SOCIO-CULTURAL FACTORS THAT INFLUENCE GIRLS' PARTICIPATION IN MATHEMATICS IN SECONDARY SCHOOLS IN THE OSHANA EDUCATION REGION.

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ABSTRACT

This study sought to find out how socio-cultural factors (traditions, culture, norms and beliefs) influenced the girls' participation in Mathematics in the Oshana Education Region. The study addressed the following questions: What are the perceptions of girls toward Mathematics learning in the Oshana education region? What influences do parents and teachers have on girls taking Mathematics as an area of study at high school in the Oshana education region as perceived by girls? What cultural/traditional norms do the girls perceive to hinder their participation in studying Mathematics in the Oshana education region? What beliefs do girls hold about Mathematics in the Oshana education region? Literature has demonstrated the importance of self-concept, motivation and influence from parents and teachers as imperative factors for a change in girls' perceptions of Mathematics.

The study was of a mixed research design that employed both quantitative and qualitative approaches to gather the data. The data were obtained from 216 girls in Grades 11 and 12 classes who were randomly selected from eight secondary schools in the Oshana Education Region. A questionnaire comprising both close-ended and open-ended questions was used to obtain information from the sample on how socio-cultural factors influenced girls' participation in Mathematics in the Oshana Education Region.

The results showed that the perceptions of girls were influenced by cultural beliefs, child-rearing practices and gender-role stereotypes in the family.Additional barriers to

girls' participation and learning in Mathematics included lack of support from the parents, teachers and peers as well as the masculine belief that Mathematics is difficult.

The findings seem to suggest the need to motivate girls starting from primary school to actively participate in the learning of Mathematics. The study recommends empowering and preparing of girls socially, physically and mentally in order to encourage them to study Mathematics beyond secondary school.

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DEDICATION

This work is dedicated to my beloved wife, Everine Iyambo, my daughter, Alma Ndalelwa Iipinge and to the Namibian education sector.

DECLARATIONS

I, Joseph J. Iipinge, declare hereby that this study is a true reflection of my own research, and that this work, or part thereof has not been submitted for a degree in any other institution of higher education.

……. [Signature] Date……..

[Joseph J. Iipinge]

CHAPTER 1: INTRODUCTION

1.1 ORIENTATION OF THE STUDY

Although there has been an improvement in the participation of girls in the field of Mathematics in many countries, this does not seem to be the case in Namibia (Mbalu, 2004). Mbalu reports that Namibia is a country that faces a shortage of female Mathematics graduates both at secondary school and tertiary levels. According to Mwetulundila (2000) girls in Namibia do not fully participate in Mathematics because of the following reasons: The South African colonial education was inferior particularly with regard to Mathematics; the low participation of females is carried-over from secondary schools or high schools to tertiary level; the "hidden curriculum," which not only lacks gender equality regarding what is taught, but also regarding how it is taught; lack of female role models; socio-economic factors and teenage pregnancy.

Mwetulundila's (2000) findings prompted this study because it left the question of how socio-cultural factors influence girls' poor participation in Mathematics, unanswered. The Association for the Development of Education in Africa (ADEA) and the Forum for African Women Educators (FAWE) indicate that only 22% of girls in Africa attend secondary school and only 10% of the 22% study Mathematics related topics (Mwetulundila, 1999). According to African Development Fund, Appraisal Report of 2011 only 22% of the girls enrolled in Mathematics in secondary school in 2004, 26% of the girls enrolled in Mathematics in secondary school in 2008, and 33% of the girls

enrolled in Mathematics in secondary school in 2010 (Zahidi, 2011). From this report, it is still clear that even though the number of girls' enrolment in Mathematics is increasing, it does not surpass the boys' enrolment. The poor performance is fuelled by the fact that female learners and students both at secondary school and tertiary levels have negative perceptions about Mathematics (Mwetulundila, 1999). These negative perceptions have resulted in the Mathematics and Science sectors being dominated by males.

According to an international study conducted by IEA, on average across all countries that were part of the study, there was a difference in achievement between boys and girls at either the eighth grade or tenth grade (Mullis, Martin, Gonzalez, and Chrostowski, 2004). The finding of two consecutive International studies (TIMSS, 1999, 2003). The Iranian educational system (a system in which co-education is prohibited and female teachers teach in the girls' schools and male teachers teach in the boys' schools) also confirms that there is a significant difference between boys and girls in Mathematics achievement, whereby boys outperform the girls in Mathematics. However, data from these studies show a significant decrease in the boys' Mathematics achievement score from the time of TIMSS 1999 and the significant improvement in the girls' achievement over the same period in Iran, but still the boys outperformed the girls (Kiamanesh, 2006).

According to the National Science Foundation (NSF), in the United States of America, women earn 45% of the undergraduate degrees in Mathematics (NSF, 2008a), but women make up only 17% of university staff in Mathematics (NSF, 2008b). In Namibia, statistics have shown that only one third of the girls entering secondary school complete their schooling with good Mathematics knowledge and grades (Ministry of Education, 2007). The Ministry further reports that the figures are worse at tertiary level where only one out of twenty graduates is a female. Ndunda (1999) examined the causes of women's under representation in Mathematics related fields in Namibia. According to Ndunda, approximately 87% of students doing Mathematics at secondary school and university levels combined in Namibia in 1998 were male. She also reported that, between 1992 and 1998, only 5% of the graduates in Mathematics related fields were women at the University of Namibia. However, her study did not consider how social-cultural factors and traditions in Namibia affected female students. Although the few studies carried out in Namibia in this field (Ndunda, 1999; Mwetulundila, 1999; Mbalu, 2004) have produced some interesting data, they leave out a range of other factors which might contribute to the problem of under-representation of women in Mathematics. This study was therefore, aimed at finding out how socio-cultural factors influence girls when deciding whether to enrol or not to enrol in Mathematics courses at ordinary level or at a higher level in Namibia, in the Oshana Education region.

1.2 Statement of the problem

According to Mbalu (2004) Namibia faces a shortage of female Mathematics graduates both at secondary school and tertiary level. Ndunda (1999) also, reports that approximately 87% of students who were doing Mathematics at school level in 1998 in Namibia were male. Since then only little improvement in girls' participation in Mathematics at school level has been recorded by the Ministry of Education (Sebeen, 2007). For example, according to the statistics of the Ministry of Education only one third of the girls entering secondary school opt for the Mathematics field of study and complete their schooling with good Mathematics knowledge and grades (Ministry of Education, 2007). Hence, the question that needs to be addressed is: Why do female learners shy away from Mathematics at school level in Namibia (Sebeen, 2007)? As mentioned earlier, this problem has been studied from various angles. However, the effects of socio-cultural factors towards the poor participation of females in Mathematics in Namibia, especially in the Oshana Education region, have not been researched. Therefore this study was aimed at finding out how socio-cultural factors influence girls' participation in Mathematics in the Oshana education region.

1.3 Research questions

The following four questions were addressed in this study:

1. What are the perceptions of girls toward Mathematics learning in the Oshana education region?

2. What influences do parents and teachers have on girls taking Mathematics as an area of study at secondary school in the Oshana education region as perceived by girls?
3. What cultural/traditional norms do the girls perceive to hinder their participation in studying Mathematics in the Oshana education region?
4. What beliefs do girls in the Oshana education region hold about Mathematics?

1.4 Significance of the research study

The significance of this study is that it might identify the socio-cultural barriers that make it difficult for girls to take part in Mathematics programmes in the Oshana education region. By doing so it could pave the way for further comprehensive research on gender differences in mathematics learning. This study might also provide useful information to teachers, society, school administrators and curriculum developers to address the social-cultural factors that hinder girls from studying Mathematics. It might also contribute to the improvement of education policies that might address the problems girls face in learning Mathematics.

1.5 Limitations

Namibia has 14 regions and over 500 secondary schools. Therefore, due to the vast geographical distances separating these schools, time and financial constraints, the research was carried out in eight secondary schools only in the Oshana education region. Other limitations include those inherent to quantitative methods such as the low

questionnaires response rate (McMillan and Schumacher, 2001). Hence, not all the questionnaires given to the eight schools were returned to the researcher.

1.6 Delimitations

This study was limited to Grade 11 and 12 girls from eight (8) secondary schools in the Oshana Education region only. The study targeted girls only because according to the Ministry of Education (2010) and Kiangi and Tjiramba (2005) the boys are progressing better in Mathematics than girls, and the majority of boys are studying pure Mathematics and hard Sciences at tertiary level, while the majority of girls opt for biological Sciences studies. According to UNAM Annual Report of 2012, indicates that 65 males and 52 females graduated with the Bachelor of Science degree from the University of Namibia (Tjiramba, 2012).

1.7 Definition of terms

It is important to define terms that could be misinterpreted in order to establish a frame of reference in which the researcher approached the problem (Best and Kahn, 1993). For terms and concepts to carry any meaning that pertains to the study, they need to be clearly defined. Accordingly the following terms should be understood as defined herein:

Under-representation of women: According to (Bob, 2005), "Under-representation" basically means there are fewer representatives of women in the learning of Mathematics than men.

Parents: the term will be used to refer to biological parents and also significant adults in the home and community environment of children.

Socio-cultural beliefs: The mental conditions or habits stemming from the living conditions, arts, behaviour and artistic expression in the community or society (Bob, 2005).

Culture: Culture can refer to the customs or artistic achievement of a particular community or people in social, moral, historical laws, and developmental stages. Culture is equivalent to the intellectual side of civilisation and it stems from socialisation, development and refining of mind from a young age by elders in the norms that are regarded as acceptable by that social group, institution or community (Bob, 2005).

Perception: is a way that a person thinks about something or the impression a person has of something (Angus, 2011).

Self-efficacy: According to Vos and Brits (1990), self-efficacy refers to the belief of the person that he or she is able to perform a task at hand and is correlated with achievement-related behaviours, self-worth, achievement-performance, motivation, and positive processing.

Attitudes: According to (Angus, 2011), an attitude can be understood as an emotion that has an influence on the behaviour of human beings. Le Roux (1994, p. 6) defined attitudes as "positive or negative emotional relationship with or predisposition towards an object, institution or person".

Self-worth: The value a person gives to his/her life and achievements (Angus, 2011).

Self-motivation: According to Le Roux (1994), if a person is self-motivated; they are capable of hard work and effort to achieve a set of goals without the need for encouragement.

CHAPTER 2: LITERATURE REVIEW

In this chapter, the literature on women and Mathematics are reviewed with the focus on socio-cultural aspects. The literature review thus concentrates on the socio-cultural factors that hinder the progress of girls in Mathematics. The review of literature is organised to cover both the international and Namibian findings regarding culture, traditions, and Mathematics learning.

2.1 Socio-cultural framework

According to Brophy (1985, p. 115), culture is the "objective force that infuses social relationships, social development and the development of a disciplined society." Brophy further notes that culture in its broadest sense is cultivated social behaviour through learning; and the essential core of culture consists of traditional ideas and their attached values, attitudes, knowledge and skills. Culture is essential to this study because children's cognitive development and functioning are "highly influenced by social events that a person is exposed to and these originate from the culture, social environment and traditions that one is exposed to" (Mwamwenda, 2005, p. 89).

According to Mwamwenda (2005, p. 90) culture is learned, it is created by people and it exists in time and space, that is, in an environment in which human beings act and respond upon their space, time dimension, their thoughts about things, themselves and others. In this study culture has three dimensions as adopted from Mwamwenda (2005),

artefacts (that, which is made, created and produced), socio-facts (the way in which people organise their society and relate to one another) and menti-facts (the ideas, beliefs and values that people hold). Culture is further understood by Brophy (1985) as having three other levels, for example, national level (the nation as a whole), regional level (associated with ethnicity, language and religion) and lastly gender level (associated with female vs. male). Traditions are important to this study because according to Brophy (1985, p. 32) "they are seen as transferred knowledge, which can shape, change and control the conduct of girls in Mathematics". Mwamwenda (2005) also indicated that some traditions maybe more open and accommodative of girls to study Mathematics and Science while others may not be as open and accommodative.

2.2 Girls' participation in Mathematics

The falling number of male and female students choosing to pursue studies in Mathematics has become a matter of societal concern and debate in many countries (Osborne, Simon and Collins, 2003, p. 102). Most of the countries which participated in the 1999 Third International Mathematics and Science Study (TIMSS) have experienced a degree of gender imbalance in the results for Mathematics with Israel having the largest gender imbalance especially in Grades 7 and 8 at the middle school (Zohar and Sela, 2003, p. 245). Zohar and Sela alluded to the fact that not only do the current Israel examination results seem to refute innate ability differences between boys and girls, but they also highlight strong cultural influences. Such influences clearly affected girls'

achievements in a 38-country investigation of 8th grade Mathematics achievements (Zohar and Sela, 2003, p. 246).

The Third International Mathematics and Science Study (TIMSS) report by Zohar and Sela (2003) states that, across the whole ability range, “in most countries the gender difference was negligible” (p. 48). But among the highest scoring 25% of learners there were significant differences. Within that group only three countries showed statistically significant male superiority: “In Israel, Tunisia, and the United States, the percentages of boys reaching the upper quarter level were significantly greater than the percentages of girls reaching this level” (p. 48). For those three countries, there appears to be considerable cultural differences, such as gender expectations, gender role models and provision, affecting gender achievements in high-level mathematics, which was not seen in the other countries.

Further, the study of the Third International Mathematics and Science Study (TIMSS) report by Fox, Engle, and Paek (2001) indicated that in the United States “girls’ lower levels of confidence in mathematics become even more problematic in the middle school years” (p. 43). Girls’ poor achievement in Mathematics has prompted many governments and ministries of education to attempt to increase awareness and recognition of the importance of mathematical knowledge and its cultural significance for the development of their economies (Fox, Engle and Paek, 2001). Although a significant increase in the participation of women in Mathematics has been recorded

internationally, it has not been accompanied by a corresponding increase in the level of participation and achievement by woman in the scientific and technological sectors of the workforce (Osborne, Osborne, Simon and Collins, 2003, p. 45).

Some researchers have indicated that girls' beliefs and attitudes contribute most to their Mathematics interests and experience (Hanson, 1996, p. 56; Kahle, Parker, Rennie and Riley, 1993, p. 79 - 81; Mayer and Khoehler, 1990, p. 60 - 64), while Van Lauven (2004, p. 249) argues that girls often underestimate their Mathematics competence, feel less adequate, and have lower expectations for success in Mathematics when compared to boys. Other factors considered having an impact on gender differences regarding Mathematics achievement include:

- The different interactions of teachers with male and female students (Brophy, 1985, p. 115 - 117). As Sadker (2009) said, classroom interactions between teachers and students put males in the spotlight, and relegate females to the sidelines, or to invisibility. Upon carrying out a meta-analysis of 81 studies on gender differences in teacher-student interaction, Kelly (2008) concluded that teachers tended to interact more with boys than girls both in teacher and student initiated interactions. Teachers asked boys much more questions and provided them more response opportunities. In other words, Kelly found that teachers paid more attention to boys than girls and this fact exists in most classroom contexts including Mathematics.
- Teachers' attitudes toward girls and Mathematics (Haggerty, 1995, p. 1 - 5).

Kinga (2010) studied the impact of teachers' attitudes on girls' achievement in Mathematics. The study found that a teacher's opinion about Mathematics or how Mathematics is taught greatly influences the girls' attitude and beliefs, which in turn impact achievement in the subject. Kinga further states that learning of Mathematics depends on the way it is presented to the learner, the way the learner interacts with the learning experiences presented and the environment within which the learning takes place. The study showed that 82% of the teachers in the study strongly believed that boys have a natural talent for Mathematics. This attitude influenced their teaching and reaction to the way girls performed in Mathematics. This kind of attitude does not serve the girls well, since the belief that boys can naturally do Mathematics implies that regardless of effort, girls cannot outperform the boys.

- Parents' expectations regarding their daughters and sons (Eccles and Jacobs, 2006, p. 67 - 69).

Eccles and Jacobs found that girls' own self-perceptions reflected the parents' expectations. When parents had low expectations of their daughters, the girls increasingly lost confidence in their Mathematics skills and lowered their evaluations of the usefulness of Mathematics for the future.

Socio-cultural influences and gender-role stereotyping with regard to participation in Mathematics are well documented by Byrne (2008) and Kelly (2008) but the focus is on a Western culture and not on an African culture. Both Byrne and Kelly found that "the

poor performance of girls in Mathematics may in part be due to anxiety that girls experience in test taking situations. When taking a test in Mathematics, female students enter the test situation concerned that a poor performance on their part will confirm a culturally held stereotype about Mathematical inferiority of females". As a result, they experience stereotype threat, which saps mental energy, attention, and effort and thereby disrupts their performance on a Mathematics test. Some researchers indicate that girls' beliefs and attitudes contribute most to their Mathematics interests and experience (Hanson, 1996, p. 56; Kahle, Parker, Rennie, and Riley, 1993, p. 379; Mayer, and Khoehler, 1990, p. 60 - 62). On the other hand, Van Lauven (2004) argues that girls often underestimate their Mathematics competence, feel less adequate, and have lower expectations for success in Mathematics when compared to boys.

Manning, Bear, and Minke (2006, p. 88) suggested that "a basic characteristic of an adolescent, namely the self-concept or self-esteem, is highly influenced by family, peer groups and educators." These beliefs stem from what parents or teachers say to their children or learners and are influenced by differing expectations for male and female learners which are transmitted by parents, society and the schools (Wiest, 2001). According to Baumeister (2003), these beliefs lead to heavy cultural pressure for males to be more successful than females. This means parents rank intellectual and educational value lower for girls than for boys resulting in girls suffering from a negative self-concept (Labudde, Neuenschwander, Herzog, and Gerber, 2006). Pianta (2006) examined the different interactions that teachers have with male compared to female

learners in Mathematics classes, in Virginia, the United States of America. His findings were that teachers were not interacting that much with girls in Mathematics lessons as in the case with boys, mainly due to the fact that teachers had different expectations and beliefs about pre-existing knowledge in girls and in boys. Pianta further pointed out that teachers frequently asked more questions and gives more practical tasks to boys than girls in Mathematics because girls were perceived to be less superior in solving Mathematics problems than boys.

Van Leuven (2004) claimed that teachers hold the view that girls are not as capable as boys in Mathematics. Van Leuven further reports that teachers' expectations influenced by culture can lead to self-fulfilling prophecies as far as female secondary school learners' achievement is concerned. Parents and teachers are "role models to girls" (Mwamwenda, 2005, p. 49) and what they say is of great significance to them. Parents and teachers can help improve girls' Mathematics interest and performance by encouraging and helping them believe that Mathematical competencies can be improved through consistent effort. Mwamwenda further reports that another important influence from the parents is that of socio-economic status whereby girls from parents with low socio-economic status earn lower test scores.

Saha (2002, p. 191) says that "parents' socio-economic level is thought to exercise an independent positive effect in the male and female learners' Mathematics performance, but a negative effect on the career aspiration of a female adolescent learner". This is

because parent aspirations have been associated with increasing learners' interest in Mathematics. The study by Tait (2006) suggests that parents with high education (and this is associated with high income) tend to have high aspirations for their children's education and this in turn motivates girls to aim high. From the arguments above, it is clear that it is imperative to ascertain what influences from parents and teachers might contribute to girls' performance in Mathematics and Science.

There are beliefs and norms that stem from cultures and traditions that convey the negative message that girls are less capable in Mathematics and Science than boys. For example, Van Leuvan (2004) alluded to the fact that some parents hold on to the belief that girls have more difficulty with Mathematics than boys and are less suited to venturing into fields involving Mathematics, even when performance is the same for both sexes. This means that parents have gender-stereotyped attributions for success and failure of girls in Mathematics. According to Brown (2005) parents are more likely to attribute their son's Mathematics success to ability and their daughter's success to effort. Brown concluded that parents' gender-typed beliefs and expectations can influence the child's self-competence, and sense of what is appropriate, because children are very adept at picking up gender-typed information as they are actively trying to find out what is normal, and what is expected of them from the parents.

The study by Ireson (2005) found that teachers can hold gender-stereotyped attributions to the learners' success and failure, and relay gendered expectations and encouragement

to students just like parents could. Ireson found that teachers pay more attention to boys, call on them more, give them more complex questions, expect boys to be assertive, and girls are expected to be cooperative and expressive. This difference in treatment can inadvertently lead to differences in cognitive development as a boy who is given more attention and harder questions in a Mathematics class may receive more cognitive stimulation, while a girl would gravitate toward less competitive, more socially oriented domains (Brunner, 2007). Brunner suggested that girls and boys have gender-based learning preferences, where boys are more inclined to like the theoretical and competitive learning environments, while girls prefer creativity and cooperative learning environments. Brunner concluded that these learning preferences may lend themselves to particular subjects as girls adjust well to the creativity associated with reading and writing, but may not perform as well in Mathematics and Science which are traditionally taught in a competitive manner. Therefore, the learning preferences may inhibit girls' interest and performance in Mathematics.

Cultures and traditions are inherited from parents (Mwamwenda, 2005), and it is the duty of parents to teach and educate their children about what is acceptable and what is not. It is believed that if the cultures of child-rearing practices are gender-stereotyped, then boys and girls will be brought up very differently from each other (Van Leuvan, 2004). This means that in most cases, parents will rather spend more money on boys than on girls; therefore girls are conditioned from an early age that they are inferior to

boys (Dorsey, 2004). This may negatively affect the motivation and achievement of girls.

The school should not become an extension of societies' child rearing practices for girls by gender-stereotyping school subjects (Flanagan, 2002), but should rather encourage female learners to take up Mathematics and Science subjects (Young and Fraser, 2003). Young and Fraser further stated that in some cultures, the school practices are to be blamed for the girls' relatively low achievement. Boys are often taught to attain higher grades in physics than female learners because of the unequal science related experience and cultural stereotyping of the female role combined with a non-science career orientation (Kelly, 2008). If the schools' cultures and traditions support and encourage girls to do Mathematics, they will have high interest in these fields (Byrne, 2008; Kelly, 2008; Lawrenz and Veach, 2005). Wiest (2001, p. 14) argues that "gender differences in Mathematics performance are predominantly due to the accumulated effect of gender-role stereotypes in the family, culture and traditions." This means that when girls have to choose a career they have to consider what vocational choices are acceptable in the community for a girl to follow before making a choice.

Most young women do not see themselves as being capable of studying and succeeding in Mathematics, therefore they are not interested in it (Gilbert, and Calvert, 2003). The myths and realities of women progressing in the Mathematics field were studied by David, Ginorio, Hollenshead, Lazarus, and Rayman (2006, p. 29 - 31) who concluded

that “the attitudes adopted by girls from parents, teachers, friends and society have a significant influence on the girls’ choices and performance in Science and Mathematics.” These influences come from a cultural or social background.

The school should provide equal learning opportunities for both boys and girls, but, as Labudde et al (2006, p. 143) report, “most boys have more positive attitudes fuelled by higher achievement in Mathematics, while girls are slightly more confident about attaining language proficiency”. The same study suggests that girls can do well if they are assisted through building positive attitudes and aspirations. Even though there is a tendency among low social economic status schools to practice gender chauvinism against female learners (Smith, Cowie, and Blades, 2008), it is believed that when the school environment is enriching and it stimulates positive attitudes, female learners will achieve higher grades (Wiest, 2001). Schools with less provisions, fewer teachers, poor school buildings and inadequate facilities for female learners will have a negative influence on the attitudes and academic achievements of female learners (Jules, and Kutnick, 2002).

Beliefs may stem from a variety of influences such as parents, religion and tradition, beliefs are not static, which means beliefs can change with time. The environment can affect one’s beliefs (O’Conell, 2004). As Seifert (2004, p. 139) states, “self-efficacy is the person’s belief that he/she is able or unable to perform the task at hand and is correlated with achievement-related behaviours like motivation and self-worth.” Van

Leuvan (2004, p. 248 - 249) adds that "women constitute only a small percentage of the Mathematics workforce because of their beliefs and attitudes that contribute to their Mathematics interest and experience." If these beliefs are negative, it will make girls underestimate their Mathematics competencies, feel less adequate, and have lower expectations for success in Mathematics compared to boys (Van Leuvan, 2004).

Other authors like Maccoby and Jacklin (2002, p. 120 - 121), David (2006, p. 33 - 34) and Harding (2006, p. 432 - 433) found that "girls are reluctant with regards to taking up Mathematics, less motivated to do Mathematics, lack the culture of Mathematics and rather shy away from Mathematics". No explanation was given as to what causes these behaviours especially in terms of the socio-cultural influences that girls' experience. These are the gaps that this research addressed with regard to the situation in Namibia.

2.3 Girls' participation in Mathematics in Africa in general

Some researchers are of the opinion that gender stereotyping is more prevalent in Asia and Africa than in the United States and Europe (Lawrenz, and Veach, 2005). Gender stereotyping is prevalent in Sub-Saharan Africa where culture and society have been influenced for centuries of a male dominated lifestyle in the field of Mathematics (Lawrenz, and Veach, 2005). Statistics suggest that in third world countries, girls are less likely to attend school than boys (World Bank, 1994). Although there has been a significant improvement in girls' access to schools, particularly at primary school level, in the past twenty years this has not been the case in Africa (Gilbert, and Calvert, 2003).

By 1990, according to World Bank (1994) statistics, girls made up 47% of primary school learners, 33% of secondary school learners and 4% of tertiary students in Sub-Saharan Africa. This must be understood in the context of extreme poverty and socio-cultural aspects in which these girls live (World Bank, 1994). Botswana and Namibia are the only two countries in Africa where there is a slightly higher enrolment rate for girls than boys in schools (Kelly, 2008).

Although Maccoby and Jacklin (1992) claim that boys and girls in general, especially in developed countries, enjoy Mathematics at primary school level, this picture does not seem to apply to the African context as girls are less likely to take Mathematics as one of their choice of subjects (Mwetulundila, 1999). This is corroborated by Klein (2004) who argues that the inconsistency of results in Mathematics and Science subjects between boys and girls is influenced by factors that have not yet been studied, like inter group ethnicity and socio-economics or socio-cultural differences manifested in various gender-related norms, stereotypes and expectations. This reiterates the importance of socio-cultural influences when trying to understand gender stereotyping regarding participation in Mathematics and Science, given that Mathematics is now compulsory up to grade 12 in Namibian education system. With the exception of a few schools in some African countries, the conditions remain the same in most schools (World Bank, 1994), but the focus was on how the socio-cultural factors, such as tradition, culture, perceptions and beliefs impact on the girls' education.

According to Asmeng-Boahene (2006), many African countries face the problem of low levels of girls' attainment in Mathematics. One of the causes thereof is that the goals, contents and methods of mathematics education are not supportive and/or not sufficiently adapted to the cultures and needs of the African peoples. Although the "participation in Mathematics at primary level is compulsory in all Sub-Saharan Africa (UNESCO, 2001, p. 133), the gender gap becomes wider from senior secondary school to university level". This is mainly due to the girls' perceptions of Mathematics difficulty at school level. A study by Dovi (2004) reveals that it is mistakenly believed that girls in Africa struggle to achieve or pursue Mathematics due to inability; it is rather the lack of opportunities that is a retarding factor. Girls at school can excel in Mathematics if they have role models to follow, Mathematics clubs for girls, Mathematics competitions, funding and recognition awards at school and national level (Dovi, 2004). The school as an institution of change should have the culture that supports, promotes and enhances Mathematics programmes for both sexes.

The social and cultural perceptions regarding the expected roles of men and women in society are major impediments to the educational advancement of girls. According to Bloch and Tabachnick (1998, p. 178), the main socio-cultural factors that affect women's participation and performance in education in Sub-Saharan Africa include "family, religious, social and economic influences". They further revealed that in Kenya, both male and female students from higher socio-economic backgrounds outperform lower-income students in all aspects of education, including Mathematics.

Asmeng-Boahene (2006), claim that African families of lower socio-economic status will for moral or religious reasons rather send their sons than their daughters to college. Many African families thus arrive at decisions that impede the education of their daughters. African men are less likely to marry women who are more educated than themselves especially in Mathematics; therefore an educated daughter has less chance of having a husband, bearing children and maintaining her moral values (Klein, 2004).

Another social problem in Africa is that of a high drop-out rate of girls due to pregnancy. Bloch and Tabachnick (1998) report that about 18% of African women aged between 15 and 19 give birth each year, as compared to 8% in Latin America and 3% in Asia in the same age group. In Botswana for example, 75% and 85% of dropout of girls from junior and senior secondary schools respectively is due to early pregnancy (Jules, and Kutnick, 2002). While in Namibia, 26% and 52% of dropout of girls from junior and senior secondary schools respectively is due to early pregnancy (Smit, 2011).

It is against the above-mentioned statistics regarding the situation of girls in Africa that this study focused on identifying the underlying socio-cultural factors that cause girls' low participation in Mathematics learning in the Oshana education region.

2.4 Girls' participation in Mathematics learning in Namibia

In the Namibian context, very little research has been carried out in this area. According to Mwetulundila (1999), few studies done in Namibia have emphasised on equality and

empowering girls through education in learning Mathematics. The high dropout rates and low enrolments of female students in Mathematics related fields was investigated by Tjipueja (2002), but with no particular reference to the causes of the problem. Mwetulundila (1999) also reports on the causes of female under representation in Mathematics and the negative perceptions girls have about Mathematics learning in Namibia. Mwetulundila's study focused on the colonial oppression and imbalances as the causes of female under representation in Mathematics.

The enrolment at the University of Namibia in 2002 for the Bachelor of Science degree was 17 males and 8 females while the enrolment in 2003 was 21 males and 4 females (Kiangi, and Tjiramba, 2004). These enrolments show a small number of female students registered in fields of study requiring Mathematics. According to the UNAM Annual Report of 2005, 43 males and 31 females graduated with the Bachelor of Science degree from the University of Namibia (Kiangi, and Tjiramba, 2005). Furthermore, UNAM Annual Report of 2012 indicates that 65 males and 52 females graduated with the Bachelor of Science degree from the University of Namibia (Tjiramba, 2012). These figures serve as an indication that there are imbalances in the Namibian education system, which discourage girls from taking part in Mathematics learning. However, little is known about the effects of socio-cultural factors in this regard. Therefore, this study sought to fill the gap in the literature regarding the lack of female participation in Mathematics education in Namibia and the influence of socio-cultural factors that might hinder girls from studying Mathematics in Namibia.

2.5 Girls' attitudes towards Mathematics learning

Studies have shown that, girls tend to have more negative attitudes towards Mathematics than boys (Leder, 2005), and that attitudes tend to become more negative as girls move from elementary to secondary school (McLeod, 2004). The general attitude of the girls toward Mathematics is related to the quality of the teaching and to the social-psychological climate of the class (Haladyna, 2003).

According to McLeod (2004) Mathematics was often considered to be a domain in which boys are higher achievers, in terms of both academic scores and self-concept. Contrary to this, recent findings show that Mathematics' school achievement and grades do not differ significantly between boys and girls (Halpern, 2010). This similarity in performance between males and females is clear in the meta-analysis conducted by Lindberg (2011) with data from 242 studies representing 1 286 350 people, indicating no gender differences and nearly equal male and female performance in Mathematics at secondary school level. However, Lindberg acknowledges that there are noticeable differences in the beliefs held by boys and girls. Results concerning gender differences in attitudes are less consistent than those in self-concept. A meta-analysis conducted by Etsey and Snetzler (2008) taking into consideration 96 studies concluded that gender differences in learners' attitudes toward mathematics do exist but are small. The results further indicated that males show more positive attitudes than female learners. However, Etsey and Snetzler (2008) reported that in elementary school studies, the effect size was about 0.20 in favour of females and for grades 9 to 12 the effect size was similar, 0.23,

but in favour of males. Also, Hyde (2005) confirmed in her meta-analysis a small gender effect, which increases among older students (high school and college), with females holding more negative attitudes.

Asante (2012) states that, when compared with boys, "girls lacked confidence, had debilitating causal attribution patterns, perceived mathematics as a male domain, and were anxious about mathematics" (p. 2). The research carried out by Asante in Ghana, showed that boys had more positive attitudes toward Mathematics than girls. Also Sanchez (2004) in a study with North American students found significant gender differences in high school students' attitudes toward Mathematics. Sanchez's findings were that "American boys were more interested in Mathematics than girls, but girls perceived Mathematics as more important than boys. Girls also presented higher scores on items with regard to difficulties with math". According to Asante (2012), the school environment, developmental changes in gender identity, and teacher and parent attitudes and beliefs towards Mathematics are factors that may contribute to the differences identified between boys and girls in their attitudes towards Mathematics.

It is therefore against the above-mentioned research findings regarding the girls' apparent negative attitudes in the learning of Mathematics that this study focused on the underlying socio-cultural factors that might reduce girls' participation in Mathematics learning in the Oshana education region.

2.6 Girls' interests in the learning of Mathematics

Despite comparable performance by women and men in a variety of Mathematics subjects such as Algebra and Geometry (Else-Quest, Hyde, and Linn, 2010) and similar abilities associated with completing Mathematics-related tasks (Barnett, and Rivers, 2004; Spelke, 2005), female interest in Mathematics is markedly lower than male interest (Frenzel, Goetz, Pekrun, and Watt, 2010; Nosek, Banaji, and Greenwald, 2002). At a young age girls and boys express similar interests in and positive attitudes toward Mathematics (Linver, Davis-Kean, and Eccles, 2002); however, gender differences in Mathematics interest become apparent after elementary school. By eighth grade, boys are more likely than girls to indicate an interest in Mathematics (Linver et al., 2002). Between fourth and twelfth grades, the percentage of girls who indicate they are no longer interested in studying Mathematics increases from 9% to 50% (Boswell, 2004).

Reported lack of interest by girls is masked by course-taking patterns. Girls enrol in Mathematics based courses throughout middle and high school at the same rate as boys do and perform as well on Mathematics based standardized performance tests (Freeman, 2004). These trends present a confusing picture of females and Mathematics. Competing statistics have been reported, and research has focused on identifying experiences that might explain the lack of interest among females despite the fact that they and males demonstrate equal aptitude for Mathematics (Spelke, 2005). To that end, Spelke (2005) found that sociocultural factors play a major role in students' perceptions about the degree to which females and males are good at Mathematics and the utility of studying

the subject. Negative views held by influential individuals such as parents and teachers underscore these messages and are internalized by girls, negating their interest in Mathematics. When considering the long-term impact, lack of interest in Mathematics among girls is directly related to fewer women pursuing degrees in Mathematics related careers, including science, technology, and engineering (Linver et al., 2002; Spelke, 2005; Watt, 2006).

2.7 Girls' perceptions toward Mathematics

Gender based differences in Mathematics are due to the individual's perception of own abilities and the sex role (Schiefele, and Csikszentmihalyli, 2000). Costello (2003, p. 23) reported that "almost all literature on this topic points to the commonly held perception that doing Mathematics is consistent with a male self-image and inconsistent with a female self-image." This self-image is usually caused by peer pressure. Males are more inclined towards the study of Mathematics than females. This is because males view Mathematics with passion while female with detachment (Costello, 2003). It has been found that at secondary school level most of the girls do not actively participate in Mathematics classes due to their poor perceptions about Mathematics (Fennema and Sherman, 2000). Girls are negatively influenced by their sex-role stereotypes (Boswell, 2004; Fennema and Sherman, 2000; Sherman, 1999; Leder, 1999; Ethington, 1998).

Campbell (2006) found that girls' lack of confidence in themselves as Mathematics learners, their perception of Mathematics as difficult, and their view that Mathematics is

a male activity, all had impact on girls' attitudes, achievement, and participation in advanced Mathematics courses. In a longitudinal study of sixth, eighth, tenth, and twelfth graders, Fennema and Tartre (2000) found that, for girls, viewing Mathematics as a male domain was correlated to Mathematics achievement.

2.8 Girls' beliefs about the learning of Mathematics

Gender is one of the factors that has been found to be of great influence, but not to the same extent on the performance as on the beliefs and on the motivation and the purpose of learning Mathematics. Around the turn of the century some researchers (Brandell, Nyström, and Staberg, 2002; Pehkonen, 2004) showed that beliefs towards Mathematics, the study of Mathematics, and the experience of being a learner of Mathematics, which were held by pupils in lower secondary schools, were changing. According to Pehkonen (2004), the pupils expressed beliefs indicating that Mathematics was more for girls than for boys, and her research further showed that girls worked better in Mathematics class and were more successful.

Fennema and Sherman (2000) identified as critical, beliefs about the usefulness of, and confidence in learning mathematics, with males providing evidence that they were more confident about learning Mathematics and believed that Mathematics was, and would be, more useful to them than did the females. Fennema and Sherman further affirmed that there was evidence that while young men did not strongly stereotype Mathematics as a male domain, they did believe much more strongly than did young women that

Mathematics was more appropriate for males than for females. The importance of these variables (confidence, usefulness and male stereotyping), their long-term influence, and their differential impact on females and males was re-confirmed by many other studies (Hyde, 2005; Fennema and Tartre, 2000; Leder, 2005).

According to Leder (2005) girls' views of Mathematics are shaped in part by gender-based stereotypes that convey misconceptions that differential innate Mathematical abilities exist between males and females. Research that focuses on cognitive development among students of various ages, document that Mathematical reasoning among girls and boys develops from a shared set of biologically-based capabilities that lead both genders to develop an equal aptitude for Mathematics (Spelke, 2005). In general, both girls and boys have the same innate ability to learn mathematics skills and are born interested in a variety of objects and ideas (Spelke, 2005; Spelke and Grace, 2007). Sociocultural forces impart beliefs that boys are born with a greater aptitude for Mathematics. Environments such as Mathematics classrooms and households that are heavily influenced by beliefs that girls may be disadvantaged genetically when it comes to Mathematics ability can have a serious negative effect on Mathematics interest among girls (Dweck, 2007).

2.9 Summary

This chapter provided a review of studies in Mathematics in relation to the effects of socio-cultural factors that might hinder girls from studying Mathematics in Namibia.

From the literature it becomes evident that various experiences that girls go through contribute heavily to their perceptions, beliefs and interest in Mathematics. Parents and teachers influence girls both positively and negatively as far as girls' participation in Mathematics learning is concerned as they do boys as well. Generally, some socio-cultural factors like self-concept, teachers' expectations, beliefs, child rearing practices and societal educational aspirations are factors that contribute to a small number of girls opting for the Mathematics field of study. The next chapter presents the research methodology of this study.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter presents the research design, the population, the sample, the instruments used, the data collection procedure, the data analysis and the research ethics applied in the study.

3.1 Research design

Due to the nature of the problem under study, a mixed research design that employed both quantitative and qualitative research approaches was used in this study. Quantitative research consists of those studies in which the data can be analysed in terms of numerical values (Loraine, 2004). The questionnaire data were quantified into frequencies, a characteristic of a quantitative study. Furthermore, the study used the qualitative research approach to investigate the perceptions of girls toward Mathematics learning. Qualitative research is "a type of inquiry which seeks to build a holistic, largely narrative, description to inform the researcher's understanding of a social or cultural phenomenon" (McMillan and Schumacher, 2001, p. 45). McMillan and Schumacher further indicated that qualitative research takes place in natural settings employing a combination of observations, interviews, questionnaires and document analysis. The questionnaire consisted of both closed-ended and open-ended questions.

3.2 Population

The study targeted all eight secondary schools in the Oshana education region with a population of Grade 11 and 12 girls. The sample for this study was selected from the senior secondary school girls in Grades 11 and 12 in the Oshana education region. The Grade 11 and 12 girls were chosen for this study because they had to make career choices based on the influences in their lives (Mwamwenda, 2005).

3.3 Sample and sampling procedure

3.3.1 Sample

Three of the eight secondary schools were situated within Oshakati town. Two in Ongwediva town; one in Ondangwa town; and two secondary schools were situated about ten kilometres outside Oshakati, Ongwediva and Ondangwa towns. The buildings of the two secondary schools situated outside towns were in good condition and on average each class accommodated 32 learners. The six secondary schools situated in towns had well established buildings, electricity, running water, good sanitation and modern library facilities equipped with computers and internet. The secondary schools in the towns were slightly overcrowded, with a teacher-learner ratio of 1:40 compared to 1:32 teacher-learner ratio of the two secondary schools outside towns.

From the population of 3628 girls in Grade 11 and 12 in all eight secondary schools in the Oshana education region, a sample of 240 girls were randomly selected. To ensure equal representation of the population in the sample a random sample of 30 girls was

selected from each school. Furthermore, 120 girls were selected from Grade 11s and another 120 girls from Grade 12s.

3.3.2 Sampling procedure

With the help of teachers in targeted secondary schools using their class lists, girls were selected using a stratified random sampling**.** According to McMillan and Schumacher (2001) a stratified sampling procedure involves dividing the population to be studied into subgroups of similar characters (usually characteristics such as age, ethnic background, gender, IQ scores, class, etc). In this study, girls were classified into two groups: Group 1 for girls in Grade 11, and group 2 for girls in Grade 12. Then, from these two groups, samples were drawn randomly by putting the learners' names in a container and selecting 15 girls from group 1 and 2 respectively. This resulted in 30 girls in total from each school. A total of 240 girls from eight secondary schools in the Oshana education region formed the sample.

3.4 Research instruments

3.4.1 Questionnaire

The questionnaire comprised both closed-ended and open-ended questions and was used to collect data. One of the reasons for choosing a questionnaire for this study is the advantage that it has regarding "the possibility of obtaining information from a large and geographically widespread sample without the direct presence of the researcher" (Mwamwenda, 2005, p. 97). The questionnaire was used to gather information regarding

the following aspects from the sample: self-image, Mathematics as male domain, girls' perceptions toward Mathematics, beliefs, culture and tradition, and teachers' and parents' roles that might hinder girls in studying Mathematics at the higher level. The respondents were asked the extent of their agreement with a particular statement by marking one of the following: strongly agree, agree, disagree or strongly disagree. Half of the statements were stated positively and half of the statements were stated negatively. This was done with the aim of striking a balance between the positive and negative statements. If participants were to answer only positively stated statements or only negatively stated statements, it could become monotonous and people might mindlessly agree with all statements and thus dilute the credibility of the instrument.

In this study, face and content validity were determined. For face validity the instruments were submitted to two colleagues and the two supervisors, to evaluate the suitability of the questions and outline in relation to the objectives of the study as recommended by Polit and Hungler (1997). This was done to ensure that questions actually assessed the characteristics that were targeted by the investigator. The responses were then compared with a standard measurement of the desired characteristics being assessed (Hulley, 2001). For content validity the existing literature on girls' participation in the learning of Mathematics was utilised. To ensure reliability, the researcher used a consistent data gathering procedure for all of the questionnaires.

3.5 A Pilot study

The questionnaire was piloted with Grade 11 and 12 learners in two secondary schools in the Oshikoto education region that were not targeted to take part in the main study to determine whether it would elicit the intended responses. Forty girls, 20 from each school were randomly selected to take part in the pilot study. Ten of them from each school were Grade 11s and other ten were Grade 12s. Based on their responses the questionnaire was modified accordingly. Certain statements or questions that were found not to be making sense to most participants were replaced with more appropriate ones. For example, the statement "It is not logical for girls to accomplish better in Mathematics than boys", was replaced with "It is quite normal for boys to perform better than girls in Mathematics".

3.6 Data collection procedures

Permission to collect data was requested from the Permanent Secretary of the Ministry of Education, and from the Oshana Education regional director. The researcher also sought permission to administer the research questionnaire from the school principals of the eight secondary schools targeted for the research. The purpose and ethical conduct of the research were explained to the principals, the teachers and learners before the commencement of the research process. Learners, who were randomly selected to participate in this study, were asked to complete the questionnaire. The questionnaires were administered in one lesson under the supervision of the teachers at the schools. The

teachers then collected the questionnaires thereafter, which were later collected by the researcher.

3.7 Data analysis

According to Bogdan and Biklen (1992, p. 145), data analysis is "the process of systematically searching and arranging the data transcripts, field notes and other materials which were accumulated by the researcher to increase his or her understanding, which can enable the researcher to present the findings". In this study, the quantitative data analysis involved the expression of data into frequencies and presented in tables for interpretations.

According to Johnson and Christensen (2000, p. 114), "data analysis involves coding, categorising and clustering information". The qualitative data analysis in this study involved categorising and clustering of information obtained from the questionnaires. The analysis of the qualitative data of the questionnaire followed the path of aggregating the data into themes.

3.8 Research ethics

Schools and learners participating in this study received full information about the purpose of the study so that they could make informed decisions about whether or not to participate. Participants were assured that their information will be treated with the strictest confidentiality and anonymity (Brink and Wood, 2001). Anonymity was

ensured by not asking the participants to indicate their names. The schools' or learners' names were not shown on the instrument, and any form of identification that made it possible to trace responses to schools or learners was eliminated by the use of codes. Participants were not forced to complete the questionnaire; it was a voluntary exercise as recommended by Folkman (2002).

3.9 Summary

This chapter described the research design, the sample, the research instrument used, the data collection procedure, the data analysis and the research ethics. The next chapter presents the results, interpretation and discussion.

CHAPTER 4: DATA ANALYSIS, INTERPRETATION AND DISCUSSION

The preceding chapter dealt with the methodology and research techniques in order to achieve the aim of this research, which was to explore the socio-cultural factors that affect girls' participation and learning of mathematics in secondary schools in the Oshana Education Region.

In this chapter the data from the questionnaires are analysed, interpreted and discussed. The results are presented according to the following headings: Perceptions of girls toward learning Mathematics; parents' and teachers' influences on girls taking Mathematics as an area of study at high school; cultural/traditional factors that hinder girls' participation in the learning of Mathematics; and beliefs girls hold about Mathematics**.** The researcher assured the participating schools as well as the participants' confidentiality and anonymity. Pseudo names are therefore, used for the schools and the participants.

4.1 Information about the participating schools in the Oshana Education Region

All the eight schools A, B, C, D, E, F, G and H that were involved in this study were government secondary schools in the Oshana Education Region. The Oshana Region is situated in the Northern part of Namibia. The majority of the people in the region were small stock farmers and agriculturalists. Glesne and Peshkin (1992) maintained that the researcher should select a site where he or she would be accepted and feel comfortable

working at. Therefore, the Oshana Education Region was selected because it is well known to the researcher.

4.2 Data presentation and discussion

The questionnaire consisted of Part A and Part B**.** Part A comprised 40 statements of which 20 were positively stated and other 20 were negatively stated. Part B of the questionnaire comprised six open - ended questions. The results from the questionnaire are presented herein.

4.3 Return rate of questionnaires

The questionnaires were distributed to the eight secondary schools in the Oshana Education Region. Table 1 shows the number of questionnaires dispatched, number returned and percentages of the questionnaires completed per school.

Table 1. Total number of participants per school

School	Number of questionnaires dispatched	Number of questionnaires returned	Percentages
A	30	30	100
B	30	28	93
C	30	26	87
D	30	29	97
E	30	30	100
F	30	26	87
G	30	24	80
H	30	23	77
Total	**240**	**216**	**90**

Table 1 shows that the questionnaires' return rate was extremely good with a 90% return. "The 10% of the total questionnaires given to the participants were not returned as they were lost."

4.4 Ages of the respondents

The ages of the respondents in this study are presented in Table 2. The respondents in this study were Grade 11 and 12 girls only in all eight secondary schools in the Oshana Education Region.

Table 2. Age groups of the respondents.

Age group	Frequency	Percentage
under15	0	0
15 - 16	8	3
17 - 18	60	28
19 - 20	58	27
21 - 22	45	21
23 - 24	36	17
25 - 26	9	4
above 26	0	0
Total	**216**	**100**

As can be seen from Table 2, the majority of respondents, 60 (28%) fell in the age group 17 – 18 years, followed by 58 (27%) in the 19 – 20 years interval. The 25 – 26 and above 26 age groups are included due to the possibility that there may be repeaters due to pregnancies, failure of previous grades and repeaters due to individual reasons or the learners started the school late in the rural areas.

4.5 Part A: Closed ended questions

The following were the findings from the questionnaires on the socio-cultural factors that influenced girls' participation and learning of Mathematics in secondary schools in the eight selected secondary schools in the Oshana Education Region.

4.5.1 Perceptions of girls toward learning Mathematics

Table 3 shows the participants' responses on the ten statements that required the responses of girls to indicate their agreement. The learners were asked to indicate their agreement of each statement using a four point scale of Strongly Agree, Agree, Disagree

and Strongly disagree regarding the perceptions of girls toward the learning of Mathematics in the Oshana education region.

Table 3 Perceptions of girls toward the learning of Mathematics

Statement	Strongly Agree	Agree	Disagree	Strongly disagree
1. Girls can perform better than boys in Mathematics tests.	64 (29.7%)	40 (18.5%)	78 (36.1%)	34 (15.7%)
2. Girls who outperform the whole class in a Mathematics test are teased by their classmates.	54 (25.0%)	20 (9.3%)	68 (31.5%)	74 (34.2%)
3. Whenever a measurement has to be done in a Mathematics lesson, a boy does it because girls are not willing to do it.	69 (31.9%)	73 (33.8%)	55 (25.5%)	19 (8.8%)
4. During Mathematics class activities boys and girls share tasks equally.	53 (24.5%)	20 (9.3%)	68 (31.5%)	75 (34.7%)
5. Mathematics lessons are boring.	116 (53.7%)	80 (37.0%)	12 (5.6%)	8 (3.7%)
6. I enjoy reading Mathematics related publications.	20 (9.3%)	16 (7.4%)	88 (40.7%)	92 (42.6%)
7. I think Mathematics is an easy subject to understand.	12 (5.6%)	17 (7.9%)	74 (34.2%)	113 (52.3%)
8. Mathematical games are for boys.	92 (42.6%)	67 (31.1%)	23 (10.6%)	34 (15.7%)
9. I do not like to solve Mathematical problems in class.	64 (29.6%)	79 (36.6%)	57 (26.4%)	16 (7.4%)
10. It is quite normal for a boy to perform better than girls in Mathematics.	78 (36.1%)	48 (22.2%)	45 (20.8%)	45 (20.8%)

For statement number 1, 29.7% and 18.5% of the respondents strongly agreed and agreed respectively with the statement: *Girls can perform better than boys in Mathematics tests*. On the other hand, 36.1% and 15.7% of the girls disagreed and strongly disagreed respectively with the statement. These results show that 51.8% of the

participants disagreed with the statement while 48.2% agreed. It can therefore be concluded that many of the girls in Oshana education region perceived that they could perform equally as boys in Mathematics. This seems to suggest that the girls ranked their intellectual ability in Mathematics equally to that of boys, resulting in positive perceptions towards Mathematics learning. This overestimation of the ability of girls attributed to the high perception of self-worth which in turn positively affected the achievement of girls in Mathematics (Seifert, 2004). Seifert (2004) refers to higher self-efficacy and higher self-worth as the main contributors to greater achievement in Mathematics.

It can be seen from Table 3 that the majority (90.7%) of the respondents agreed with the statement that *'Mathematics lessons are boring'*. Additionally, 83.3% of the girls disagreed that *'they enjoyed reading Mathematics related publications'*; while 86.5% disagreed with the statement that *'I think Mathematics is an easy subject to understand'*. From these three statements it is possible to assume that girls in the Oshana education region had negative perceptions toward learning and the teaching of Mathematics. Most young women do not see themselves as being capable of studying and succeeding in Mathematics, therefore they are not interested in it (Gilbert and Calvert, 2003). The myths and realities of women progressing in the Mathematics field were studied by David (1996, p. 29) who concluded that "the perceptions adopted by girls from parents, teachers, friends and society have a significant influence on the girls' choices and

performance in Mathematics." These influences might come from a cultural or social background of parents, teachers and friends in the Oshana education region.

It is also interesting to note that 66.2% of the girls were of the view that during the Mathematics class, boys and girls did not share the tasks equally. This seems to suggest that the Mathematics teachers tended to favour one sex over the other. It can therefore be concluded that girls perceived that there is inequality in some classes as far as learning Mathematics is concerned in the Oshana education region.

From the other statements, especially the second one: Girls who outperform the whole class in a Mathematics test are teased by their classmates, 65.7% of the girls agreed. It was clear that the boys were often favoured to do the Mathematics tasks by their teachers. Labudde et al (2006) examined the different interactions that teachers have with male compared to female learners in Mathematics classes. Labudde et al found that teachers on average spend 44% of their time with girls and 56% with boys, so that by the end of a school career a girl will receive 30 hours less individual teacher attention than a boy.

Furthermore, Labudde et al elaborated that teachers had different expectations and beliefs about pre-existing knowledge in girls and in boys. Van Leuven (2004) describes teachers as having expectations that girls are not as capable as boys in Mathematics and Science. The teachers' expectations influenced by socio-cultural factors, for example

attitudes, cultural perceptions, family and economic status could lead to self-fulfilling prophecies as far as female secondary school learners' Mathematics achievement is concerned.

4.5.2 Parents' and teachers' influences on girls taking Mathematics at high school.

Table 4 shows the responses regarding the parents' and teachers' influences on girls taking Mathematics as an area of study in high school in the Oshana education region. The results are tabulated as frequencies for Strongly Agree, Agree, Disagree and Strongly Disagree.

Table 4. Parents' and teachers' influences on girls taking Mathematics at high school.

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
11. The Mathematics teacher asks boys questions more often than girls.	80 (37.1%)	72 (33.3%)	30 (13.9%)	34 (15.7%)
12. I am free to express my opinion in the Mathematics class.	114 (52.8%)	38 (17.6%)	20 (9.3%)	44 (20.3%)
13. Boys and girls learn Mathematics equally in my class.	83 (38.4%)	36 (16.7%)	65 (30.1%)	32 (14.8%)
14. My parents discourage me to take Mathematics as my major subject in the future.	81 (37.5%)	35 (16.2%)	60 (27.8%)	40 (18.5%)
15. The Mathematics teacher often gives more opportunities to boys to solve Mathematical problems on the board than girls.	118 (54.6%)	34 (15.7%)	42 (19.5%)	22 (10.2%)
16. My Mathematics teacher punishes us for not correctly answering the Mathematics problem(s).	87 (40.3%)	95 (44.0%)	22 (10.2%)	14 (6.5%)
17. My Mathematics teacher helps each individual learner with solving Mathematical problems.	113 (52.3%)	74 (34.2%)	17 (7.9%)	12 (5.6%)
18. I was discouraged by teachers to do Mathematics from primary school.	34 (15.7%)	23 (10.6%)	67 (31.1%)	92 (42.6%)
19. My parents advise me to avoid taking Mathematics as a school subject.	79 (36.6%)	67 (31.0%)	36 (16.7%)	34 (15.7%)
20. I get support from my parents on solving difficult Mathematics problems.	12 (5.6%)	16 (7.4%)	100 (46.3%)	88 (40.7%)

It is important to note that 70.4% of the respondents (in Table 4) supported the statement: '*The Mathematics teacher asks boys questions more often than girls'*. Additionally, the majority of girls (70.3%) in this study were of the opinion that '*the Mathematics teachers often give more opportunities to boys to solve Mathematical problems on the chalkboard than girls'*. From these two statements it is possible to assume that teachers in the Oshana education region treated girls differently from the boys. It can therefore be concluded that Mathematics teachers appeared to favour one sex as far as the frequency of asking questions and giving girls opportunities to solve Mathematical problems on the chalkboard were concerned. More questions seem to be directed to boys than to girls.

This result tends to justify Braund's (2005) view that in some cultures, both teachers and parents contribute to the poor performance of girls in Mathematics. Braund claimed further that teachers had different expectations regarding existing knowledge in Mathematics for boys and girls. Hence, this belief tends to justify that the teachers ask more questions to boys than girls. Such practices negatively influenced the perceptions of girls about their abilities to perform well in Mathematics.

Further, 67.6% of the girls were of the opinion that parents advised them to avoid taking Mathematics as a school subject. This view was supported by 53.7% of the girls who agreed that their parents discouraged them from taking Mathematics as a major in the future. It can therefore be assumed that there was a high level of discouragement from

parents for girls taking up Mathematics at school and tertiary levels in the Oshana education region. Additionally, 87% of the girls indicated that they did not get support from their parents on solving difficult Mathematics problems. One could thus assume that very few parents supported their female children that experienced difficulties with Mathematics questions due to lack of skills. These results seem to support the research findings by Chin and Kayalvizhi (2005) who reported that low parental aspiration and expectation for girls to do well in Mathematics negatively influence their performance. Also the existence of family child rearing practices that are gender stereotyped where boys are brought up differently from girls negatively influence girls performance in Mathematics. One example given by Chin and Kayalvizhi (2005, p. 110) is where "parents will rather spend money on boys than on girls, this having a negative impact on the girls' interest".

4.5.3 Cultural/traditional factors that hinder girls' participation in learning of Mathematics.

Table 5 shows responses regarding the cultural/traditional factors that hinder girls' participation in learning of Mathematics in the Oshana education region. The results are tabulated as frequencies for Strongly Agree, Agree, Disagree and Strongly Disagree.

Table 5: Cultural/traditional factors that hinder girls' participation in learning of Mathematics.

Statement	Strongly Agree	Agree	Disagree	Strongly disagree
21. In my culture, women are allowed to become Mathematicians.	50 (23.1%)	52 (24.1%)	34 (15.7%)	80 (37.1%)
22. Some cultural beliefs in my community are in conflict with the opinion that girls can do Mathematics.	78 (36.1%)	74 (34.3%)	42 (19.4%)	22 (10.2%)
23. In my tradition girls are regarded as capable of learning Mathematics as boys.	67 (31.0%)	36 (16.7%)	32 (14.8%)	81 (37.5%)
24. In my culture girls are free to learn Mathematics.	120 (55.6%)	50 (23.1%)	25 (11.6%)	21 (9.7%)
25. In my tradition, it is more important for boys to achieve in Mathematics than for girls.	118 (54.6%)	44 (20.4%)	32 (14.8%)	22 (10.2%)
26. I find it worthless to work hard in Mathematics because my future is not there.	95 (44.0%)	85 (39.4%)	22 (10.2%)	14 (6.5%)
27. In my culture, girls are expected to take subjects that are related to domestic science e.g. Home Economics.	113 (52.3%)	74 (34.2%)	17 (7.9%)	12 (5.6%)
28. My tradition expects boys and girls to have equal job opportunities in Mathematics.	52 (24.1%)	67 (31.0%)	73 (33.8%)	24 (11.1%)
29. In my culture housework is a normal activity for girls.	79 (36.6%)	67 (31.0%)	36 (16.7%)	34 (15.7%)
30. In my tradition adults motivate girls to do Mathematics.	88 (40.7%)	12 (5.6%)	16 (7.4%)	100 (46.3%)

It is important to note that 70.4% of the respondents in Table 5 supported the statement: '*Some cultural beliefs in my community are in conflict with the opinion that girls can do Mathematics'*. This seems to indicate that the cultural beliefs in communities from where these female respondents came from did not encourage girls to study Mathematics. It can therefore be concluded that there are some cultural beliefs that are

in conflict with the idea that girls can do Mathematics. Cultures and traditions are learned mainly from parents (Mwamwenda, 2005), and therefore it is the duty of parents to teach and educate their children about what is acceptable and what is not. It is believed that if the cultures of child-rearing practices are gender-stereotyped, then boys and girls will be brought up very differently from each other (Van Leuvan, 2004). This means that in most cases, parents would rather spend more money on boys than on girls; therefore girls are conditioned from an early age that they are inferior to boys (Dorsey, 1989). This may negatively affect the motivation and achievements of girls in Mathematics.

In addition, the majority of the girls (87.5%) in this study agreed that: '*In my culture, girls are expected to take subjects that are related to domestic science e.g. Home Economics'*. Such a situation obtaining in the communities where these girls come from will not be helpful nor encourage the girls to study Mathematics. The message or impression given to them seemed to imply that the "girls' place is in the kitchen". It can therefore be concluded that the cultural expectations of these female participants was for girls to do subjects that were related to domestic science. Wiest (2001) argues that gender differences in Mathematics performance are predominantly due to the accumulated effect of gender-role stereotypes in the family, culture and traditions. This means that when girls have to choose a career they have to consider what vocational choices are acceptable in the community for a girl to follow before making a choice. Hence, culture and tradition limit girls' freedom about career choices in the

Mathematics field. Thus, one could conclude that culture/tradition negatively influences girls in pursuing careers in the field of Mathematics.

Further, the results in Table 5 show that 67.6% of the respondents agreed with the statement: '*In my culture housework is a normal activity for girls'*. Household chores, for example cooking, pounding mahangu grains, and washing, take up a lot of girls' study time. Accordingly, girls may be disadvantaged by shouldering the burden of doing chores in the home. As a result, little time would be reserved to the study of Mathematics, a subject that requires the dedication of a large amount of time. The results given in Table 5 seem to suggest that there are cultural beliefs that discourage or hinder girls from studying Mathematics in the studied schools. It can therefore be concluded that the majority of the participants' cultures regard house work as normal activities for girls.

4.5.4 Girls' beliefs about Mathematics

Table 6 shows the responses of the respondents regarding the beliefs girls hold about Mathematics in the Oshana education region. The results are presented as frequencies for Strongly Agree, Agree, Disagree and Strongly Disagree with the corresponding percentages in brackets.

Table 6: Girls' beliefs about Mathematics

Statement. No	Strongly Agree	Agree	Disagree	Strongly Disagree
31. I do Mathematics with confidence.	40 (18.5%)	34 (15.8%)	78 (36.1%)	64 (29.6%)
32. I underestimate my ability to do Mathematics.	74 (34.3%)	54 (25.0%)	68 (31.5%)	20 (9.2%)
33. I have no future with Mathematics.	109 (50.5%)	73 (33.8%)	19 (8.8%)	15 (6.9%)
34. Girls in my school are willing to do Mathematics.	53 (24.5%)	20 (9.3%)	75 (34.7%)	68 (31.5%)
35. I believe that it is an unusual practice for girls to do Mathematics.	46 (21.3%)	80 (37.0%)	60 (27.8%)	30 (13.9%)
36. Mathematics is very important for my future career.	16 (7.4%)	22 (10.2%)	100 (46.3%)	78 (36.1%)
37. Boys and girls have equal Mathematical abilities.	43 (19.9%)	57 (26.4%)	84 (38.9%)	32 (14.8%)
38. Mathematics is a subject for the boys.	92 (42.6%)	67 (31.0%)	23 (10.6%)	34 (15.7%)
39. Mathematics is too complicated for my understanding.	94 (43.5%)	79 (36.6%)	27 (12.5%)	16 (7.4%)
40. I think I can contribute to solving complex Mathematical problems in class.	78 (36.1%)	40 (18.5%)	34 (15.7%)	64 (29.6%)

The majority (84.3%) of the girls in this study held the belief that they '*have no future with Mathematics'*. On the other hand, 82.4% disagreed that '*Mathematics is very important'* for their future careers. This belief is further confirmed by a large number of female respondents (80.1%) who agreed that *'Mathematics is too complicated for their understanding'*. One could thus assume that the majority (more than 80%) of the girls in this study in the Oshana region held negative beliefs about learning Mathematics. These results seem to support the research findings by Van Leuvan (2004, p. 248 - 249) who says that "women constitute only a small percentage of the Mathematics workforce because of their beliefs and attitudes that contribute to their Mathematics interest and

experience." If these beliefs are negative, it will cause girls to underestimate their Mathematics and Science competence, feel less adequate, and have lower expectations for success in Mathematics and Science compared to boys (Van Leuvan, 2004).

Further, 73.7% of the girls were of the view that Mathematics was a subject for boys, even though an almost equal number of the girls (53.7% versus 46.3%) agreed that boys and girls had equal mathematical abilities. These results seem to support Gilbert and Calvert's (2003) point that most young women do not see themselves as being capable of studying and succeeding in Mathematics, therefore they are not interested in it. The myths and realities of women progressing in the Mathematics field were studied by David (1996, p. 29 - 32) who concluded that "the attitudes adopted by girls from parents, teachers, friends and society have a significant influence on the girls' choices and performance in Science and Mathematics." These influences come from a cultural or social background. One of the causes thereof is that the goals, contents and methods of mathematics education are not supportive and/or not sufficiently adapted to the cultures and needs of the African peoples.

4.6 Analysis and discussion of data from the questionnaire, Part B: Structured questions

Question 1: Do you believe that you will fail Mathematics no matter how much effort you spend in studying your Mathematics?

This question intended to find out the girls' beliefs and their personal views on whether they would fail Mathematics no matter how hard they studied Mathematics. The responses are given in table 7.

Table 7: Girls' beliefs on whether they would fail Mathematics no matter how much efforts they spent in studying the subject

Responses	Frequency	Percentage (%)
Yes	160	74.07
No	53	24.54
No response	3	1.39
Total	**216**	**100**

Table 7 shows that the majority of the girls (74.07%) were of the opinion that they would fail Mathematics no matter how much effort they spent in studying Mathematics compared to only 24.54% of the girls who believed that they would not fail Mathematics. Thus, one could assume that the girls in this study in the Oshana education region held negative beliefs that they would fail Mathematics no matter how much effort they spent in studying the subject.

The respondents gave the following reasons to the question: "Do you believe that you will fail Mathematics no matter how much effort you spend in studying your Mathematics?" Those who opted for a "Yes" answer said that:

"I will fail Mathematics because I am not good at solving Mathematical problems".

"I will fail Mathematics because I do not like the subject".

"I will fail Mathematics because of the subject's anxiety".

"I will fail Mathematics because of the teachers' teaching methods and explanations".

"I will fail Mathematics because I am not naturally gifted in doing Mathematics".

"I will fail Mathematics because I hate to work with the numbers".

"I will fail Mathematics because my Mathematics teacher does not support me".

"I will fail Mathematics because Mathematics is just not my subject of interest".

"I will fail Mathematics because the subject is too difficult for me".

"I will fail Mathematics because I hate formulas".

The reasons given by the girls on why they would fail Mathematics no matter how much effort they spent in studying Mathematics, it was obvious that girls had a tendency of undermining their own abilities in solving problems in Mathematics; they hated the subject and were afraid of Mathematics. Furthermore, the girls stated that the teachers' teaching methods and explanations would fail them Mathematics. Finally, the girls acknowledged that they would fail Mathematics due to the fact that they were not naturally gifted Mathematically. This is supported by the majority of the girls (74.07%) who were of the opinion that they would fail Mathematics no matter how much effort they spent in studying Mathematics. This seems to support the research findings by Van Leuvan (2004) who says that women constitute only a small percentage of the Mathematics workforce because of their beliefs and attitudes that contribute to their Mathematics interest and experience. If these beliefs were negative, they would cause girls to underestimate their Mathematics competence, feel less adequate, and have lower expectations for success in Mathematics compared to boys (Van Leuvan, 2004).

On the other hand, 53 of the 216 girls in this study in the Oshana education region indicated that they would not fail Mathematics due to the fact that they liked working with the numbers and symbols and they enjoyed solving practical problems in Mathematics. Moreover, the girls disclosed that they would not fail Mathematics because the subject was fun. Only 24.54% of the girls who believed that they would not fail Mathematics.

Those who opted for a "No" answer on whether they would fail Mathematics no matter how much effort they spent in studying Mathematics said that:

"I will not fail Mathematics because I am enjoying solving practical problems".

"I will not fail Mathematics because I like working with numbers and symbols".

"I will not fail Mathematics because Mathematics is fun".

"I will not fail Mathematics because I am mathematically gifted".

"I will not fail Mathematics because it is my most favourite subject".

"I will not fail Mathematics because I have a good Mathematics teacher".

"I will not fail Mathematics because I believe that Mathematics is very easy".

"I will not fail Mathematics because it is exciting working with the numbers".

"I will not fail Mathematics because I just have to know the formulas and how to use them".

The reasons given by the girls on why they would not fail Mathematics regardless of how much effort they put in studying Mathematics in this study in the Oshana education region included the fact that they liked working with numbers and symbols and they enjoyed solving practical problems in Mathematics. Moreover, the girls (24.24%) indicated that Mathematics was fun. Thus, one can conclude that there is a high level of belief amongst girls in the Oshana education region that they will fail Mathematics no matter how much effort they spent in studying Mathematics.

Question 2: If you have a choice between Mathematical studies and Social Science studies, which one of the two would you study and why?

This question was intended to find out whether the girls' would be interested to study Mathematics or Social Science Studies. The question further sought to find out girls' personal views on why they would either go for Mathematics or Social Science studies. The responses are given in table 8.

Table 8: Girls' choice between Mathematics and Social science studies

Responses	**Frequency**	**Percentage**
Mathematical studies	93	43.31
Social studies	121	56.02
No response	2	0.93
Total	**216**	**100**

According to Table 8, more than 56.02% of the girls indicated that they would study Social Science studies instead of Mathematics if they had a choice compared to only

43.31% of the girls who had indicated that they would indeed study Mathematics. The respondents gave the following reasons:

"*Mathematics is too difficult for me"*.

"I am interested in becoming a lawyer and one does not necessarily need to study Mathematics to become lawyer".

"Mathematics is not a subject for every person; some people are poor at solving Mathematical problems".

"I want to become a social worker, thus I would study Social Science".

"I do not enjoy solving Mathematical problems, so Social Studies would be preferred by me".

"I would go for Social Science because I hate Mathematics".

"I would rather go for Social Science because most of the learners are failing Mathematics.

"Mathematics is a subject for boys".

More than half of the girls (56.02%) had indicated that they would study social science instead of Mathematics if they had a choice. The reasons given by the girls on why they would opt for social science studies instead of Mathematics if they had a choice, included; Mathematics was too difficult for them; and they were not interested to pursue further studies in Mathematics. This seems to affirm the study by Van Leuvan (2004) who indicated that girls shy away from pursuing Mathematics studies, because they view these fields as too complicated or redundant for girls and there are few female role

models in the Mathematics field that can encourage girls to take part in Mathematics learning.

On the other hand, some of the girls (43.31%) in the Oshana education region would opt to study Mathematics and not social studies if they had a choice because they believed that the Mathematics field would widen their career choices; and that Mathematics was an easy subject to understand and did not have to memorise a lot as in the case of social studies. Furthermore, 43.31% of the girls felt that Mathematics was an interesting and fun subject; hence they would go for it.

Those who opted for "Mathematics studies" instead of "Social studies" if they had a choice said that:

"Mathematics field of study will enable me to have more career choices".
"Mathematics is an easy subject to understand and I do not need to do a lot of memorization as the case for social subjects".
"Mathematics is interesting and fun".
"I would like to become an electrical engineer, so I will study Mathematics".
"I want to become a Mathematics teacher".
"Mathematics is very easy subject for me".
"If I successfully complete my Mathematical studies, I will get a good paying job".
"Mathematics is commonly used in any job market".

From the given reasons above, it is obvious that 43.31% of the girls in the Oshana education region would opt to study Mathematics and not social science studies if they had a choice because they believed that the Mathematics field would widen their career choices; and that Mathematics was an easy subject to understand and one did not have to memorise a lot as in the case of social studies. This result indicates girls' positive belief about Mathematics learning.

Question 3: Do your parents care whether you like Mathematics or not?

This question intended to find out whether the parents cared if their daughters liked Mathematics or not. The results are given in Table 9.

Table 9: Parental care regarding girls studying Mathematics

Responses	**Frequency**	**Percentage**
Yes they care	133	61.57
No they do not care	78	36.11
No response	5	2.32
Total	**216**	**100**

Table 9, shows that 133 (61.57%) of the girls were of the opinion that their parents cared whether they liked Mathematics; while only 78 (36.11%) of the girls indicated that their parents did not care whether they liked Mathematics. The respondents gave the following reasons to question 3: Those who opted for a "Yes" answer said that:

"*Parents often advised me to study Mathematics very hard in order to become a doctor, engineer and architect*".

"Parents are helping me to excel in Mathematics subject by hiring for me a private tutor in order to attend extra tutorial sessions".

"Parents bought me extra Mathematics textbooks from bookstores".

"My parents cared for to like Mathematics because they are always helping me with my homework at home".

"My parents are both Mathematics teachers, so they are usually teaching me in the afternoon where I do not understand".

"My parents care for me to like Mathematics because they are always asking for all the Mathematics activities I did at school".

From the reasons given above, one could assume that indeed parents cared for their daughters as far as Mathematics is concerned. The parents wanted their female children to pursue good career choices where Mathematics is a pre-requisite, such as becoming doctors, engineers and architects. This was an indication that parents in the Oshana education region in this study cared that their daughters liked Mathematics. This was supported by 61.57% of the girls who believed that their parents cared that they liked Mathematics. This finding seems to support Tait's (1996) findings which suggest that parents' involvement in their daughters' Mathematics learning in school send some critical messages to their daughters, and that parents are demonstrating their interest in

their daughters Mathematical activities and therefore reinforcing the idea that learning Mathematics is important.

Those who opted for a "No" answer that their parents did not care whether they liked Mathematics said that:

"My parents are not educated".

"Parents are not involved in my Mathematics education apart from paying for the school and hostel fees".

"My parents are not aware of the importance of Mathematics".

"My parents' numeracy skill is too low".

"My parents hardly ask me to know how I am performing in Mathematics".

"My parents do not know Mathematics".

"My parents are always out, so I hardly get any educational support from them".

From the reasons given above by the girls on why their parents did not care whether they liked Mathematics, one might assume that the poor educational background of the parents in this study in the Oshana education region was a factor that hindered the parents from caring about their daughters' liking of Mathematics. This was supported by 36.11% of the girls. From the arguments given so far, one might conclude that the lack of parental involvement in their daughters' Mathematics education was a contributing factor for their inability to assist them in Mathematics school work, hence they did not

care whether their daughters liked Mathematics. The lack of parental support has negative influence that might contribute to girls' poor performance in Mathematics and to pursue Mathematics studies (Tait, 1996).

Question 4: Do your Mathematics teacher expect less academic work from girls than from boys?

This question sought to find out whether the Mathematics teachers had low academic expectations for girls than for boys. The responses are given in Table 10.

Table 10: Expectations of Mathematics teachers regarding academic work of girls

Responses	Frequency	Percentage
Yes	135	62.50
No	77	35.65
No response	4	1.85
Total	**216**	**100**

According to Table 10, 135 (62.50%) of the girls believed that their Mathematics teachers expected less academic work from them than from boys compared to only 77 (35.65%) of the girls who did not agree with the question. The respondents gave the following reasons:

"My Mathematics teacher always gave boys more chances than girls to solve the problems on the chalkboard".

"My Mathematics teacher pays less attention to girls when asking for assistance during and after the lesson".

"My Mathematics teacher always says that boys are better than girls in our class".

"Girls are not taken seriously during the Mathematics lessons as boys".

"My Mathematics teacher always pays more attention to boys than girls.

From the reasons given by the girls in this study, one could assume that Mathematics teachers in the Oshana education region in this study held low academic expectations for the girls as compared to the boys in the Mathematics lessons. This view was supported by 62.50% of the girls. Kayalvizhi (2005, p. 15) claimed that "girls' attitudes are affected by subject teachers that demand modest and inferior behaviour from girls". He further stated that "lack of support, positive influence and encouragement from teachers are factors that foster poor gender equitable perceptions, lower academic achievement, and poor self-concept" (p. 23). These lead to inferior and negative attitudes in girls towards Mathematics. Thus, one might conclude that Mathematics teachers in the Oshana education region held low academic work expectations for girls in Mathematics resulting in girls losing the interest in the learning of Mathematics.

On the other hand, from the reasons given by the girls who disagreed that their Mathematics teachers expected less academic work in Mathematics from girls, one might also assume that some of the Mathematics teachers in the Oshana education region held equal academic expectations as far as the Mathematics academic work was

concerned for boys and girls. This was supported by 35.65% of the girls. The positive expectations of teachers for the girls regarding academic work in Mathematics might inspire the girls to perform well and succeed in the learning of Mathematics.

Those who opted for a "No" answer on whether Mathematics teacher expected less academic work from the girls than from the boys said that:

"My Mathematics teacher equally acknowledges the academic work for boys and girls in a class".

"My Mathematics teacher motivates the girls to work smart and inform us that we are more capable of doing Mathematics than boys".

"Everyone in class gets an equal treatment as far as teaching and learning of Mathematics in class is concerned".

"My Mathematics teacher does not discriminate girls in class".

"The teacher equally pays attention to both girls and boys".

"My Mathematics teacher has equal academic expectations for every learner in a class".

The reasons given by the respondents who disagreed that their Mathematics teachers expected less academic work in Mathematics from girls in this study in the Oshana education region included the fact that their Mathematics teachers motivates them to work smart and informed them that they were more capable of doing Mathematics than

boys. Moreover, the girls (35.65%) indicated that their Mathematics teachers had equal academic expectations for every learner in a class. However, this represent a very few number of girls who were of the opinion that Mathematics teachers had equal academic expectations for boys and girls. Hence, teachers' expectation as socio-cultural factor might hinder girls' participation in the learning of Mathematics in the secondary schools in the Oshana education region.

Question 5: Does your Mathematics teacher treat girls differently from the way boys are treated during the lessons?

This question sought to find out whether the Mathematics teachers treated girls differently from the way the boys were treated during the Mathematics lessons. The responses are given in Table 11.

Table 11: Treatment of girls and boys during Mathematics lessons

Responses	Frequency	Percentage
Yes	57	26.39
No	156	72.22
No response	3	1.39
Total	**216**	**100**

According to Table 11, the majority of the girls (72.22%) disagreed that their Mathematics teachers treated them differently from the way the boys were treated during the Mathematics lessons as compared to 26.39% of the girls who were of the opinion

that they were treated differently during the lessons. The 72.22% of respondents gave the following reasons:

"My Mathematics teacher does not consider girls as being intelligent enough in solving Mathematics problems as boys in class".

"I do not get good comments on my written work (test scripts) as those given to boys".

"My Mathematics teacher always favours boys in our class".

"My Mathematics teacher does not listen to girls when raising their concerns during the lesson".

"My Mathematics teacher does not care whether girls understand the topic or not as always concerned with the boys.

The majority (72.2%) of respondents were of the view that teachers were impartial in the treatment of both boys and girls. However a few girls (26.39%) agreed that their Mathematics teachers treated them differently from the way the boys were treated during the lessons. Kayalvizhi (2005, p. 98) suggests that "involving all learners in solving practical problems is a significant factor in promoting positive attitudes". However, the reasons given above by the girls seem to indicate that the teachers in the Oshana education region tended not to favour boys over girls during the Mathematics lessons, and this would promote positive attitudes amongst the girls toward Mathematics.

Those who opted for a "No" answer on whether the Mathematics teachers treated the girls differently from the way the boys were treated during the Mathematics lessons gave the following reasons:

"The teacher equally takes care of every learner when experiencing problematic areas in Mathematics during the lessons regardless of being a girl or a boy".

"The teacher gave every learner an equal chance of participation during the lesson".

"The teacher likes everyone in class".

"The Mathematics teacher always makes sure that learners' problems are equally attended to".

"The teacher does not favour any gender in class".

Contradicting the first set of responses, 77.2% of the respondents indicated that the Mathematics teachers in the Oshana education region in this study treated girls and boys equally during the Mathematics lessons. Thus, one might conclude that there is no favouritism of male learners over female learners during Mathematics lessons in the Oshana education region. The teachers were seen to treat both boys and girls in the same way.

Question 6: Do you think teachers ask the boys more difficult questions than girls in Mathematics?

This question sought to find out whether the Mathematics teachers asked the boys more difficult questions than girls during the lessons. The responses are given in Table 12.

Table 12: Girls' views on whether Mathematics teachers asked more difficult questions to boys than girls

Responses	Frequency	Percentage
Yes	108	50.00
No	106	49.07
No response	2	0.93
Total	**216**	**100**

According to Table 12, 50.00% of the girls believed that Mathematics teachers asked the boys more difficult questions than the girls; while 49.07% of the girls disagreed with the question. This seems to suggest that generally the Mathematics teachers equally asked both boys and girls complicated questions. The girls who believed that the teacher asked the boys more difficult questions than girls in Mathematics gave the following reasons:

"The teacher perceives boys to be more gifted in solving Mathematical problems than the girls".

"Most often the girls are shy and not willing to solve difficult problems, hence the teacher in most cases asks the boys more questions".

"In most cases, the boys solve the problems correctly and this makes the teacher to focus more on boys than girls".

"My Mathematics teacher perceives boys to be more capable in solving Mathematical problems than the girls".

"Girls in our class are being underestimated by the Mathematics teacher".

From the reasons given above, one could conclude that Mathematics teachers in the Oshana education region in this study as perceived by 50.0% of the respondents asked boys more questions than girls. According to Lemmer (1994) teachers have different expectations regarding existing knowledge in Mathematics for boys and girls. If Mathematics teachers were asking more difficult questions to boys than to girls then this practice could reduce the interest of girls in the subject as they would regard themselves as less capable than boys.

Furthermore, the reasons given by the girls who disagreed that Mathematics teachers asked the boys more difficult questions than girls seemed to suggest that the teachers in the Oshana education region asked the more difficult questions equally to both boys and girls during the lessons. Thus, one might conclude that there was no gender discrimination as far as asking more difficult questions by the Mathematics teachers in class in the Oshana education region is concerned. See Table 12 for the responses of the girls.

Those respondents who opted for a "No" answer regarding the Mathematics teachers asking more difficult questions to the boys than the girls:

"The teacher does not discriminate when asking questions in class".

"Every learner in our class stands an equal chance of being asked more difficult questions regardless of being a girl or a boy".

"Teaching methods enables learners to discuss and solve complicated problems together; hence questions are asked for every learner in a class".

"My teacher always makes sure all learners are participating in class by giving group work".

"My Mathematic teacher always emphasis teamwork among girls and boys, in order for every learner to succeed in a subject.

From the reasons given by 49.07% of the girls who disagreed that Mathematics teachers asked the boys more difficult questions than girls seemed to suggest that the teachers in the Oshana education region asked the more difficult questions equally to both boys and girls during the lessons. Thus, one might conclude that there was no gender discrimination as far as asking more difficult questions by the Mathematics teachers in class in the Oshana education region was concerned.

4.7 Summary

This chapter dealt with the presentation, analysis, interpretation and discussions of the results of the Socio-cultural factors that appear to influence the girls' participation in Mathematics in secondary schools in the Oshana education region. In the next Chapter, the summary, the conclusions and recommendations are presented.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In this study, the focus throughout has been on exploring whether there were socio-cultural factors that affected girls' participation and learning of Mathematics in secondary schools in the Oshana education region.

5.1 SUMMARY

In Namibia there is lack of literature regarding the issues of women and Mathematics. The effects of socio-cultural factors towards the poor participation of females in Mathematics in Namibia especially in the Oshana Education region have not been researched. Therefore this study was aimed at finding out how socio-cultural factors influence girls' participation in Mathematics in the Oshana education region.

The study addressed four questions:

1. What are the perceptions of girls toward Mathematics learning in the Oshana education region?
2. What influences do parents and teachers have on girls taking Mathematics as an area of study at high school in the Oshana education region as perceived by girls?
3. What cultural/traditional norms do the girls perceive to hinder their participation in studying Mathematics in the Oshana education region?
4. What beliefs do girls hold about Mathematics in the Oshana education region?

In order to establish what were the socio-cultural factors that could affect girls' participation and learning of Mathematics in secondary schools; a mixed research design that employed both quantitative and qualitative research approaches was used in this study. A questionnaire comprising both closed-ended and open-ended questions was administered in the eight selected secondary schools. The study targeted all eight secondary schools in the Oshana education region with a population of Grade 11s and 12s girls. From the population of 3628 girls in Grade 11 and 12 in all eight secondary schools in the Oshana education region, a sample of 240 girls were randomly selected. Furthermore, girls were selected using a stratified random sampling. In this study, the quantitative data was analysed by expressing the data into frequencies and presented in tables for interpretations; while the qualitative data was analysed by categorising and clustering of information obtained from the questionnaires.

The findings of the study indicated that socio-cultural factors such as girls' perceptions toward Mathematics learning, parents' and teachers' influences, cultural/traditional norms, and girls' beliefs about Mathematics negatively influenced girls' participation and learning of Mathematics in secondary schools.

5.2 Conclusions

The results in this study appear to show that the majority of the girls (74.07%) in this study generally did not regard themselves as learners who would be interested in exceling in Mathematics. They perceived Mathematics as difficult, too complicated and

a masculine subject. Although many girls believed that they would be able to perform successfully in Mathematics, they themselves had no interest in doing so. In this study the results of the investigation suggests that girls had developed negative attitudes toward Mathematics. It could thus be concluded that the negative attitudes of the girls in Mathematics could lead to their lack of motivation and poor interest in Mathematics learning.

The results in this study further shows the negative perceptions of girls toward Mathematics learning at secondary level. Thus, one might conclude that there is a prevalence of gender differences in favour of the male learners. According to the results of this study, one can also conclude that girls may have less interest in mathematics than boys because of the ways teachers communicate with learners, often interacting more with boys than with girls during mathematics lessons. Also, the results indicated that some girls lacked parental support in the learning of Mathematics. Thus, one can conclude that the teachers and parents had negative influences on girls in the learning of Mathematics. Furthermore, from the results 50.00% of the girls agreed that teacher asks boys more difficult Mathematics problems than girls. One could therefore conclude that teachers perceive girls as less capable of doing Mathematics.

5.3 Recommendations

The following recommendations are given emanating from the results of this study:

1. Girls generally do not regard themselves as people who would be interested or would excel in Mathematics. They perceive Mathematics as difficult, too complicated and a masculine subject. Therefore, the possible recommendation to this finding is that the education authorities should include the following aspects of gender issues in general curriculum (including training for teachers and information sessions for parents in this regard): Gender equality, how Mathematics can be made easy, and career guidance which is not gender specific.

2. According to one of the findings of this study, about 65.50% of Mathematics teachers in the Oshana education region held low academic expectations for the girls as compared to the boys in the Mathematics lessons. Therefore, the recommendation to this finding is that girls should be encouraged by teachers to actively participate in Mathematics classroom activities by initiating questions, and being more assertive when making statements. This could help girls to break free from the mental block that hinders their progress in Mathematics.

3. There should be a concerted effort from all the stakeholders in education to positively influence traditions and cultural practices in order to empower girls and

women as far as Mathematics learning is concerned. The ultimate aim is to help girls achieve the desired outcomes in Mathematics as boys do.

4. Parents should encourage and influence young girls to develop positive attitudes toward the study of Mathematics.

5. The education authorities should arrange information sessions for parents and training workshops for teachers to inform them about the different methods and techniques that could be used during the different stages to instil positive beliefs in girls regarding Mathematics.

6. The Mathematics teachers should continuously seek advice from the subject advisors on how to make Mathematics fun, interesting, challenging and easy to learn in class. Teachers should involve all students in hands-on, inquiry-based activities to increase mathematics interest, which could motivate both male and female students to pursue careers in the Mathematics field.

7. Teachers should use collaborative pedagogical strategies that allow learners to work together on projects or assignments that can help increase interest in mathematics as it reduces anxiety among learners and provides them with an opportunity to reflect on and process new material.

8. Parents and teachers should free the girls from the cultural beliefs that do not support the freedom of women in the learning of Mathematics by getting rid off of the traditional beliefs that foster negative attitudes for girls' education in Mathematics. Parents and teachers should encourage and influence young girl's to become positive about the fields of Mathematics and gender equality.

9. The empowerment and preparation of the girls socially and mentally for Mathematics by teachers is recommended. Girls should be encouraged to study Mathematics by informing them that they can do Mathematics just as well as the boys.

10. Parents, teachers, and other stakeholders in education should support and encourage the female learners in learning Mathematics. This can be done by inviting motivational speakers at school and also through study tours. Parental and teacher support is important in fostering girls' interest in Mathematics by introducing girls to a range of careers that requires Mathematics.

11. The cultural practices that hinder girls from studying Mathematics should be avoided, such as household chores. This might be achieved by educating the community and the girls on the value and importance of Mathematics in their lives and future careers.

12. Further research should be carried out on a large scale including other educational regions in Namibia to find out the socio-cultural factors that affects girls' participation and learning of Mathematics in secondary schools in Namibia.

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Appendix A: Questionnaire

Dear learners

I am a Master of Education student in Maths and Science Education at the University of Namibia. I kindly invite you to participate in my study that explores ‘‘*the socio-cultural factors that affect girls’ participation and learning of mathematics in secondary schools in the Oshana Education Region*’’. The purpose of this study is to provide useful information for teachers, society, school administrators and curriculum developers to address the social-cultural factors that hinder girls from studying Mathematics. Furthermore, the study will assist the Ministry of Education to improve the policies that address the problems girls face in learning Mathematics.

Responding to all the items in this questionnaire will help me to ensure that I accurately represent your valuable input. Do not write your name on any part of this questionnaire to ensure confidentiality of responses.

Thank you in advance for your helpful participation.

Most sincerely,

.....
JJ Iipinge
MEd student [200110764]
University of Namibia
Faculty of Education

Biographical Data

Fill in the following:

1. School Name:.....

2. Your grade:.....

Mark with an X in the appropriate box

3. What is your age group?

(a) under15	
(b) 15 - 16	
(c) 17 - 18	
(d) 19 - 20	
(e) 21 - 22	
(f) 23 - 24	
(g) 25 - 26	
(h) above 26	

4. Home language(s). What language(s) do you speak at home?

(a) English	
(b) Afrikaans	
(c) Oshiwambo	
(d) Nama/Damara	
(e) Otjiherero	
(f) Other...Specify	

Part A: Closed-ended questions

1. Perceptions of girls toward learning Maths

For the following 10 statements, mark with an **X** in the appropriate box your agreement.

Statement	Strongly Agree	Agree	Disagree	Strongly Agree
1. Girls can perform better than boys in Mathematics tests.				
2. Girls who outperform the whole class in a Mathematics test are teased by their classmates.				
3. Whenever a measurement has to be done in a Mathematics lesson, a boy does it because girls are not willing to do it.				
4. During Mathematics class activities boys and girls share tasks equally.				
5. Mathematics lessons are boring.				
6. I enjoy reading Mathematics related publications.				
7. I think Mathematics is an easy subject to understand.				
8. Mathematics games are for boys.				
9. I do not like to solve Mathematical problems in class.				
10. It is quite normal for boys to perform better than girls in Mathematics.				

2. Parents' and teachers' influences on girls taking Mathematics as an area of study at high school

For the next 10 statements, mark with an **X** in the appropriate box your agreement.

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
11. The Mathematics teacher asks boys questions more often than girls.				
12. I am free to express my opinion in the Mathematics class.				
13. Boys and girls learn Mathematics equally in my class.				
14. My parents discourage me to take Mathematics as my major subject in the future.				
15. The Mathematics teacher often gives more opportunities to boys to solve Mathematical problems on the board than girls.				
16. My Mathematics teacher punishes girls for not correctly answering the Mathematics problem(s).				
17. My Mathematics teacher helps each individual learner with solving Mathematical problems.				
18. I was discouraged by teachers to do Mathematics from primary school.				
19. My parents advise me to avoid taking Mathematics as a school subject.				
20. I get support from my parents on solving difficult Mathematics problems.				

3. Cultural/traditional factors that hinder girls' participation in learning of Mathematics

For the next 10 statements, mark with an **X** in the appropriate box your agreement.

Statement	Strongly Agree	Agree	Disagree	Strongly disagree
21. In my culture, women are allowed to become Mathematicians/Scientists.				
22. Some cultural beliefs in my community are in conflict with the opinion that girls can do Mathematics.				
23. In my tradition girls are regarded as capable of learning Mathematics as boys.				
24. In my culture girls are free to learn Mathematics.				
25. In my tradition, it is more important for boys to achieve in Mathematics than for girls.				
26. I find it worthless to work hard in Mathematics because my future is not there.				
27. In my culture, girls are expected to take subjects that are related to domestic science e.g. Home Economics.				
28. My tradition expects boys and girls to have equal job opportunities in Mathematics.				
29. In my culture housework is a normal activity for girls.				
30. In my tradition adults motivate girls to do Mathematics.				

4. Beliefs girls hold about Mathematics

For the next 10 statements, mark with an **X** in the appropriate box your agreement.

Statement. No	Strongly Agree	Agree	Disagree	Strongly Disagree
31. I do Mathematics with confidence.				
32. I underestimate my ability to do Mathematics.				
33. I have no future with Mathematics.				
34. Girls in my school are willing to do Mathematics.				
35. I believe that it is an unusual practice for girls to do Mathematics.				
36. Mathematics is very important for my future career.				
37. Boys and girls have equal Mathematical abilities.				
38. Mathematics is a subject for the boys.				
39. Mathematics is too complicated for my understanding.				
40. I think I can contribute to solving complex Mathematical problems in class.				

Part B: Open ended questions

1. Do you believe that you will fail Mathematics no matter how much effort you spend in studying your Mathematics study?

Yes	No

Give reasons for your answer

.....

.....

.....

.....

.....

2. If you have a choice between Mathematical studies and Social science studies, which one of the two would you study and why?

……

……

……

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……...

3. Do your parents care whether you like mathematics?

Yes they care	No they do not care

Explain your answer

……

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…….....

4. Do your Mathematics teacher expect less academic work from girls than from boys?

Yes	No

Give reasons for your answer

……

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…….....

5. Do your Mathematics teacher treat girls differently from the way boys are treated during the lessons?

Yes	No

Give reasons for your answer

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…….....

7. Do teachers ask the boys more difficult questions than girls?

Yes	No

Give reasons for your answer

……

……

……

……

…….....

THANK YOU FOR YOUR PARTICIPATION!!

Appendix B: A letter to the Permanent Secretary

P/Bag 5578
Oshakati
Namibia
30 March 2012

The Permanent Secretary
Ministry of Education
P/Bag 13186
Windhoek
Namibia

Dear Sir/Madam

RE: REQUEST TO CONDUCT A SURVEY AT SECONDARY SCHOOLS IN THE OSHANA EDUCATION REGION

I am Joseph Jonas Iipinge, a grade 8 – 12 Mathematics teacher and Head of Department for Maths and Science at Iipumbu Secondary School in the Oshana education Region. At present, I am in my final year of my Master of Education program at the University of Namibia. As a requirement for the fulfilment of the degree, I am required to complete a research paper. It's for this reason that I am hereby requesting a permission to conduct a survey at secondary schools in the Oshana education Region. The purpose of my study is to find out how socio-cultural factors (traditions, culture, norms and believes) influences girls' participation in Mathematics learning. Hence, the title of my study is "**SOCIO-CULTURAL FACTORS THAT INFLUENCE GIRLS' PARTICIPATION IN MATHEMATICS IN SECONDARY SCHOOLS IN THE OSHANA EDUCATION REGION".** The findings and recommendations will be shared with the schools involved as well as the Ministry of education.

I will be delighted if I am granted the permission.

Yours Sincerely,

…….

Joseph J. Iipinge (Mr.)
(Student: 200110764)

Appendix C: A letter to the Director of education

P/Bag 5578
Oshakati
Namibia
30 March 2012

The Director of Education
Oshana region
P/Bag 5518
Oshakati
Namibia

Dear Madam

RE: REQUEST TO CONDUCT A SURVEY AT SECONDARY SCHOOLS IN THE OSHANA EDUCATION REGION

I am Joseph Jonas Iipinge, a grade 8 – 12 Mathematics teacher and Head of Department for Maths and Science at Iipumbu Secondary School in the Oshana education Region. At present, I am in my final year of my Master of Education program at the University of Namibia. As a requirement for the fulfilment of the degree, I am required to complete a research paper. It's for this reason that I am hereby requesting a permission to conduct a survey at secondary schools in the Oshana education Region. The purpose of my study is to find out how socio-cultural factors (traditions, culture, norms and believes) influences girls' participation in Mathematics learning. Hence, the title of my study is "**SOCIO-CULTURAL FACTORS THAT INFLUENCE GIRLS' PARTICIPATION IN MATHEMATICS IN SECONDARY SCHOOLS IN THE OSHANA EDUCATION REGION".** The findings and recommendations will be shared with the schools involved as well as the Ministry of education.

I will be delighted if I am granted the permission.

Yours Sincerely,

…….

Joseph J. Iipinge (Mr.)
(Student: 200110764)

Appendix D: A letter to the Principal

P/Bag 5578
Oshakati
Namibia
30 March 2012

The Principal
……..
……..
……..

Dear Principal

RE: REQUEST FOR PERMISSION TO CONDUCT A RESEARCH AT YOUR SCHOOL

I am Joseph Jonas Iipinge, a grade 8 – 12 Mathematics teacher and Head of Department for Maths and Science at Iipumbu Secondary School in the Oshana education Region. As a requirement for the fulfilment of the degree, I am required to complete a research paper. It's for this reason that I am hereby requesting a permission to conduct a survey at your school. It's for this reason that I am hereby requesting a permission to conduct a survey at your school.

The purpose of my study is to find out how socio-cultural factors (traditions, culture, norms and believes) influences girls' participation in Mathematics learning. Hence, the title of my study is "**SOCIO-CULTURAL FACTORS THAT INFLUENCE GIRLS' PARTICIPATION IN MATHEMATICS IN SECONDARY SCHOOLS IN THE OSHANA EDUCATION REGION**". The findings and recommendations will be shared with the schools involved as well as the Ministry of education.

I will be delighted if I am granted the permission.

Yours Sincerely,

…….
Joseph J. Iipinge (Mr.)
(Student: 200110764)