynamics, traditional stereotypical attitudes about girls, absence of role models, economic constraints and teenage pregnancy all contribute to preventing girls from receiving quality education and pursuing careers in science.

The beliefs about who can or cannot do Science and Mathematics, which have their origins in the colonial experience, however, need to be challenged. In Namibia this problem requires prompt attention, because disadvantaging girls in education means restricting the country's progress and holding back our own development, because women make up more than half the country's population. It goes without saying that 'Knowledge is Power' and scientific knowledge has tended to be a measure of development (Ndunda, 1999). As has been outlined, school and classroom discourses potentially portray modes of being that are implicitly given wide social approval. As a result, girls continue to select themselves away from science, because they think it is not relevant to them (MEC, 1993). Schools need to set up proper and accommodating time-tables that give equal options to allow girls to take up subjects traditionally regarded as male domain. What teachers do and say in classrooms has been found to play a significant role in determining whether boys and girls aspire to continue with science. To afford all students that chance, teachers should involve all learners and make the effort to call on girls to be part of the lessons. It is important that teachers tap on the informal experiences, which are familiar to both girls and boys in lesson delivery. There is a need to use less sex-biased published materials, and make use of home made materials instead. In addition, teachers should make it a point to critically comment on the contents of images in textbooks.

If teachers are to liberate learners in their classrooms, there is a need for them to change their ways of instruction, and make classroom environments more favourable for all learners to participate in the learning process. In order to ensure equal participation in school and class activities by boys and girls, all teachers must be encouraged to become gender sensitive and a balance in the use of gendered activities should be encouraged. They should actively involve all learners, preferably in small groups, and particularly encourage girls to give their points of view and express their opinions.

There is a great need to educate parents, teachers, schoolboys and girls not to differentiate roles in terms of gender. Cross-sex activities and interests should be developed and encouraged from the first day of school, and right through education. Teachers should try to improve the image of science and mathematics that is projected in the classroom and encourage girls to see science as being relevant and useful in their own lives. Science teachers should encourage girls to do projects for the science and mathematics fairs. Schools in conjunction with communities could organise

annual prize-giving functions at which the best and promising students of both sexes are rewarded for their efforts. So, girls need to resist the pressure being put on them to leave school.

Gender biased curriculum and stereotyped attitudes towards girls require urgent attention as they have been found to affect girls' self esteem. Teachers and educators should develop gender-conscious curricula and gender balanced textbooks. Classroom science activities should be expanded to include a familiar part of the world of girls to boost their interest in and identification with science. Teachers need to be sensitised to classroom practices where boys dominate and girls tend to hang in and take steps to compensate for that. Girls need gender-conscious and equitable education so the government should urge all stakeholders in education, community, parents, teachers, educators and schoolchildren to have equal expectations for boys and girls. It needs to be made clear that in today's world a woman's place is not only the kitchen. As a matter of fact, both genders must be seen gaining from the successful use of technology. Of equal importance is the fact that girls must not meekly accept the gender stereotype about them. They should be taught to challenge it, by opening up and confidently participating in science and mathematics. Schooling, is after all, supposed to be about opening up options and developing individual potential, not about closing off and polarising options (Parker, 1984).

Female scientists in urban areas should find time to regularly travel to rural areas to boost the morale of girls and provide models. Girls should be encouraged to enter fields that were not so open to them before. Having attended females-only secondary schools, I can attest to the fact that many of us who chose to do Science, did really well in the subject. The final results from these schools were comparable to male-only schools, and better than girls in co-educational schools.

Because of what happened to me during my early years of schooling I am of the stance that girls in Namibia are capable of doing better in Science and Mathematics education than they are now. Perhaps consideration could be given to single sex schools or classrooms (Science and Mathematics) which are not a common thing presently in Namibia. Research evidence exists to support this proposition. However, other views have it that boys and girls should be taught together from the onset, so that both are used to the idea, otherwise girls, especially, will become too conscious of themselves when they find themselves among boys for the first time at university.

Regarding economic factors and labour demands on girls by the family, parents should be educated about the value of schooling their daughters as against keeping them at home, which results in a vicious circle of poverty. Government should provide where it can to the needy. The private sector or industry should open up chances of apprenticeships for girls, especially those who are low achievers in Science. Mass education in sexuality needs to be done at schools, so girls are fully exposed to the harsh realities of being young teenage mothers from already impoverished families. They should also be educated about the bad effects that an unwanted pregnancy can have on someone so young. The use and value of contraceptives should be taught to both boys and girls so that a year or two of schooling that will be lost due to nurturing a child could be saved. Efforts at ministerial level should be made to allow girls back into schools after giving birth,

which does not happen in some schools in Northern Namibia. If girls must be given equitable educational and economic opportunities, the factors that steer them away from Science and Mathematics, and hence careers in science, have to be addressed. Policy changes to challenge the structural base of this inequity need to be enforced. Action to be taken should be taken to ensure the full participation of girls in the mainstream of education.

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