

**FACTORS AFFECTING FEMALE STUDENTS' PARTICIPATION IN MALE
DOMINATED FIELDS OF STUDY IN TERTIARY INSTITUTIONS IN
ZAMBIA: THE CASE OF THE UNIVERSITY OF ZAMBIA.**

**A DISSERTATION SUBMITTED TO THE UNIVERSITY OF ZAMBIA IN
PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE MASTER OF
ARTS DEGREE IN GENDER STUDIES.**

BY

MUNAMUZUNGA C. SIKAULU

UNIVERESITY OF ZAMBIA

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DECLARATION

I, MUNAMUZUNGA CAMILLUS SIKAULU do solemnly declare that this dissertation represents my own work and that it has not been previously submitted for a degree at this or another University.

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APPROVAL

This dissertation by **Munamuzunga C. Sikaulu** is approved as fulfilling part of the requirements for the award of the degree of Master of Arts in Gender Studies of the University of Zambia.

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DEDICATION

I dedicate this dissertation to my family: my late father for instilling in me the value of education, my late mother for her foresight, determination and strong will and finally, my brothers, sisters and brother-in-law for their support, encouragement and patience during my pursuit of this programme.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my Supervisor Dr. Kabunda Kayongo for her critical advice, guidance and care. Without her, this work would not have shaped up to its present status. I further extend my thanks to the lecturers in the Gender Studies Department for their valuable lectures during Part I of the M.A. programme. I would also like to thank Dr L. Mung'omba and Zambia Women in Science and Technology for reading through my work and making valuable criticisms.

Special thanks also go to the officials at the Academic Office for their assistance during data collection. The same gratitude is extended to the careers and guidance teachers at Kabulonga, Roma Girls, Kamwala and Munali Secondary Schools for their help. Nickolas Hambokoma, Chrispin Chomba, Kenneth Kaoma and Boniface Sianagange also deserve thanks for their role in data collection at the University of Zambia. The Director of the Computer Centre at UNZA Mr. John Munsaka, Mrs Hilda Chilufya and Mr. Boniface Zulu require special mention for allowing me almost unlimited access to the computer room. Special thanks go to the department at Examinations Council for their assistance.

A further word of thanks go to the people who made completion of this M. A. possible through financial, material and moral support. These are my mother Betty K. Sikaulu, my sister and brother in-law Catherine and Charles Siatontola, my brother Callistus, my cousin Munakopa, Zuzu Sikazwe, Frs. Searson and Jim McGloin, Sacred Heart of Mary Sisters, Uncle Isaac Sitali, Hanniah Syabbamba and my young brothers and sisters.

My classmates Mr. Hazemba, Ba Chellah, Mrs. Mwale, Mrs. Hamusonde, Bo Kakuwa, Henri, Cosmas, Christine, Lara, Abby and Joseph will forever be remembered for those lively debates, frustrations and strong will. We became a family, Lastly but not the least my gratitude goes to Bo Inonge, Mrs. Mwape, Mrs. A.Mulenga, Mrs Miti, Keron Chimoka, Alina Kasonde, Michael Banda, Dr. Martin Simuunza, Anderson Mbahwe, Ecloss Munsanka, Madalitso Banja, Dennis Mweemba, Brother Cletus Namooobe, Emmanuel Hamatwi, Felix Masiye, Nkenda Sachingongu and Padre Eugene Nyambe for being very supportive to me during my studies.

Finally, I would like to thank my work mates at Mazabuka Girls for their love, support, and encouragement during those trying days. To all the people mentioned above and that are not mentioned God bless you all.

ABSTRACT

Women have historically been under-represented in education and careers around the world. In Zambia, females are under-represented at all levels of the education system. However, the situation is worse at tertiary level, where most female students are found in fields of studies traditionally perceived to be for women such as teaching, nursing and social work. Males are dominant in science and technology fields. This situation prevails despite the high rates to education at the secondary and tertiary level, and the numerous benefits to society from educating females (World Bank, 1993). Females have accounted for one-fifth of the University of Zambia first year admissions for sometime. For instance, out of the total university enrolment of 4686 in all disciplines in the 1989/90 academic year, females accounted for nearly one-fifth, about 19.3 percent (MOE, 1995).

This study sought to establish the factors that perpetuate females' low participation in science and technology fields at tertiary level. An investigation was also made on whether a pattern of choice of field of study existed between students from co-education and those from single sex schools. Furthermore, an evaluation was made on whether the gender concerns on admission of the University of Zambia strategic plan were being met. The study was conducted at the University of Zambia and selected secondary schools in Lusaka.

Both qualitative and quantitative techniques of data collection were used in this study. The qualitative technique of in-depth document review was employed in examining documents on performance of pupils in the Grade Twelve Examinations from selected secondary schools. Documents related to admission at the University of Zambia were also examined in order to establish the enrolment trends by gender in the period of

the UNZA strategic plan of 1993 to 1998. The quantitative technique in the form of structured questionnaires was used to elicit responses from sampled first year students. Data from the questionnaires were analyzed using the Statistical Package for the Social Sciences while qualitative data were arranged, categorized and described to establish linkages, trends or differences.

Both females and males ranked personal interest in a particular field as the main reason for choice of field of study. The students be it in the school of Education, Humanities or Natural Sciences attributed their choice of these schools to personal interest in them. This study could not conclusively establish the source of this personal interest whether from the social or psychological point of view. Further research is recommended on the factor of personal interest influencing the students' choice of field of study, as this study did not establish the source of this personal interest. Other factors also emerged as being responsible for the female's under-representation in science fields. These factors were, segregated secondary school curriculum (in terms of subjects offered), inadequate career guidance and counselling and under-representation of females in foundation classes. The females were grossly affected by these factors in their learning process such that at the point of choosing a field of study, the majority opted for art-based programmes.

The pattern of choices field of study that emerged was that there were more females from single sex schools than females and males from co-education admitted into the University especially in the School of Natural Sciences. Furthermore there were more males from co-educational schools than those from single sex schools. An additional interesting finding was that the females from private schools admitted into University

were more than the males from the same schools. The above pattern was linked to the good performance of females from single sex schools.

Female admissions at the University of Zambia continued to fluctuate in the years of the strategic plan. The targeted increase in admission of females from about one fifth of first year enrolment to one third was only met in the 1998/99 academic year which was due policy changes governing admission by the University of Zambia senate. Frequent closures of the University affected the implementation of the Strategic Plan.

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ABBREVIATIONS

1. BSAC	British South Africa Company
2. CBU	Copperbelt University
3. FAWE	Forum for African Women Educationalists
4. FEMSA	Female Education in Mathematics and Science in Africa
5. ERIP	Educational Rehabilitation and Implementation Project
6. NGOs	Non-Governmental Organizations
7. PAGE	Programme for the Advancement of Girl Child Education
8. SPSS	Statistical Package for the Social Sciences
9. UN	United Nations
10. UNZA	University of Zambia
11. ZERP	Zambia Education Rehabilitation Project

CHAPTER I

BACKGROUND TO THE RESEACH PROBLEM

The issue of women under-representation in education and careers is both old and worldwide. Modern research has shown that following the UNESCO Regional Conferences on Education of the 1960s and the 1990 World Conference on Education, in Jomtien, Thailand, the situation of parity between female and male students began to assume some divergent characteristics. For example, near parity in access to education between female and male students in some areas such as Western Europe, North America and Japan has been achieved (UN, 1995). Females in some of the Great Tiger Nations of East Asia both outnumber males and perform as well as males in schools (Tilak, 1993). To date the regions that are yet to achieve equality of access to education between females and males are Sub-Saharan Africa, North Africa, and South India.

The situation of under-representation is more profound in science and technology fields. Despite the fact that in some regions females outnumber males in secondary schools, this numerical strength for females does not translate into their numerical strength at the tertiary level. A common problem to all the regions is that, at the tertiary level, most female students are found in the art-based fields of study, which are traditionally considered female study areas. Only a small percentage of females are in science disciplines. Males continue to dominate the science fields (Harding, 1992, UN, 1995 and Siame et al, 1998). For this study male dominated fields of study refer to science and technology fields where the participation of females is very low especially when compared to their participation in art-based fields.

In Zambia, females are grossly under-represented at all levels of the education system. The situation is worse at tertiary level, where most female students are found in fields of study traditionally perceived as “female territory”. These disciplines include teaching, nursing, and social work to cite a few. For example, in most trades training institutes female students are found in secretarial and accounting programmes while the males dominate in mechanical and crafts areas (MOE, 1995 and Siame et al, 1998). Much the same scenario obtains at the University of Zambia where the number of females in art-based programmes is higher than that in science related fields. Tables 1(a) and 1(b) below shows the enrolment situation in terms of gender at the University of Zambia and the Copperbelt University.

Table 1(a) First Year Enrolment by Gender at the University of Zambia for 1992/93 Academic Year. (Source; Education Statistics Bulletin, 1995)

SCHOOL	MALE	FEMALE	TOTAL
Humanities and Social Sciences	183	82	265
Natural Sciences	323	47	370
Education	127	58	185
Law	5	1	6
Medicine	0	3	3
Engineering	3	0	3
Agricultural sciences	54	1	55
Mines	1	0	1
Continuing Education	17	6	23
Veterinary medicine	0	0	0
TOTALS	713	198	911

Table 1(b) First Year Enrolment by Gender at the Copperbelt University for 1992/93 Academic Year. (Source: Education Statistics bulletin, 1995)

SCHOOL	MALE	FEMALE	TOTALS
Business	97	25	122
Environmental Science	0	0	0
Architecture	5	0	5
Building	6	0	6
Land Economy	9	2	11
Urban and Regional Planning	4	0	4
TOTAL	121	27	148

The table above clearly shows the gender imbalances at the two universities in terms of field of study and admission. Given this situation, the focus of this study was on the factors that influence female and male students' choice of field of study at tertiary level. The study looked at how these factors particularly enticed or compelled females at the University of Zambia to study the arts, and not the science and technological fields.

1.1 The University of Zambia

The University of Zambia was established by an act of parliament in 1965. It began its operations in March 1966 with an enrolment of 310 full time students (Kelly, 1991). It started with three schools namely Education, Humanities, and Natural Sciences. As the facilities developed, new schools were established. These were Law in (1967), Engineering (1969), Medicine (1970), Agricultural Sciences (1971), Mines (1973) and Veterinary Medicine (1983) (Mwanakatwe, 1968). The University of Zambia currently

offers 11 science and 10 art based degree programmes (see appendix 1 for programmes offered at the University of Zambia and admission requirements). It also offers certificate and diploma programmes. At present, the University of Zambia is accessible to school leavers, non-school leavers and distance learning students. The school leavers are direct entrants from secondary schools while the non-school leavers are those who could not make it as school leavers for various reasons or those already in professions with a diploma or other qualifications.

The University of Zambia was chosen as the prime research site for this study because it is one of the highest tertiary institutions in Zambia; and offers a variety of fields of study or disciplines hence giving prospective students a wide choice of fields to venture into. Furthermore, the University was easily accessible to the researcher.

As mentioned earlier, females are not only under-represented in numerical terms at the University of Zambia but are more predominant in art-based fields. In the sciences, they are severely under-represented. Kelly (1991) says that, between 1982 and 1987 females averaged just 10.9 percent of the total enrolment in science-based disciplines, whereas, they formed 28 percent of those in the humanities. Owing to such glaring gender disparities, in 1993 the University Senate decided to incorporate a gender dimension in its Strategic Plan, whose aim was to revitalize the University so as to achieve its mission. The planners recognized the need of making education, especially higher education, accessible to females. The target set in the Strategic Plan of the University was, "to raise female admissions from the current levels of slightly more than one fifth of first year enrolments to at least one third by the end of the plan period in 1998

and to parity with admission of males by the end of the subsequent period, but without recourse to differential admission criteria"(UNZA, 1993).

One of the primary focuses of the Strategic Plan was to provide quality undergraduate education relevant to the needs of the country. In this regard science education was of major concern to the planners who recognized that the University had already adopted a policy that biased student in-take towards the sciences because of the needs of the national economy (UNZA, 1993). Originally, the average percentage intake in the sciences was 55 percent. However, due to the higher failure rate from the school of Natural Sciences that affected the progression of a number of students into different science-based programmes, it was recommended to allocate 60 percent of the undergraduate in-take to all science-based programmes, including Bachelor of Science with education. Programmes in the School of Education were to receive 15 to 20 percent while the balance was to go to all the other programmes in the University.

The mission of the University alluded to earlier, encompasses four purposes, which are: Firstly to fulfil the historical purpose of the University through the pursuit of excellence in teaching, research and scholarship. Secondly, to promote learning by offering opportunities for advanced education to all suitably qualified persons, without distinction of race, gender, religion or political affiliation. The third purpose is to advance national development through the application of learning and research. The last purpose is to enhance Zambia's potential to promote the goals of the wider African and International communities (UNZA, 1993). The inclusion of a gender dimension in the strategic plan by the planners was in recognition of the gender disparities in the

University, and the need to redress them in order to realize the purposes of the University; one of them is against any form of discrimination on the basis of gender.

1.2 Statement of the Problem

The problem is that the majority of women who enter institutions of higher learning constantly gravitate towards traditionally perceived 'female fields' of study such as teaching, nursing, and social work. At the University of Zambia, the number of females in art-based programmes is higher than those in science related fields. According to the Ministry of Education Policy document Educating Our Future (1996: 94)

About 45% of the total University enrolments take science-based programmes, within these males outnumber females by about seven to one. Amongst the 55% who take arts and humanities based programmes, the male to female ratio is three to one.

Most female students who do science are found in life sciences such as biology and almost none in engineering or similar technological fields.

1.3 Objectives of the Study

The objectives of the study were as follows:

- (a) To find out what factors influenced female and male students' choice of field of study at the University of Zambia;
- (b) To determine whether a pattern of choice exists between students from co-education and single sex schools;
- (c) To find out the extent to which the strategic plan of the University of Zambia was fulfilling its gender concerns on admissions.

1.4 Research Questions

The research questions under consideration in the study were as follows:

- (1) What factors influenced female and male students' choice of field of study at the University of Zambia?
- (2) Were those factors different by gender?
- (3) Was the University of Zambia successful in fulfilling the gender concerns on admissions contained in its Strategic Plan?

1.5 Significance of the Study

The significance of this study lay in its effort to unravel the causes of most female students' preference for social science based programmes. Duncan (1989) argues that the low participation of women in science and technological fields is now an issue of concern in terms of equity and human resource implications. In other words, the participation of women and men in science and technology is important for national development as men and women bring different strengths and limitations to the generation of knowledge (Harding, 1992). In the same vein, Villarreal and Du Guerny (2000:4) argue that "each gender has a different contribution to make to society and that the difference has thus an important social value". Therefore, a study that attempts to study why there is this low participation in science-based disciplines is important as its findings can contribute towards redressing the situation since both female and male students potentially ought to have similar opportunities and rights in their choice of field of study.

The issue of parity not only in enrolment but also by field of study, from a gender perspective, has one of its bases in the theory on the social construction of gender. Proponents of this theory such as Lorber (1991:355) argue, "gender is essentially a social

construction, and that relations between women and men are essentially social relations". Therefore, what is socially constructed can be reconstructed and consequently social relations can be rearranged. The word gender is used here to refer to the set of relations between women and men, which are sustained by institutional patterns of behaviour. Gender is thus embedded in the social structures that make up modern society. Males have dominated these structures and hence benefited more than females. This domination has been in areas such as the households, education, employment sector, and decision-making positions.

Lorbel and Farrell (1991) argue that the manner in which women and men are considered unequal varies from society to society. They further argue, "where there is inequality, women are invariably devalued and allocated work that is also devalued, whether it is in the family or in paid work force"(Lorbel and Farrell, 1991:2). Consequently, the type of work women commonly do, such as household chores and caring for the family, even jobs such as nursing, teaching, social work and office work are paid at a low rate sometimes not at all. Furthermore, in terms of education, certain fields of study lead to poorly paid, low status jobs; especially occupations where there is large number of women.

There is therefore need for parity in order to redress the situation. It must be noted that gender inequities can either favour males or females. For instance, in some developing countries especially in Latin America girls' school enrollment are higher than that of boys in all levels (Villarreal and Du Guerny, 2000). The interventions in this scenario would be to eliminate the gender gap (to favour males) on the premise that no gender inequality is good either for individuals or the society as a whole. This is the basis

on which parity is necessary in the Zambian education system at all levels; primary, secondary and tertiary, especially of particular interest for this study in the participation of women in science and technology fields. The World Bank Task Force on Higher Education and Society (2000) aptly puts the case for the need for women to participate in science by quoting the Declaration on Science and the Use of Scientific Knowledge made at the World Conference on Science in Budapest (July, 1999) which states that “science education, in the broad sense... is a fundamental prerequisite for democracy and for ensuring sustainable development”. Therefore, the lack of full participation by females in science and technology means a portion of a country’s potential is realized. There is hence need for parity in order to capture all the country’s human resources consequently bringing about enhanced development.

1.6 Organisation of the Dissertation

The dissertation is divided into five chapters. In chapter one, the introduction, statement of the problem, objectives of the study, research questions and significance of the study are discussed. Chapter two contains the review of literature. The methodology used in the study is discussed in chapter three. In chapter four the findings of the study are presented and discussed. The last chapter contains the conclusion and recommendations of the dissertation.

CHAPTER II

LITERATURE REVIEW

There is substantial literature available that discusses the low participation of females in the education sector, particularly science education, both in Zambia and around the world. An examination of this literature brought out certain perspectives, which are dominant in the area of low participation of females' in science. Three of these perspectives as outlined by Singh (1999) are very pertinent to the present discussion. My review will thus be based on these perspectives, which are a categorization of factors that impede females in the education sector. These are culture, person, and structure- centered factors or constraints. Furthermore, I review the literature on the benefits of educating females and how they relate to these factors of culture, person and structure centred constraints.

Culture centered constraints are "concerned with the social construction of gender and the assignment of specific roles, responsibilities, and expectations to women and to men" (Singh, 1999:6). Some scholars have discussed the role of the local culture and socialization in determining the amount and type of education females receive. Kelly et al (1986) argues that the societal stereotyped image of women being subordinate and submissive plays a major role in the low enrolment of females at the primary level and consequently secondary and tertiary levels. The socialization is such that the females' future role does not warrant them much education. Payne (1980:32) looking at education of girls in western society argues that:

in our society girls are socialized into the expectation that their primary role will be one of wife and mother and once this expectation is accepted

and internalized, the contribution of the existing sexual division of labour is ensured.

With regard to career choices Mutukwa et al (1995) argues that some parents tend to discourage their daughters from pursuing courses that required long years of study, as this would affect their prospects for marriage. Mutukuwa's study mainly concentrated on the primary and secondary sectors in Zambia. Therefore, the impact of parental advice on the eventual career choices of pupils did not come forth where as in my study the students were asked whether they received advice from their parents on choice of field of study and to assess the usefulness of this advice.

Certain scholars have linked socialization and culture to the under performance of females in sciences. Looking at women and science in Zambia, Achola (1984) argues that the under-representation of females in science and technological fields is not due to lack of intelligence but cultural conditioning "to the effect that maths and other subjects requiring computational skills are the domain of males and not females. Uncritical acceptance of some socialized values can generate a self confirming cycle" (Achola, 1984:18). Females thus come to perceive themselves as being less capable of handling sciences. Duncan (1989) looking at science attitudes and achievement among girls and boys in Botswana also argues in the same line as Achola. She argues that cultural norms and values in most African societies are a barrier to women's full participation in science and technology. Duncan also made an observation about the existence of a relationship between girls who accept and internalize female norms and values, and their performance in science. She found that those, whose behaviour is in line with female role expectation, tend to perform poorly in Science, Mathematics, and Agricultural Sciences.

Person-centered constraints refer to the psychosocial attributes that include personal characteristics, attitudes and behavioural skills of females themselves (Singh, 1999). Certain scholars have argued that females have less intellectual abilities than males particularly when faced with computational subjects such as mathematics, and sciences (Pitburn, 1977 and Graybill, 1975 in Mulopo, 1988). In a study on African American adolescents' achievement-related beliefs about mathematics and science, Mcledon and Wigfield (1997) found that males had more positive beliefs about their abilities and expectancies for success in mathematics and science than females had. Consequently, males performed better in these subjects than did females. Furthermore, it was observed that higher achieving students valued mathematics and science more than did lower achieving students. In Zambia, Kelly (1994), Mutukwa et al (1995), Sinyangwe and Chilangwa (1995) also found that girls at primary and secondary levels tended to have lower self-image than boys do, particularly in mathematics and science. This entails that poor academic achievement in Mathematics and Science may affect the females' chances of venturing into science fields at tertiary level. These studies mainly looked at the situation at the secondary level whereas this study involved both the tertiary and secondary levels.

Other studies using this perspective have shown that there are no significant gender differences in reasoning abilities (Linn and Hyde 1989 in Harding, 1992). These scholars point to lack of empirical evidence, which shows that indeed females are less capable than males. They condemn teachers, whom they perceive as guilty of perpetuating this stereotyped view that girls are incapable of handling science and mathematics. They add that such attitudes could lead to a self-fulfilling prophecy among

females in regard to science. Proponents of this point of view, despite the good points they raise both for and against, have a tendency to over emphasise the differences in performance between females and males. My study involved an enquiry on the performance of students in selected secondary schools; both co-educational and single sex. This provides for a useful comparison on whether girls really under perform.

Structure-centred constraints have to do with women's disadvantaged position in the organizational structure of society or institutions. Issues such as gender disparities in enrolment; availability of and access to career guidance and the curriculum fall into this category. The gender disparities in enrolment in Zambia's education sector have been traced to the British South Africa Company (BSAC) rule and the colonial period of Zambia's History (Gadsden, 1992). Gadsden argues that because most of the missionaries who were the main educators were male, they concentrated on providing education to males. Though the colonial government positively discriminated in favour of females through the removal of age restrictions on starting school and lower fees for girls, there were still fewer girls in schools than males. Males continued to have more facilities and opportunities for further training. The education of females was mainly tailored to produce wives for emerging educated males. For those women who received further training it was in fields such as teaching and welfare work (Gadsden, 1992). The preponderance of females in these fields has a historical perspective.

Some researchers have attributed the low enrolment of females in the tertiary sector in Zambia to the under-representation of females in the upper primary and secondary sectors of the Zambian education system (Kelly, 1991; Milimo, 1995; Achola, 1984 and Mutukwa et al, 1995). The near parity in enrolment at the primary sector

between females and males is not reflected in the subsequent secondary sector. The gap is wider at tertiary level. Kelly (1991) argues that the selection points at Grade Seven and Grade Nine contribute to the under-representation of females since females tend to under perform and there are limited places available for them compared to the males. This under performance is also prevalent at Grade Twelve level. Given this background few females are available to compete for places at tertiary level. However, there could be other factors that account for females' propensity to avoid science fields or their predominance in the art-based fields at tertiary level as was investigated in the study.

The school curriculum is another structure-centered constraint to females' education and consequent low participation at tertiary level. Some scholars have attributed the absence of, or the negligible presence of females in science fields to the school curriculum (Spender, 1980; Milimo, 1995; Mulopo, 1988; Shifferaw, 1982; Kelly, 1985 and Graham-Brown, 1996). The curriculum is looked at in terms of subjects offered to both females and males, and the portrayal of women in learning materials. Mulopo (1988) argues that the poor performance of females in sciences at secondary and even tertiary level in Zambia is due to the pedagogic practices. That is, the instructional materials are sex-biased. Most science books portray men as being the 'owners' of science. Further more, the majority of the teachers of science are male, thus females lack role models. Kelly (1985) cited in Harding (1992) added another dimension to this issue about pedagogy by saying that boys claimed science laboratories as their territories thus making the girls feel excluded. Females are thus less inclined to pursue a career in science and technology let alone perform well because according to Spender (1980:25) school text books portray sexist images that "function to convince young members of

society that men and women are different and unequal.” In Zambia there have been marked improvement in the presentation of women in school textbooks especially in the ninties.

Shifferaw (1982) observed that girls tended to be concentrated in Home Economics and art-based subjects rather than science in most secondary schools in Zambia. Furthermore, for those girls in single sex girl’s schools, technical subjects were not offered to them. She argues that this situation curtailed girls’ chances of developing their potential in sciences. However, much has happened from the time of Shifferaw’s study (1982); females have now been allowed into technical schools and more single sex girls’ schools offer both pure sciences and physical sciences. Despite these changes females are still not venturing into science and technology fields, hence the justification for this study. Milimo (1995) took this argument further and said that due to such curricular segregation boys and girls were prepared for different careers and training at higher levels of education.

Career guidance and counselling play a vital role in the lives of the students. Mostert, Keyter, and Scott (1999) in a study carried out in Namibia observed that young people had difficulties in realizing and evaluating their interests and abilities. As such, they relied on others to make choices for them. In Zambia studies by Sanyal et al (1976), Wood (1974) and Bardouille (1981) revealed that students received a lot of information concerning careers from a variety of sources. These sources include parents, peers, relatives, and guidance teachers. Sanyal and Wood observed that most students tended to rely on the advice they got from parents and peers in their choice of career or field of study. The limiting factor in both Sanyal and Wood’s studies was that they did not

provide sex desegregated data. However, my study not only investigated the sources of career advice to the students in the sample but also provides sex-desegregated data, which enables us compare, the situation between boys and girls.

Bardouille (1981) in contrast to Sanyal and Wood argues that it is the students' educational experience rather than their family backgrounds that shaped the type of careers they expected to pursue. Bardouille also observed that female and male students had similar considerations when entering the University of Zambia, these considerations being the desire for professional qualifications and the belief that a university degree would ensure social mobility and monetary benefits. Despite her extensive study on the career expectations of University of Zambia students, Bardouille gave little consideration to the predominance of females in the Humanities and Education faculties, and their marginal presence in science based disciplines. These aspects are the primary focus of this study and are discussed extensively in chapter four of the study. Infact, it will be interesting to test Bardouille's argument that it is the students' educational experience rather than their family backgrounds that shape their career aspirations with my sample's responses on why they chose the fields of study they are currently pursuing.

Graham-Brown (1996) made similar observations as Bardouille on the role of educational experiences in shaping the future of the pupils. She argues that girls' experience of school is one that reinforces their ideas about 'appropriate' roles whether in relation to employment or to the family and to "man." The school is thus a socializing agent that perpetuates the stereotypes found in a given society. The attitudes of some teachers towards their female and male pupils have reinforced the socialization process from society and home. Studies on classroom interaction by various scholars in different

countries have shown that teachers tend to treat females and males differently especially in co-education schools (Sinyangwe and Chilangwa, 1995; Graham-Brown, 1996 and Duru-Bellat, 1995). Teachers send hidden and sometimes-overt messages to pupils that their expected future roles are dissimilar as revealed in Gordon's study in Zimbabwe (cited in Swainson, 1995). She observed that gender roles stereotyped in schools affected the teacher's expectations and treatment of girls. As such, both male and female teachers tended to accept that the female roles were primarily domestic while the males were the breadwinners. Consequently, the teachers felt it was their duty to prepare the pupils for these roles. Brewster (1980) writing about the situation in England argues that females are demoralized into taking science and mathematics by some teachers who say that females had no need for mathematics in their future careers. The impact of these teacher attitudes on the students' choice of field of study was a subject in this research. The extent to which the values imparted to pupils in schools affected their career decision was not covered in Graham-Brown's study. However, the students in my sample were asked to evaluate the usefulness of the advice from teachers particularly career guidance teachers on their choice of field of study.

Females' participation in higher education has been linked to the labour markets' ability to absorb them (Subbarao et al, 1994; Anker, 1998; Duru-bellat, 1995 and Kelly, 1987). That is, the labour market opportunities tend to influence the decisions of parents, pupils and schools on how much education to give to females and males. Kelly (1987: 96) argues that,

When employment is not open to women, girls' education tends to be depressed; when, however, employment opens up, the demand for women's education is much greater on the part of parents as well as of girls.

Therefore, limited opportunities for females in certain careers lead them to avoid pursuing studies in those fields (Duru-Bellat, 1995). Whether this had a bearing on my sample's choice of field of study was investigated and the results are interesting as discussed in chapter four.

2.1 Benefits From Investing in the Education of Females

A number of scholars argue that there is evidence that show the benefits that society stands to accrue from investing in the education of females. These benefits are in the form private and social rates of return. Private rates of return are those benefits that directly come to the individual as a result of going to school, while the social returns go to society as a result of public investment or expenditure on education. Private returns to schooling are the greatest incentive for individuals to and families to invest in education. Whereas social returns provide a basis on which society can provide more public resources for education (Hill and King, 1993). Education is broadly recognised as being essential to economic and social development. Therefore, when more girls and women, as well as boys and men gain access to schools, the benefits to society multiply (Hill and King, 1993). A review of literature pertaining to these benefits and how they weigh against the culture, person and structure centered constraints to females' education is relevant.

According to the Forum for African Women Educationalists (FAWE, 1998), the immediate areas of benefits to female education are improved family welfare, health and nutritional care.

Hill and King (1993) argue,

“a better educated mother has fewer and better children. She is more productive at the work place. And she raises a healthier family, since she can better apply improved hygiene and nutritional practices”.

Other documented benefits by FAWE are that education knocks down the myths about stereotyped worldview of the relation between women and men. This is reflected in the boosted self-esteem and confidence of an educated female. Furthermore education opens up opportunities that would have been closed to women and also increases their chances of advancement in employment. It also promotes gender equity and helps in changing self-degrading attitudes, which either ignore or suppress girls' potential.

Though scholars are agreed that education is beneficial to women and society, and that the highest return to investment in education are in developing countries, they do not agree on what level these benefits are enjoyed. Scholars such as Colclough and Lewin (1993) argue that primary schooling provides the highest rates of return yet more money is spent on the higher levels. While Schultz (1993) argues that it is both the primary and secondary sector that gives high returns to education. He argues further that private returns are higher in Africa. The World Bank (1988) and (1993) is of the view that the secondary sector and the tertiary level yield more returns than the primary sector in countries such as Kenya and Zambia. In Zambia they found that there is little correlation between primary education and the beneficial outcomes such as low fertility (World Bank, 1993). The correlation emerges at secondary and higher levels of education. They further argue that returns to education for women with higher education are as high and in some cases higher than those of men. This to them implies that the constraints to

women's participation in the labour market are more due to the gender gap in education and training rather than due to cultural or discrimination factors.

The concern of this study was therefore on why there are gender differentials in enrolment especially in science and technology fields despite the high returns to education, particularly female education. These differentials in the education sector could be due to person and structure centered constraints given that education knocks down barriers of stereotyping as it changes the self-degrading attitudes that either ignore or suppress girls' potential (FAWE, 1998). Bellew and King (1993) argue that the common view advanced by some scholars that girls' decision to enter low paid traditional female occupations are reinforced by teachers' stereotyped notions of girls' inabilities particularly in sciences and maths is questionable. They argue that there is no empirical evidence from developing countries to support or refute the hypothesis that teachers' interactions with female students discourage the females' attendance or achievement in sciences. My sample's reasons for their choice of field of study provide an interesting insight on this issue.

2.2 Summary of Literature Review

The literature reviewed in the foregoing reveals that there are a number of factors that impede the education of females, particularly their participation in science and technology. These factors have been examined from three perspectives of culture, person and structure centeredness. A further issue at play in the education of females and males is one of the perceived benefits to education particularly female education and how these weigh against culture. The social and private rates of return to female education are high especially in developing countries. In Zambia these are noticeable at secondary and

tertiary level. This literature gives impetus to this study to try and unravel why females under-represented in male dominated fields of study at Tertiary level.

CHAPTER III

METHODOLOGY

The overall aim of the study was to find out the factors that affect the participation of women in male dominated fields of study at tertiary level. In order to answer the specific research questions of the study two types of research methods were adopted, namely exploratory and descriptive. Bless and Achola (1988:38) argue, “the purpose of exploratory research is to gain insight into a situation, phenomenon, community or person. The need for such a study could arise out of lack of basic information on new area of interest”. Though the under-representation of females in education and particularly science fields is not a new area of interest for scholars there is inadequate information on why females shy away from the sciences. In order to respond to research questions one and two an exploratory approach was necessary. The sampled students from the University of Zambia provided the information on factors that affected their choice of field study. From these inferences were drawn on why females are under-represented or shy away from science and technology fields.

As to descriptive research Bless and Achola (1988:39) argue, “ the purpose of descriptive research is to give an accurate account of the characteristics of a particular phenomenon, situation, community or person”. This descriptive aspect of the research was necessary as it allowed for a detailed understanding of the situation in selected secondary schools on the type of curriculum offered and the performance of pupils in the Grade Twelve School Leavers’ Examination. Furthermore the descriptive aspect provided a basis for examining the enrolment trends at the University of Zambia in response to

research question number three. Below is a more detailed of the methodological considerations of the study. These include the following; research design, research sites, target population, sampling procedures, data collection procedures, and data analysis. Also included in this chapter are the limitations of the study.

3.1 Research Design

According to Bless and Achola (1988) a research design has two meanings. In the widest sense, it is a programme that guides the research in collecting, analysing and interpreting observed facts. The second meaning is that a research design relates more directly to the logic of testing a hypothesis. Considering that my study is not based on a hypothesis, I adopted the widest sense of a research design. Therefore within the framework of descriptive and exploratory research, I engaged both the qualitative and quantitative research techniques. These were chosen because their techniques for data collection would complement each other in response to the research questions the researcher was investigating. The qualitative research technique of document review was used in the collection of data from secondary sources where relevant documents were reviewed. The quantitative technique of structured questionnaires was adopted when collecting data from primary sources. This study was at two levels: secondary school and university. The secondary school level was included in the study in order for it to provide an insight on what was prevailing in schools. That is, the aim was to determine whether there were gender disparities in the curriculum offered in schools, the placement of pupils into arts or science class in grade ten and the general participation and performance of females in sciences in the Grade Twelve School Leavers' Examination. These areas have a bearing on the progression of pupils into higher education and their subsequent career

choices. The university level was chosen because it was one of the tertiary destinations for school leavers if not the epitome of tertiary education in Zambia.

3.2 Research sites

The research was conducted in Lusaka because of its cosmopolitan nature and easy accessibility to the researcher. The secondary schools in the sample were four; namely Kabulonga Girls, Roma Girls, Munali and Kamwala Secondary Schools. Kabulonga and Roma Girls are single sex schools, though government and missionary run, respectively. They were chosen on the basis that they would provide useful comparison to Munali and Kamwala, which are co-education government schools. On hindsight, the study should have included at least one or two schools from peri-urban or rural set up. These would have provided worthy comparison to the urban schools. The researcher was unable to do this as resources prevented him from covering a larger geographical area and also because my interest was not in rural-urban disparity.

The University of Zambia was chosen to be the prime research site because it is the most dominant tertiary institution in Zambia. The majority of school leavers aspire to get to this institution. It is only after failing to get admission that most school leavers go to other tertiary institutions. Furthermore, the University of Zambia offers a variety of fields of study, thus giving prospective students a wide range of choice. This was advantageous to the study, as it assisted in bringing out the factors that affect choice of field of study. Data were collected in the months of September and October 1999 at the secondary and university sites respectively.

3.3 Target Population

At the University of Zambia the population comprised full-time first year students in the Schools of Education, Humanities and Social Science, and Natural Sciences. The choice of first year students was motivated by the following reasons: firstly, most of the students had just been grappling with the choice of a field of study. Other students, particularly those in the Natural Sciences were still engaged in the process of choosing a field in which to major. Therefore, first year students were ideal for the study as they still had fresh ideas about the factors at play in their choices of fields of study. The above mentioned schools were chosen because they admitted more students in numerical terms than the other schools at the University of Zambia. There are other admitting schools and departments such as Agricultural Sciences and Mass Communications, respectively. However, their first year students still have to pass through the schools of Natural Sciences and Humanities. The other reason for choosing Humanities and Natural Science was that the majority of first year students were non-quoted, meaning they still had to decide what field of study to major or specialise in.

From the secondary schools, the researcher targeted careers and guidance counsellors who were seen as key informants. These provided information on the curriculum in their schools and how they placed the pupils into arts or science classes in Grade Ten. The Grade Twelve Examination results records were also collected from the career and guidance counsellors.

3.3 Sampling Procedures

The total population of full-time first year students pursuing degree programmes in the three schools was 894 of whom 596 were male and 298 female. From the total population of 894 a sample of 300 students was drawn using random sampling procedures. Of the 300 students, 150 were male and 150 female. The sample size of 300 students out of 894 was arrived at after considering the need for statistical significance. Nyagah (1995:171) argues that to achieve “statistically significant results, it is recommended that a reasonably large sample is used”. Nyagah brings two concepts that are relevant to sampling: the sampling error and the level of confidence. The sampling error is the range within which the population characteristic probably will fall while the confidence level refers to the extent to which a researcher can be sure that the population statistic falls within a given range and with minimal sample error. Therefore, using a table provided by Nyagah (1995) on the required sample sizes for various population sizes against selected confidence levels and sampling errors, I chose the sample of 300 students out of 894 which gives the study about 90% confidence level and 5% sample error. The division of 150 males and 150 females was done for gender balance.

The sampling was done individually for each school. Firstly, lists of first year students in each school under study were obtained from the computer center of the University of Zambia. The lists contained names of all first year students, their gender and hostel, for those accommodated on campus. The researcher then enumerated the male and female students in each school separately. A table of random number was used to arrive at the desired sample sizes for males and females in the respective schools. A

tabulation of the population and the sample sizes drawn from each school is shown in table 2:

Table 2: Distribution of First Year Student Population According to School (source: Academic Office)

SCHOOL	TOTAL POPULATION OF FIRST YEAR STUDENTS		TOTAL NUMBER OF RESPONDENTS	
	MALE	FEMALE	MALE	FEMALE
Education	242	92	50	50
Humanities and Social Sciences	137	124	50	50
Natural Sciences	217	82	50	50
TOTALS	596	298	150	150

3.5 Data Collection

Bearing in mind the nature of objectives one and two, data from the students sampled were collected using structured questionnaires, which had a mixture of both open ended and closed questions (see appendix 2 for sample of questionnaire). The key variables in the questionnaires were as follows: the personal characteristics of the respondents, the type of secondary school they attended, the proprietor of that school and the type of class, that is., art based or science based class. Further variables were the performance of respondents in the Grade Twelve School Leavers’ Examination,,the occupations of their parents or guardians by gender, the schools that the respondents are

in at the University, and why they applied into these schools. Additional variables were sources of information about programmes offered at the university and the respondents' opinions on why there is the low participation of females in science programmes. No pre-test was done on the questionnaire due to the limited time frame in which the research was supposed to be done. It must be acknowledged that a pilot would have strengthened the questionnaire. The researcher and four research assistants administered these to the sampled students. Of the 300 questionnaires distributed, 239 were answered and retrieved; 108 (45.2 percent) were from females while 131(54.8) were from males. The reasons for this return rate are given in the section on limitations of the study.

More data were collected through a survey of documents from the University of Zambia Academic Office, Computer Centre, Careers and Guidance counsellors from selected secondary schools. From the Academic Office and the Computer Centre documents on the admission requirements of the University of Zambia and enrolment figures for students from 1993 to 1999 academic years were collected. The careers and guidance counsellors provided the researcher with Grade Twelve Examination results analysis for their respective schools. They also provided information on the curriculum offered in their schools and how they placed or allocated pupils into arts and science class in Grade Ten.

3.6 Data Analysis

Data were analyzed both qualitatively and quantitatively. Data from secondary sources were analyzed qualitatively. That is, the researcher categorized and grouped the data from the secondary schools on Grade Twelve examination results in order to establish whether there were any patterns, similarities or differences. Inferences were drawn after making comparisons on the varying pass percentages per subject and school.

Comparisons in performance were made between males and females in co-education schools; and between girls in co-education schools and those in single sex schools. Further comparisons were made between males in the two co-education schools and females in single-sex schools. The researcher also made comparisons among the four schools in terms of subjects offered and the placement of pupils into different classes.

With regard to secondary data from the University of Zambia Academic Office, the researcher made a comparison between the enrolment figures from 1993/94 to 1998/99 academic years. This was the period over which advancements in admission and the general well being of the University were supposed to have been made.

Primary data from the questionnaires were analysed using the Statistical Package for the Social Sciences (SPSS). Before using this package the researcher coded the variables in the questionnaires. These variables are mentioned in section on data collecting procedures. A distinction when coding was made between responses from open-ended and closed questions. The aggregating by gender was done when entering the coded responses into the SPSS package. After coding, the data were entered in to the computer. Percentages, frequencies and cross-tabulations were calculated using SPSS.

3.7 Limitations of the Study

The study had the following limitations: firstly data collection from primary sources at the University of Zambia was delayed because the University of Zambia was prematurely closed in May 1999 before the end of first semester. As a result the targeted sample was away. They opened for a month in October 1999 for examinations. This short period was utilized for distribution of questionnaires. Given the pressure of examinations on the sampled students, it was difficult for the researcher and the research assistants to find the

students in their rooms. Repeated follow-ups were made to the sampled students' rooms on campus. Some students were just not available despite leaving notes explaining the need for the questionnaires to be returned. Particularly difficult to find were the females hence their less percentage return rate. Follow-ups to lecture rooms could not be made as students were on study break hence were not attending lectures. However, perseverance led to a favourable response rate.

Another limitation was that some of the sampled students had no accommodation on campus, and as such were difficult to locate. However, their course mates and friends assisted us in tracking them down. A further limitation was the confining of the study to the University of Zambia. Students from another tertiary institution and secondary schools should have been involved in this study, as their responses would have provided useful comparison to those from UNZA. Limited resources led to the exclusion of other tertiary institutions like Evelyn Hone College of Applied Arts and Commerce and Natural Resources Development College (though it was closed at the time the research was being conducted). Additionally, the sample should have included senior students (from second years onwards) and lecturers. Interviews and focused group discussions with these categories of people would have complimented the information from the first years to which the questionnaires were administered.

Another limitation arises from the sampling procedure. The random sampling of the first year students led to the inclusion of non- school leavers such as mature age entrants into the university. The percentage of these is reflected in chapter four under the section on personal characteristics of respondents. A multi-stage stratified random sampling procedure should have been used, as it would have resulted in a school leaver sample only.

CHAPTER IV

PRESENTATION OF RESULTS AND DISCUSSION

The preceding chapters of this study have not only indicated the problem of the study but have shown what other scholars have written on why female are underrepresented in male dominated fields of study. Furthermore, the methodology used in this study was discussed. As seen from our target population our sample comprised of first year students who had elbowed their way to University and would provide valuable insights on why they chose their present fields of study. This information would allow useful comparisons to what other scholars have said

In this chapter there is the presentation of findings and discussion on the three objectives of the study and research questions. The first part looks at the second objective, which sought to establish whether a pattern of choice existed between students from co-education schools and those from single sex school. After this part follows the findings and discussion on the factors that influence male and female students' choice of field of study. Special emphasis was placed on how these factors led to females' low participation in science programmes at the University of Zambia. The last section is on whether the University of Zambia Strategic Plan's gender concerns on admission were being met.

4.1 Patterns of Choice between Students from Co-education and those from Single Sex Schools

In order to adequately answer the demands of objective two the following variables were examined; the personal characteristics of the respondents, occupational background of

their parents, the kind of proprietor of the secondary school they were at, the type of school they attended and the schools/faculties they are in at the University.

Out of the total sample of 300 students, 239 students responded. Of the 239 respondents, 131 (54.8%) were male and 108 (45.2%) were female. The difference in the response rate between females and males could be attributed to a higher number of females without campus accommodation hence making it difficult to retrieve the questionnaires once administered. The majority of the students 74.9% were in 21 - 25 years' range. There were 16.3% below 20 years, while 7.1% were in the 26 and above age group. The 21-25 average age could be due to the backlog of school leavers who were unable to enter into University a year after leaving secondary school. This situation arose because the University of Zambia academic calendar has been affected by frequent closures of the institution particularly in 1997 when the University was closed for a year. Thus, the school leavers in the sample had to wait two years before they were admitted into the University.

The majority of the respondents (92.1%) were single; 7.5% were married while 4% were divorced. The percentage of those married and divorced could be that of in-service students who have been admitted into the University to advance their careers. These were included in the sample because the lists used for sampling did not indicate whether one was a school leaver or non-school leaver. It just indicated that one was a first year student in a given school or faculty. This was a limitation in the sampling procedure used and is mentioned in the section on limitations in Chapter III.

The respondents were asked to state the occupations of their parents or guardians. Their responses are tabulated in the table below.

Table 3: Percentage Distribution of the Respondents' Parents or Guardians' Occupations
(Source: Field Data).

PARENTS/GUARDIANS' OCCUPATIONS	RESPONSE
Teacher	12.1
Farmer (subsistence)	9.2
Politician	1.3
Business/self-employed/marketer	12.5
Retired	5.8
Civil servant	3.8
Miner	4.1
Driver	2.1
Engineer/technical/electrician/Entomologist	6.3
Lecturer	2.8
Economist/social worker	10.5
Judge/lawyer	1.3
Administrator/manager/director	4.6
Medical personnel-nurse/doctor	6.3
Secretary	2.5
Police/military	1.7
Banker/accountant	.8
NGO worker	.4
Not applicable/ Not stated	11.9
TOTAL	100

Data on the educational attainment of students’ parents were not collected. However, most of the occupations of the parents and guardians listed above require some form of education, even tertiary education. Therefore, the students in the sample were mainly from homes where high-level educational attainment would have been encouraged and supported. This

background entails that the students would have some exposure to the benefits of education. However, it must be noted that there is no evidence in this study that illiterate parents or guardians value education less than highly educated ones. Some of the students in the sample could have been from homes with parents who have humble or no education at all but still value education.

The secondary school background of the respondents was examined firstly in terms of whether one had been at a government, mission or private secondary school. Secondly, analysis was in terms of whether the school where they had sat for the School Leavers' Examination was a co-education or a single sex one.

A close examination of the percentage distribution of respondents in terms the proprietor of the school they attended was as follows: 57.6% were from government schools, 36.1% from mission and 6.3% from private schools. An examination of these percentages by gender showed that 19.7% females were from government schools, 21% from mission and 4.2% from private. For the males, 37.8% were from government schools, 15.1% mission, and 2.1% private. From this sample we can notice that there were more females than males from mission schools were admitted into University. Additionally the statistics manifest that; there were more females from mission schools than females from government schools. The females from mission schools also surpassed both females and males from private schools. Another dimension that emerges is that there were more females from private schools admitted into university than males from the same schools.

Linked to the proprietor of the school the respondents were at is the type of school they attended, that is, co-educational or single sex. The percentage distribution of

respondents from co-educational schools was 51.5% while that from single sex schools was 48.5%. In terms of gender, 16.3% were females from co-educational schools and 35.2% males. For those from single sex schools, 19.6% were males while 28.9% were female. A presentation of these figures in tabular form is shown in table 4 below.

Table 4: Percentage Distribution of Respondents in Terms of Type of School Attended
(Source: Field Data)

TYPE OF SCHOOL	GENDER		TOTALS
	MALE	FEMALE	
Co-education	35.2	16.3	51.5
Single sex	19.6	28.9	48.5
TOTALS	54.8	45.2	100.0

An examination of the percentages reveals that there were more females from single sex schools admitted into the University than males from single sex schools and females from co-educational ones. The above findings raises questions that require comment; firstly is why of the sample there are more females from mission schools than from government schools and yet the reverse for the males. Secondly, why there are more females from mission schools than males. Thirdly, why there were more pupils (females and males) from government and mission schools admitted into university than those from private schools.

Since different private, single sex and mission schools do not have special quotas for entry into UNZA but all compete on the basis of the Grade Twelve Examination

results our attempt to unravel the scenario that has emerged is to look at the general performance of pupils in the said examinations. Though by proxy (students from the sample not necessarily from sampled secondary schools) this study made comparison on the performance of pupils in selected secondary schools in Lusaka. The pass percentages in these schools were high. In terms of pass or fail per subject for the years 1996,1997 and 1998, the pupils in these schools got pass percentages of above 50% in most subjects. Table 5 on the next page shows the results in percentages of the pupils in the sampled secondary schools.

Table 5: Pass Percentages Per Subject for Grade 12 Leavers from Roma Girls, Munali Secondary, Kamwala Secondary and Kabulonga Girls (source: Guidance Departments of respective schools)

SUBJECTS	ROMA GIRLS			KABULONGA GIRLS			MUNALI			KAMWALA		
	1996	1997	1998	1996	1997	1998	1996			1996	1998	
							M	F	M		M	F
ENGLISH	100	48.8	84	97.2	99.1	98.6	93.2	99	96	96	97.7	99
LIT. IN ENGLISH	92.2	97.6	96	91.6	92.5	100	84.6	91.9	71	80	47.8	60
RELIGIOUS EDUCATION	93.5	96.4	83	59.6	88.8	94.2	66.3	58	47	37	86.7	67
HISTORY	92.7	91.1	98	79.1	76	53	68.9	59	85	67	72	85
GEOGRAPHY	90.9	89.5	92	70.8	64.4	73	61.7	54	70	47	86.3	81
MATHEMATICS	75.3	84.3	54	41.1	48.6	69.1	59.9	17	68	26	56.8	92
AGRICULTURE SC	-	-	90	94.7	100	88.6	90.9	3.3	87	77	-	-
PHYSICS	95.7	77.8	76	66.7	62.7	53.5	86.5	3.3	81	35	76.2	75
CHEMISTRY	95.7	92.3	83	64	63.4	56.8	83.7	0.0	82	55	90.5	74
BIOLOGY	89	98.8	89	70.7	78.3	89.7	72	57	85	67	76.4	97
SCIENCE	87	93	80	70.7	72.3	69.2	79	65	84	62	82	89
ART	-	-	-	100	100	100	100	100	95	100	-	100
G. M. P.	-	-	-	-	-	-	0.0	-	57	-	53.9	57
BEMBA	-	-	-	-	-	-	0.0	-	100	100	-	-
FRENCH	81.8	100	50	85.7	100	100	0.0	-	33	100	80	25
COMMERCE	93.7	97.3	92	84	89.7	95.5	76	76	71	59	77.7	96
FOOD & NUTRITION	-	-	-	100	100	100	-	-	-	-	100	100
FASHION & FABRICS	-	-	-	25	100	-	-	-	-	-	-	-
ADD. MATHS	-	-	-	90	90	100	-	-	-	-	-	-
P. ACCOUNTS	-	-	-	93.8	92	92.7	100	50	80	50.3	84	60
METAL WORK	-	-	-	-	-	-	-	-	-	-	87.5	85
MUSIC	-	-	-	-	-	-	-	-	-	-	-	75

The figures in the table indicate that the performance in most subjects in the four schools was good. An examination of the performance of females at Roma and Kabulonga in comparison to that of males at Munali and Kamwala revealed an interesting phenomenon. In 1996, the girls at Roma beat the boys at Munali in all the mutually shared subjects. The situation was the same in 1998 except for English, French and Mathematics. Kabulonga girls equally did better than the boys at Munali in 1996. Apart from Science, English and Commerce, the girls at Roma performed better than the boys from Kamwala in 1998. Those from Kabulonga also performed well compared to the boys at Kamwala in most subjects in 1998. An interesting observation that has been made is that for long time girls from single sex schools such as Roma Girls and missionary schools in general have always performed a lot better than their counterparts in pure government single sex and co-educational schools. However, it has also been observed that the failure rate of these girls once at the University of Zambia, particularly in Natural Sciences has been high (UNZA, 1993). This could be a factor that deters most girls from entering science-based programmes.

A closer analysis of the trend in Mathematics, Physics, and Chemistry indicates that the girls at Roma and Kabulonga had higher pass percentages than those from Munali. For instance, 17% of the girls at Munali passed Mathematics in 1996, while 75.3% passed at Roma and 41.1% at Kabulonga in the same year. In Physics 35% of the girls at Munali passed in 1997, while Roma had 77% and Kabulonga 66.7%. In 1998 there was an improvement in performance in Mathematics by the girls at Munali. They had 70%, meaning they out performed the girls at Roma (54%) and Kabulonga (69.1%). The girls at Kamwala performed better in the same year (1998). They had 71% pass.

Some scholars have attributed the difference in performance between girls in single sex schools and those in co-educational schools to the desire for girls in co-education to conform to a perceived image of femininity or feminine behaviour (Aebischer and Valabregue, 1995). This image is one that expects girls to under-perform in *Mathematics and Science*. Duru-Bellat (1995:67) argues, “girls tend to underestimate themselves in so called masculine fields when in the presence of boys”. They hence emphasize their literary aptitudes when in co-educational contexts. This state of affairs is in line with a United Nations study (UN, 1995), which argues that girls in single- sex schools achieve more than those in co-educational schools, especially in subjects such as Mathematics and Science. Kelly (1994) argues that the co-educational environment perpetuates the domination of boys leading to better performance by the boys than the girls. This advantages the boys when it comes to entering science fields at tertiary level.

A comparison of male and female performance in English and Literature in English at Munali in 1996 and 1997 brings the argument into perspective. In 1996, the females had 99% passes in English while boys had 93.2%. For Literature, the males had 84.6% while the females had 91.9% in 1996. However, in 1998 at Kamwala the boys had a higher pass percentage in English than the girls: 99% and 97%, respectively. In Literature, the girls had 84% while the boys had 60%. This good performance of females in these art-based subjects and the improved performance in Mathematics by girls at Kamwala and Munali is an indication that females have the intellectual ability and can perform as well as or even better than males.

The good performance by the females discussed above is a further testimony of the argument that females have the ability to out perform males academically. It also

shows that given the right encouragement and learning environment females can do wonders. Unfortunately, the political will and necessary Government action in creating or initiating the right learning environment has been slow in Zambia. Through the education policy documents of Focus on Learning (1992) and Educating our Future (1996) the Government of Zambia acknowledged the disadvantaged position of women in the education system. They suggested interventions to redress the gender imbalances. They recognized that the school was a powerful agent of socialization. As such a change was needed in order to create a learning environment conducive to both male and female students. However, implementation of policy has been slow, hence the continued disadvantages of most females. Despite this slow implementation, the government must be commended for initiating some intervention programmes with some NGOs aimed at improving the education of the girl child. Two such programmes are the Female Education in Mathematics and Science in Africa (FEMSA) and Programme for the Advancement of Girl Child Education (PAGE). FEMSA aims to increase females' participation in sciences while PAGE promotes girls' education as a whole.

It was also observed that the pass percentages did not give a clear picture in terms of the grades that the pupils got. That is, a high percentage did not necessarily mean a lot of pupils got good grades. A closer look at the grades of the pupils at Roma, Munali, Kamwala and Kabulonga in Mathematics and Science revealed that few candidates got distinctions as shown in table 6.

Table 6: Performance of Pupils at Roma, Munali, Kamwala and Kabulonga in Mathematics for the 1998 School Certificate Examinations
(Source: Results analysis of respective schools).

SCHOOLS	TOTAL NUMBER OF CANDIDATES	DISTINCTION		MERIT		CREDIT		SATISFACTORY		UNSATISFACTORY
		1	2	3	4	5	6	7	8	
ROMA GIRLS	77	2	1	3	4	6	8	9	9	36
KABULONGA GIRLS	223	3	11	28	14	17	29	31	21	69
MUNALI	M	46	24	50	23	26	39	22	22	29
	F	1	4	18	16	9	34	31	27	45
KAMWALA	M	6	17	36	7	10	12	6	4	8
	F	0	0	10	13	0	21	10	7	23

The figures in the table show that only a few candidates got distinctions in Mathematics in all the four schools. The bulk of the candidates especially the females were in the credit and satisfactory categories. A number of them did manage to get merits. It must be noted that the situation around the country is that of disparities in performance between males and females and among provinces, with those along the line of rail having better results than those away from it (Kelly 1994). Therefore, the picture from our sample is not fully reflective of the countrywide scenario.

From the discussion in the foregoing we could conclude that the high number of females from mission schools and single sex schools admitted into the university is due to their outperforming the females from co-educational and government schools in the Grade Twelve Examination. A further reason could be the large number of single-sex, female mission schools. Most government schools are co-educational. There are also a large number of male single sex boarding schools run by the government than there are for females (Milimo, 1995). She gives an example of Lusaka Province where out of 12 government schools only 3 are for girls. Hence, the high percentage of males from government schools entering into university than those from mission schools. With regards to private schools, the low number of them entering the University of Zambia could be that their parents can afford to send them to universities outside the country. Additionally the syllabus in some of the private schools is one that prepares them for universities outside Zambia.

4.1.1 Distribution of Respondents according to Schools they were in at the University of Zambia.

The distribution of the respondents according to the school they were in at the University of Zambia is tabulated below.

Table7: Number and Percentage Distribution of Respondents According to School at UNZA (Source: Field Data).

SCHOOL	MALE	FEMALE	TOTALS
Education	46 (19.2)	40 (16.7)	86 (36.0)
Humanities and Social Sciences	38 (15.9)	27 (11.3)	65 (27.2)
Natural sciences	47 (19.7)	41 (17.2)	88 (36.8)
TOTALS	131 (54.8)	108 (45.2)	239 (100)

From the table, (and as mentioned in the foregoing) we can see that the response rate was higher among the males than the females. About whether a pattern of choice exists, a cross tabulation was run and the results are tabulated on the next page.

Table 8: Percentage Distribution of Respondents according to their Gender, Secondary School they were at and the School they are in at the University of Zambia (Source: Field Data).

TYPE OF SECONDARY SCHOOL		SCHOOL AT UNZA			TOTALS
		Education	Humanities	Natural Sciences	
Co-education	Male	27.8	15.6	29.5	73.0
	Female	9.8	4.9	12.3	27.0
	TOTAL	37.7	20.5	41.8	100.0
Single-sex	Male	14.4	16.3	12.5	43.3
	Female	20.2	16.3	20.2	56.7
	TOTALS	36.6	32.7	32.7	100.0

From the table, comparisons were made between the following: firstly, the distribution of male and female respondents from co-educational schools. The figures show that there were more males (73%) in the three schools at UNZA than females (27%). Additionally, the School of Natural Sciences received more males and females from co-educational schools than from the other schools or faculties. The second comparison made was the distribution of males and females from single sex schools. The opposite picture to that found in co-education pertained here. More females (56%) than males (43.3%) were found in all the three schools. Furthermore, the number of females from single-sex schools in the School of Natural Sciences is higher than that for males (though similar to that in Education). A comparison of females from co-educational schools with those from single sex schools in Natural Sciences revealed that there were more females from single-sex schools (20.2%).

Considering the size of the sample it was difficult to conclude that patterns of choice existed between students from co-education and those from single-sex schools. What was observed was that there were disparities in the numbers of students going into University from these schools. Additionally, more females from single-sex schools went into Natural Sciences. This could be attributed to the arguments put earlier that reduced stereotyping in single-sex environments makes females more self confident in sciences. Arnot (1983:79) aptly argues, “single sex schools tend to weaken gender patterns of subject choice, particularly as far as girls and science are concerned reinforces this”. This can predispose the girls into pursuing sciences at tertiary level unlike their colleagues from co-educational schools. Sunderland (1987) argues that in co-educational schools a hidden curriculum may exist which ascribes different social roles for and behaviours and subject choices on a basis of gender.

Sunderland’s argument depends on the attitudes outside the school, in society. Given the home background of our sample, as manifested by the occupational background of their parents or guardians one would argue that the respondents were from homes that appreciate the value of education hence their attainment of higher education. Their parents or guardians educated or not could have been aware of the returns to investing in education particularly female education. However, the respondents’ could have made the choice of field of study on their own merit considering that some parents consider admission into university as big enough achievement regardless of the field one is to study.

4.2 Factors that Influence Female and Male Students’ Choice of field Of Study

Data from the questionnaire distributed at the University of Zambia revealed that a number of factors were at play when the students were making their choices. These are presented and discussed in relation to their effect on females’ low participation in male dominated fields of study (science programmes). The factors identified were personal interest in field of study, segregated secondary school curriculum and pedagogic practices, performance in Grade Twelve School Leavers’ Examination especially for females from co-educational schools, under-representation of females in the foundation classes, and inadequate career guidance and counselling. An additional factor that arose from the factors mentioned earlier is the impact of lack of political will from Government on education particularly females participation in science programmes.

4.2.1 Personal Interest in Particular Field of Study

Personal interest as a factor influencing choice of field of study came out in the following category of responses; the first category depicted the opinions about the School of Natural Sciences by students in the Schools of Education and Humanities. The second category captured the reasons given by students in the Natural Sciences and Humanities for their desired fields of specialisation. And the last one was the students’ opinions about why females are under-represented in science-based programmes at the University of Zambia.

The students in the Schools of Education and Humanities were asked why they had applied into these schools and not Natural sciences. Their responses are tabulated below. It must be acknowledged that the School of Education has a Natural Science component, that is, the Bachelor of Science with Education programme.

Table 9: Percentage distribution of Male and Female Responses to why they did not Apply for Admission into the School of Natural Sciences (Source: Field Data).

CATEGORY / RESPONSE	GENDER		TOTAL
	MALE	FEMALE	
Lack of interest in Science and Maths	5.4	5.9	11.3
Particular/Personal interest in Education/ Humanities	12.6	13.4	26.0
Perceived monetary benefits after completion of course	3.3	3.3	6.6
Because of perceived simplicity of these programmes	1.3	0.0	1.3
Grade Twelve results determined choice	2.9	1.3	4.2
Subject combination at Secondary School limited choice	1.3	0.4	1.7
Had no choice	0.4	0.0	0.4
Not stated	8.4	5.0	13.4
Non – applicable	19.2	15.9	35.1
TOTAL	54.8	45.2	100.0

A larger percentage of respondents, (26%) said they applied into Education and Humanities out of interest in these schools. Apparently, of the respondents, more females (13.4%) than males (12.6%) gave this reason, though this percentage difference is minimal. Other respondents (11.3%) said they lacked interest in Science and Mathematics. Only a few respondents gave other reasons, such as perceived monetary benefits after completion of course (6.6%) and effect of Grade Twelve Examination results, 4.2%.

A follow up to the responses in table 7 was made to students in the Natural Sciences and those in Humanities as to what fields they wanted to major in. The students’ responses are tabulated in table 10 below.

Table 10: Distribution of Students in Natural Science and Humanities According to their Intended Field of Study (Source: Field Data).

FIELD OF STUDY	MALE		FEMALE	
	No.	%	No.	%
Agriculture	5	3.7	2	2.1
Chemistry	1	.7	0	00
Computer Studies	1	.7	0	00
Engineering	15	11.2	1	1.1
Food Science	3	2.2	-	-
Medicine	20	14.9	19	20.2
Bio-Chemistry	-	-	1	1.1
Food and Nutrition			1	1.1
Geology	-	-	3	2.1
Molecular biology	-	-	1	1.1
Natural resources	-	-	1	1.1
Demography	1	.7	-	-
Development Studies	1	.7	3	3.2
Economics	15	11.2	4	4.3
Law	5	3.7	8	8.5
Philosophy	1	.7	-	-
Social work	1	.7	-	-
Mass Communication	-	-	1	1.1
Public Administration	3	2.2	1	1.1
Not applicable	49	36.6	32	34.0
Not stated	13	9.7	17	18.1
TOTALS	134	100.0	94	100.0

From the table, we can see that gender disparities by field of study in sciences have continued apart from geology and medicine. In Medicine, there is near parity between female and male respondents that intended to major in it. While in Geology only female

respondents wanted to specialise in it. Only one female of those students who responded indicated that she wanted to venture into engineering.

When asked why they wanted to major in a given field, the students gave varied responses as shown in table 11.

Table 11: Percentage Distribution of Students' Reasons for Choice of Field to Specialise in (Source: Field Data).

CATEGORY OF RESPONSE	GENDER		TOTALS
	MALE	FEMALE	
Parental/Guardian Advice	2.9	2.5	5.4
Personal Interest in Field	15.9	16.3	32.2
Peer pressure	0.4	0.4	0.8
Job Prospects after completion	11.3	3.0	14.3
Advice received during 1st years' Orientation at UNZA	0.8	0.4	1.3
Performance	0.8	0.0	0.8
Not stated	5.4	6.7	12.1
Not applicable	17.2	15.9	33.1
TOTALS	54.8	45.2	100%

The figures in the table show that the majority of the respondents (32.2%) intended to specialise in particular fields out of personal interest in that field. The difference in percentage between female (16.3%) and male (15.9%) respondents is minimal probably signifying similar considerations when making choices of field of study. The percentage of those who responded that job prospects after completion influenced their choice was 14.3%. More male respondents (11.3%) than females (3%) were in this category. Very few students attributed their choice of intended major to parental/guardian advice, peer pressure and

advice received during orientation. The high percentage of “non-applicable” is because of the students in the School of Education who were not supposed to respond to this question. These were excluded from answering because they were considered to be in quotas already, that is, pursuing a subject area.

From tables, 9 and 11 we see that many respondents alluded to personal interest in a field of study as being responsible for their choice. The source of this desire to major into a field due to personal interest could be a result of the students’ intrinsic qualities, personal motivation or social pressures, which have conditioned them to like these fields. Byrne (1987) argues that girls’ vocational aspirations in adolescence are strongly affected by the opinions and attitudes of their male peers. She further argues that the socialisation process at school makes boys accept the breadwinner status and consequently choose subjects for vocational reasons. Whereas, girls are more likely to be influenced in subject choice or decisions about drop out or retention, by personal interest rather than perceptions of career relevance or vocational motivation. However, a large number of both males and females in my sample cite personal interest as the reason for their choice whether they are in science fields or art-based. Kelly (1994) and Moore (1987) argue that the choice of field of study is predetermined by a set of factors such as educational preparation, parental attitudes and personal motivation. It must be noted that there are differences within the sexes in areas of cognition, traits of social and aspirational behaviour. I cannot conclusively state the source of my respondents’ personal interest and would thus recommend further research on it.

In Namibia, Mostert, Kyter and Scott (1999) found that University of Namibia students ranked job availability high as the most important factor in the selection of a career. Only a few chose a career out of personal interest. The perceived status and salary prospects

were ranked second to job availability. The difference in the findings is interesting, as one would have expected job availability to be ranked highly by my respondents given the reduced job market in Zambia due to the restructuring of the economy.

The students in the sample were asked about their opinions on why females are generally under-represented in science and technology fields at the University of Zambia. Their responses on what they attributed females' low participation in science fields are given in table 12 below. These responses were categorized as follows; ability, lack of interest, poor background in sciences, stereotyping, traditional and cultural values, lack of confidence, low female admission rate and lack of role models.

Table 12: Percentage Distribution of Student Responses on their Opinion about Why Females are Under represented in Science-based Programmes at UNZA (Source: Field Data).

CATEGORY	GENDER		TOTAL
	MALE	FEMALE	
Ability	21.8	12.1	33.9
Lack of interest	10.0	8.8	18.8
Poor background in sciences	1.7	-	1.7
Stereotyping, traditional and cultural values	10.5	13.8	24.3
Lack of confidence	7.5	6.3	13.8
Low female admission rate into UNZA	1.3	0.4	1.7
Lack of role models	0.4	0.4	0.8
Not stated	1.7	3.3	5.0
TOTALS	54.8	45.2	100.0

The figures in the table show that more respondents (33.9%) felt that females lacked the ability to pursue science related programmes. An examination of this group of respondents

reveals that more male respondents (21.8%) than females (12.1%) held this view. This disparity could be from the male respondents' feeling that females are less able in sciences. Scholars such as Sinyangwe and Chilangwa (1995), Kelly (1987) and Duru-Ellat, (1995) argue that differential encouragement by teachers at secondary levels tends to enhance males' perception that science is their domain. Morgrade and Bonder (1995) argue that the socialisation of women at home and at school makes girls regard Mathematics and Sciences as being harder for them than it was for boys. *Girls, thus tend to feel excluded from this domain* (Harding, 1992). To the contrary, the females in this study did not feel lack of ability was the cause of their under-representation. This bears witness to the argument made earlier by Lynn and Hyde (1989 in Harding, 1992) that there is no empirical evidence that females were biologically less intelligent than males. In a subsequent section on performance in Grade Twelve Examinations, in this study it was observed that some girls out performed males even in sciences.

About 13.8% of the female respondents in this sample felt that stereotypes, traditions and cultural values were a stumbling block to their colleagues' participation in science fields of study. Only 10.5% of the males gave this reason. It must be noted that these female respondents are not saying they were affected by stereotypes in their choice of field of study. But at a general level they felt some females are hindered by stereotypes. It is worth noting that the reasons commonly put forward by some scholars, such as lack of role models, and poor background in sciences, were not highly regarded by the female respondents as being responsible for their under-representation. A paltry 0.4% cited poor background in Sciences. The percentage difference between male respondents (10.0%) and females (8.8%) that felt that females lacked interest in sciences was negligible. This shows that females are

interested in sciences but the cause of their under representation could be due to other factors. For instance, Banister (1993) argues that there is evidence that girls and boys learn mathematics and science for different reasons and hope to use the knowledge and skills gained for different purposes. Therefore, the participation of females in science programmes could at a certain level be at the mercy of the females' personal interest. The difference in percentage between female respondents (6.3%) that did not think their lack of confidence was a major issue as compared to male respondents (7.5%) was minimal.

The role that parents played in the career choices of the respondents was also assessed. This role was in the form of career advice or as a source of information about fields of study available at the University of Zambia. The majority of the students in this study, (63.2%), said that neither their parents nor guardians influenced their choice of field of study. Only 36.8% said parents or guardians influenced them. Of the 36.8% who said their guardians or parents influenced them, 19.7% were females while 17.2% were males. The parents or guardians' influence was mainly in form of advice on what the respondents should study at UNZA. This finding is in contrast with Mutukwa et al (1995) and Sanyal et al (1976) who argue that parents play a major role in their children's choice of career. Unlike Mutukwa and Sanyal, Bradouille (1981) argues it is the students' educational experience rather than family background that shape their career choices. Probably my respondents' personal interest in the fields they chose was as a result of this educational experience Bardouille is talking about.

However, though the respondents said their parents or guardians did not influence them, one cannot completely remove the parents' or guardians' role in shaping the lives of their children. This is supported by Bwali's (1990) argument that the home