GENDER IMBALANCES IN ENROLMENT AND RETENTION IN TECHNICAL AND SCIENTIFIC TRAINING, 2000-2004: A CASE STUDY OF ZASTI AND LUSAKA BUSINESS AND TECHNICAL COLLEGE

By

Shadreck Zulu

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Declaration

I, Shadreck Zulu declare that this dissertation represents my own work and has never been submitted for any academic award at the University of Zambia or another University elsewhere. All published work or materials used in this report have been acknowledged.

Signed:.....

Date :....6TH JUNE 2008.....

Certificate of Approval

This dissertation by Shadreck Zulu is approved as fulfilling the requirements for the award of the Degree of Master of Arts in Gender Studies of the University of Zambia.

Examiners' Signature

1..... Date 06/06/08

2..... Date 06/06/08

3..... Date 06/06/08

Abstract

The study sought to examine gender imbalances in enrolment and retention in technical and scientific training at Zambia Air Services Training Institute and Lusaka Business and Technical College. An assessment was made of the relative performance of both male and female students and the attitudes of staff and students towards female participation in technical and scientific training. An attempt was made to explore the development of formal education and skills training and establish the factors that lead to gender disparities in technical and scientific training in Zambia.

The genesis of gender disparities in technical education and skills training could be traced to the practice of subject specialization on the basis of sex which was highly marked during the formative stage in the establishment and development of mission schools and skills training centers in Northern Rhodesia.

A sample of 66 student respondents and 20 administrative and academic staff was used. Enrolment lists were used to draw a random sample of 22 female respondents in non-technical courses and 22 males in technical courses. 22 females in technical courses were purposively selected. In-depth interviews were used for females in technical courses and administrative and academic staff, who were key informants. Questionnaires were administered to female and male students in non-technical and technical programmes respectively. Quantitative data was collected by reviewing enrolment and examination records. Statistical analysis was done using SPSS. Frequency distribution, percentages, graphs and tables were used to depict summaries of numerical data.

A comparative analysis of female and male enrolment showed that female enrolment was particularly low in technical and scientific courses, making them traditionally male dominated fields. However, enrolment was predominantly female in non-technical courses deemed feminine or domestic oriented, such as secretarial. The proportion of male students who dropped-out of technical and scientific courses was generally slightly lower than for females.

The prevalence of social and cultural biases such as sex-stereotyped beliefs and practices constrained female participation and progression in technical training and occupations. The preference for non-technical courses and occupations among females was attributed to the poor background in science and mathematics, which instilled a sense of inferiority or lack of confidence among females. Domestic chores were also identified to be a major obstacle to female participation and success in technical and scientific courses and careers. Finally, despite the removal of formal and institutional barriers, informal barriers such as cultural biases and social expectations that domestic and care-giving roles were female preserves undermined female entry in technical and scientific courses and fields.

Nearly half of the female respondents in technical and scientific programmes and a large proportion of administrative and academic staff contended that the relevant authorities had not instituted any effective measures to promote female participation in science and technological fields. The selection policy, which reserved 30 percent of places for females as well as sensitization campaigns or encouragement, were identified by nearly one-third of the respondents to be the most effective measures instituted to promote female entry and success in male dominated courses.

Dedication

To my wonderful mother, Mrs. Elizabeth Mesho Zulu, for always being there for me; my dear wife, Gertrude Mukinda, for your love, patience and support and for giving me the courage to persevere and 'weather the storm' of life; Ngawa and Kalumbu, my children, for giving me joy; my sisters, for believing in me especially during those difficult times following the death of our dear father.

I dedicate this work in loving memory of my late father, Mr. George Chipanzawe Zulu, who laid a good foundation for my education and my late uncle, Dr. Kelvin M. Kayawe, who encouraged and supported me during the formative stages of my secondary education and my late sisters, Bridget and Velica Zulu who showed great love for other people and were a source of inspiration to me during the trying moments of my life.

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Acronyms and Abbreviations

ADB- African Development Bank

BSA Company- British South African Company

CTEVT- Commission for Technical Education and Vocational Training

DTEVT- Department of Technical Education and Vocational Training

GIDD- Gender In Development Division

LBTC- Lusaka Business and Technical College

MOFNP- Ministry of Finance and National Planning

MSTVT- Ministry of Science, Technology and Vocational Training

PLUSH- Plumbing and Sheet metal

SPSS- Statistical Package for Social Science

TEVETA- Technical Education, Vocational Entrepreneurship Training Authority

TEVET- Technical Education, Vocational Entrepreneurship Training

UNESCO- United Nations Education, Scientific and Cultural Organisation

WOPS- Water Operations

ZASTI- Zambia Air Services Training Institute

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CHAPTER ONE: INTRODUCTION

1.0 Background to the Problem

From its inception in the early 1920s, skills training and technical education in Northern Rhodesia (now Zambia) came with subject specialisation on the basis of sex. Thus, the colonial syllabus offered girls needlework and domestic science while boys were given crafts and technical courses. This tradition continued until the 1986 curriculum review paved way for girls to take practical subjects, which were previously reserved for boys (Malambo and Ntalasha, 1999). McGrath (1976:24) amply demonstrates that girls in many developing countries had limited access to technical and scientific training, and were mainly confined to "domestic courses". Indeed, sex differentiation can also be seen in formal employment and the home owing to patriarchal tendencies.

This study is an attempt to explore female involvement in technical and scientific training in selected TEVETA colleges offering mainly technical and scientific courses. It relates to training in an area that has been male dominated since the inception of technical and vocational education in the colonial era. In the wake of efforts to promote women's empowerment and improve female participation in the development process, the need to examine gender imbalances in technical and scientific training by taking cognisance of historical, cultural and socio-economic factors that militate against equity concerns cannot be overemphasized. Inequalities of access of females to technical and scientific training in part had their beginning in the lower levels of education. This was particularly evident in secondary schools, where subject specialisation on the basis of sex was highly marked, as technical subjects were predominantly male subjects while home economics and needlework were female domains. In order to set the stage for a thorough discussion of technical and scientific training in Zambia, it is necessary to give a brief overview of technical and vocational education, and explore its link to the lower levels of education and the socio-economic environment.

1.1 An Overview of Technical and Vocational Education in Zambia

During the colonial era, Africans were denied access to higher technical education despite the fact that vocational and trades training were seen as a way of uplifting village life (Carmody, 2004:148). Mwanakatwe (1974:90) takes the argument further with the assertion that limiting educational opportunities for Africans was a strategy employed by the colonial government to "sustain the myth of the white man's superiority". Thus, skills training centres for Africans focussed on the provision of skills for manual and menial jobs such as building, carpentry, plumbing and other crafts. The high status technical jobs in the mines and industry were mainly a preserve of Europeans.

It is against this background that the underdevelopment of secondary and higher education, which to a large extent was exclusively male, brought serious developmental challenges at the dawn of independence in Zambia. Government's publication of its manpower report gave a clear picture of the educational and manpower needs of the country. As noted in the Republic of Zambia's "Manpower Report" of 1966, there were four main problems that the country faced at independence. In the first place, there was a critical shortage of educated and skilled personnel. Secondly, there was excess unskilled labour, well beyond the available jobs in the formal sector. Thirdly, there was a problem of negative attitudes emanating from the values of the colonial past, which ultimately encouraged the bias against technical skills and manual work. Lastly, the government and the private sector were extremely dependent on expatriate staff for skilled labour (Republic of Zambia, 1966:1).

With the attainment of Zambia's independence, there was a general drive to increase educational opportunities for Zambians. Education was seen as a vehicle for economic development, that is, through the promotion of literacy and the provision of skilled personnel. Over the years, efforts aimed at achieving universal primary education led to phenomenal growth in educational enrolment especially during the years of economic prosperity following independence. As a result, the rapid expansion in primary and secondary education and the rapid population growth also brought immense pressure for increased educational opportunities in higher education. In relative terms, the greatest increase in enrolment at tertiary level occurred between

1960 and 1970 (World Bank, 1989:13). However, with the economic malaise of the mid 1970s, came budgetary constraints in financing education and the general decline in economic investment leading to high levels of unemployment.

In technical and vocational education, the great emphasis placed on the provision of skills training to fill the "manpower" gaps in government and industry arising from the departure of the colonial administration meant that gender issues like equity were not taken up. In addition, the system of technical and vocational training adopted by newly independent states was modelled on the European system despite the glaring differences in socio-cultural conditions between Africa and Europe (Atchoarena and Delluc, 2002:37). Consequently, access to resources and decision-making was skewed in favour of men.

1.2 Origins of Technical and Vocational Education in Zambia

This section gives a historical account of the origins of technical and vocational education in present day Zambia, from the time of the early missionaries to the post-independence era.

1.2.1 Missionaries (1880s -1964)

Following the explorations and death in 1873 of the Scottish missionary David Livingstone, European expeditions into Central Africa received great impetus particularly during the period between 1878 and the close of the nineteenth century, culminating into the entry of seven missionary societies into the territory that later became Northern Rhodesia (Snelson, 1990). The beginning of technical and vocational training in present day Zambia can be traced to the establishment of skills training centres by these missionaries. A Plymouth Brethren missionary, Frederick Arnot, opened the first school in Barotseland in 1883. Later on, other missionaries set up schools, which offered general education, as well as technical and vocational education. Apparently, this seemed unavoidable because African labour was required in the building of mission stations, churches and schools. The missionaries also wanted to provide education and practical training to Africans as a way of discouraging evil practices such as witchcraft, divination and superstition, which were widespread in traditional African society.

Therefore, training centres for carpentry, brick laying and artisan work were established at mission stations such as Mambwe mission in 1890 under the White Fathers; Kawimbe in 1890 under the London Missionary Society; Mwenzo in 1897 under the Free Church of Scotland, and Mbereshi mission in the 1890s under the London Missionary Society. Mbereshi, under the leadership of Reverend Freshwater and later Bernard Turner concentrated on industrial training and "constituted the first systematic attempt at trade-training in the country" (Snelson, 1990:36). Some missionaries like Reverend Jones of the London Missionary Society saw the teaching of better methods of agriculture as an important way of improving people's livelihood and this led to the opening of an agricultural training centre at Kambole in 1894 (Snelson, 1990:13). In 1918, Reverend John Fell of the Primitive Methodists opened the Kafue Training Institute, which provided a teacher training course that also included practical work such as type writing, carpentry, agriculture and building techniques. From the outset, mission schools only offered education and training for males, and it was not until the passage of three decades that girls' education began to take root.

In 1915, the London Missionary Society opened Mable Shaw girls' school at Mbereshi, which later initiated nursing training for girls. The Paris Evangelical Mission started a small girls' boarding school at Sesheke in 1916, and a decade later, a central boarding school for girls was opened at Mabumbu, even though initial public response was characterised by apathy and indifference, (Snelson, 1990). Thus, the genesis of gender inequality in education provision can be traced to this formative stage in the development of missionary education as social and cultural barriers impeded female access to education. Hence, industrial training was tailored for boys and men while girls were generally offered training, which concentrated on domestic science and care-giving roles such as sewing, cookery and nursing.

Up to the time of independence in 1964, missionaries were the dominant players in the provision of education in Northern Rhodesia. The resilience of missionaries in promoting girls' education paid off when successes were scored at mission stations such as Mbereshi, Chilubula, Kayambi, Chipembi and Mabumbu. Indeed, with the breaking of social and cultural barriers that hindered girls from accessing education, great strides were made in the development of girls' education. For instance, the

London Missionary Society through the work of Mable Shaw broke new ground in the development of girls' education in the country. The education provided by Mbereshi girls' school attracted a lot of girls as it was deemed suitable and relevant to girls' future roles as mothers and care-givers. Additionally, positive traditional practices like initiation ceremonies were appreciated as useful for "sex education and preparation for marriage" (Snelson, 1990:37). The first girls' secondary school was opened at Chipembi in 1946 and offered academic education besides practical training in courses that were deemed feminine or suitable for girls, for example child welfare and mothercraft (Snelson, 1990:215).

1.2.2 British South African Company (1890 – 1924)

The British South African (B.S.A) Company took over the administration of North-Western and North-Eastern Rhodesia in 1890. Following the amalgamation of the two territories in 1911, Northern Rhodesia was established. The British South African Company did very little if anything as regards the development of technical and vocational training in Northern Rhodesia. During the whole period of its administration, the B.S.A Company only established one school known as the Barotse National School, opened in 1906. The school curriculum combined academic subjects and industrial training in brick laying, carpentry and forestry. Unfortunately, the school only catered for boys. In 1917, the Litunga (paramount chief of the Lozi) made a plea for the establishment of a girls' school but the B.S.A Company showed indifference and apathy to such calls (Snelson, 1990). In the three decades of B.S.A company rule, missionary education was denied financial assistance, as the company was not interested in promoting the educational development of the Africans. The thirty-four years of the company's neglect of African education led to serious consequences that hampered the country's development (Snelson, 1990:123). On 31 March 1924, Northern Rhodesia came under the authority of the colonial government after the B.S.A Company handed over the territory.

1.2.3 The Colonial Government (1924 -1964)

When the colonial government took over control of Northern Rhodesia, the Barotse National School became the first government run educational institution for Africans. In order to promote education, immediate steps were taken by the government, including the enactment of the Native Education Ordinance in 1924. This prescribed

programmes and duration of study in all schools (Snelson, 1990). In 1925, the Phelps-Stokes Commission made recommendations on the need for practical training that would help the Africans improve their lives in villages. The colonial government's focus was placed on promotion of technical courses and agriculture.

To improve standards and coordination in the provision of education, the sub-department of Native Education was established in 1925 to undertake school inspections. Renewed interest in the provision of girls' education led to the opening of three new schools for girls at Chilubula mission, Mabumbu and Kayambi in 1926 and another at Chipembi in 1927. A year later, Mwenzo girls' school was reopened after having been closed due to lack of staff. In 1927, Mbereshi mission working with Mable Shaw girls school initiated a nursing and midwifery training programme which catered for girls doing their final year (Snelson, 1990).

In 1929, with Geoffrey Chitty Latham as director of the sub-department of Native Education, plans were put in place to train Africans as teachers, clerical workers, agricultural demonstrators, medical assistants and craftsmen. In the same year, a Jeannes training centre was opened in Mazabuka to train teachers to run schools. Thus, colonial government's involvement in the running of technical and vocational training institutions can be traced to 1930 when a Jeannes school and agricultural technical institute were set up in Mazabuka. However, the agricultural school was short-lived and closed in 1932. Following G.E Hunt's visit and advice on technical training, the Central Trades School was opened in Lusaka in 1933 to train artisans for the labour market. Prior to this, only the Barotse National School, Mbereshi and Sefula mission stations provided industrial training geared for the labour market while crafts training for work on mission stations was widely practiced (Snelson, 1990:216). Later, a trades school to train carpenters and builders was opened in 1935 at Munali, which later became Hodgson College. In May 1939, a new teacher-training centre was opened at Chalimbana, and the courses that were once offered at the Jeannes School in Mazabuka and Munali were transferred to Chalimbana.

From the outset, the colonial government preferred the provision of training in cheaper courses such as carpentry and building trades as opposed to advanced courses in technical fields such as engineering. An Apprenticeship Ordinance, which only

catered for Europeans, was established by 1943. In the same year, Mwekera training centre was opened in Kitwe to provide trades training in carpentry and brick work instruction. The colonial government also set up similar trades schools in Mufulira, Luanshya and Kitwe. Following the example set by missionaries, some government schools also provided carpentry and brick workshops for trades training. By the end of 1957, Hodgson Technical College (now David Kaunda Technical High School) was the leading institution for technical training in Northern Rhodesia. It offered a variety of courses such as plumbing, mechanics, painting, electrical wiring, brickwork and tailoring (Mwanakatwe, 1974:30).

Later, the Northern Technical College was established in 1960 to offer technical training. In spite of all the efforts made to promote education, technical education was not well developed during the colonial era. By 1963, there were thirteen trades schools- eight run by government and five by voluntary agencies. Racial discrimination and the low value placed on technical training were major concerns, which hampered technical and vocational education. With the expansion of academic education, under-enrolment became a serious challenge in technical and trades training schools as the institutions failed to attract new entrants (Kelly, 1999). In the period leading to Zambia's independence, trades schools were therefore shunned as many people opted for white-collar jobs. The post independence era continued to witness stigma against technical courses and this could have contributed to the delay in the development of technical and vocational training in Zambia (Mwanakatwe, 1974).

1.2.4 Trends in the Development of Technical Education: CTEVT, DTEVT and TEVETA

Great impetus was given to formal education during the post independence era and with the enactment of the 1966 Education Act, the government took control of the education system. The Ministry of Education was also given the mandate to oversee technical and vocational training in Zambia. Efforts were made to provide more educational opportunities for Zambians. Although the post-independence era brought increased educational opportunities for Africans, the bias towards academic courses and the resultant preference for white collar jobs still continued and resulted in technical and vocational education being undervalued and less developed.

Consequently, Mr. W.A.B. Saunders, a Canadian technical expert was given the task of critically reviewing technical and vocational education, and making recommendations on what course of action was needed to improve the situation. In 1967, Saunders' report recommended the introduction of full-time pre-employment training, the abolition of apprenticeship, the provision of training for technical and vocational teachers and the promotion of technical education through fostering of the right attitudes to training in technical fields (Kelly, 1999:14).

Thus, the deficiencies in technical and vocational training were recognized. To overcome the bias towards academic courses and white collar jobs, and owing to the need to promote technical education, Saunders went further to recommend the de-linkage of technical and vocational education from the Ministry of Education so that such training would exist under an independent authority. This culminated in the establishment of the Commission for Technical Education and Vocational Training (CTEVT). In 1969, the government came up with a statement of intent and policy regarding the reorganisation of technical education and vocational training. Arising from this, it was envisaged that technical and vocational training would be centrally planned and well coordinated with the view of improving training so as to produce competent and skilled technical personnel essential for industrial and economic growth (Kelly, 1999:118). However, the technical and vocational training policy, which was formulated in 1969, saw skills training as a "continuation of the formal education system" and did little to address the gender disparities in training provision (Ministry of Science, Technology and Vocational Training, 1997:3).

Technical and vocational training was thus solely focused on the training needs of the formal sector of the economy. It was not until 1972 when the Technical Education and Vocational Training Act came into existence that technical education was delinked from the Ministry of Education, and soon after that the Department of Technical Education and Vocational Training (DTEVT) took over the running of technical education in Zambia. From its inception, the DTEVT was charged with the task of instituting a comprehensive and integrated national programme in technical education and vocation training. It was also expected to administer all technical and vocational training institutions. The DTEVT's principal aim was to facilitate the

supply of skilled personnel essential for the present and future needs of the labour market. Nevertheless, entrepreneurship skills and gender issues were ignored.

When it however became apparent that the training offered did not meet the changing needs of the country, a new Technical Education, Vocational and Entrepreneurship Training (TEVET) policy was formulated in 1995 and technical and vocational training came under the Ministry of Science, Technology and Vocational Training. To make training more responsive to the changing skills demands of the country, the ministry formulated a new policy, which recognised the significant role played by entrepreneurship skills in the development process. In 1996, DTEVT was restructured and changed to Technical Education, Vocational and Entrepreneurship Training (TEVET). With the passage of Act no. 13 of 1998, TEVET was transformed into a regulatory body known as Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA). In the TEVET strategic paper of 1997, the Zambian government committed itself to the provision of training, which aimed at minimizing inequalities among people (MSTVT, 1997). As stated in the National Gender Policy of 2000, the Zambian government instituted a Science and Technology Council, tasked to increase the number of females taking science and technical subjects at all levels through the identification and elimination of factors that militate against female participation and progression in science and technological fields (GIDD, 2000).

According to the TEVET policy, the promotion of equity in educational and training provision is a central theme requiring attention in order to overcome gender imbalances. Therefore, the TEVET policy seeks to promote increased "female participation in male dominated programmes" (MSTVT, 1997:44) by among other things providing scholarships for females to enter science and technical training institutions, mounting publicity and awareness campaigns, and encouraging girls to take science and technical subjects. In a nutshell, institutional and formal barriers to educational inequality have been removed arising from the recognition of the need for equal participation of women in national development (GIDD, 2002).

1.3 Statement of the problem

Female enrolment in technical and scientific programmes at tertiary level in Zambia constituted less than 25 percent of total enrolment in 2000. In contrast to the Zambian scenario, evidence from other Southern African countries such as South Africa (42 %), Lesotho (50 %) and Mauritius (51 %) show that females are well represented in scientific and technical courses (UNESCO, 2003:81-82). Given this gap in technical and scientific training, it is essential to explore the reasons for female under representation. This study therefore sought to establish the factors that lead to gender disparities in technical and scientific training in Zambia. It investigated obstacles that hinder female entry and participation in technical and scientific courses and examined the attrition rate and relative performance of both male and female students pursuing technical and scientific programmes in two selected colleges.

1.4 Objectives

1.4.1 General Objective

The major objective of the study was to assess gender imbalances in enrolment and retention in technical and scientific courses at ZASTI and Lusaka Business and Technical College during the period 2000 to 2004.

1.4.2 Specific Objectives

The specific objectives were to:

i. Identify barriers and obstacles hindering female education in technical and scientific training in tertiary institutions in Zambia.

ii. Assess the attitudes of staff and students towards female education in technical and scientific training.

iii. Assess female and male student's relative performance in technical and scientific courses.

iv. Investigate the strategies instituted to promote female enrolment in technical and scientific fields, and how successful they have been.

1.5 Research questions

i. What obstacles hamper female access and participation in technical and scientific training?

ii. What are the prevailing attitudes of staff and students towards female participation in technical and scientific fields?

iii. What is the relative performance of female and male students in technical and scientific courses?

iv. What factors influence women's career aspirations and selection of fields of study in tertiary education?

1.6 Significance of the study

The study assumes significance in the wake of rapid industrial and technological advances, which entail that scientific, technological and vocational skills are vital for increased productivity and entrepreneurship in society and thus necessitating female participation and involvement in technical and scientific training and occupation. Indeed, if women do not fully participate and have access to new technologies and skills training, they will be left out and remain at the periphery of human development. It was therefore intended that this study would bring to light gender disparities in enrolment, retention and achievement in technical and scientific training in selected TEVETA colleges. The knowledge obtained would be useful to policy makers, educationists and other stakeholders. It was also hoped that the information gathered would stimulate further research, and help in mainstreaming gender in science, technology and vocational training in Zambia.

1.7 Theoretical Framework

This study was guided by a feminist theory known as liberal feminism, which strives for the eradication of barriers that promote and sustain gender inequality. As a starting point, liberal feminism recognizes the existence of inequalities of power and resources between men and women and thus seeks to combat such inequalities. This feminist perspective holds that gender inequality is inimical to the interests of both men and women, hence the need to accord men and women equal opportunities and access to resources and social services, such as education. Liberal feminism incorporates both "a doctrine of equal rights for men and women and an ideology of social transformation" aimed at removing inequalities arising from discrimination and subordination" (Stromquist, 1994). Liberal feminists contend that there is need to promote gender equality and optimise efficiency by including women in all social fields in order to achieve sustainable development. They believe that this can be

achieved by reforming the prevailing social system, with a view of eradicating institutional bias. In a nutshell, any policy and practice, be it political, social or economic, should be gender sensitive in order to meet the needs of both men and women.

1.8 Operational Definitions

Enrolment refers to the admission and registration of students in an educational or training institution for a particular study programme in a particular year.

Entrepreneurship relates to the ownership and management of a business undertaking. It involves and promotes self-employment, that is, income generation through the establishment and running of businesses.

Gender denotes the social condition of being male or female. It refers to differences between men and women that are socially or culturally determined and therefore prone to change.

Gender stereotypes are over generalised beliefs that males and females possess distinct traits and characteristics by virtue of their sex. These are based on a socially determined model that contains the cultural beliefs about what a particular group of people considers appropriate behaviour for males and females. Gender or sex role stereotypes tend to define the way a group of people feels men and women should behave.

Gender imbalances refer to disparities or inequalities between males and females in socio-economic spheres of life. These inequalities are not based on differences in sex roles between men and women. Therefore, gender imbalances are differences in men and women's access to resources, services and status, often disadvantaging women.

Gender issues refer to the needs that emerge from gender inequalities.

Patriarchy refers to a society or system that is controlled or ruled by men. It gives power and importance to male values and institutions to the detriment of females.

Retention denotes the extent to which girls and boys are able to remain in school or college once they have been enrolled. Therefore, comparing the number of students who were enrolled in a particular study programme and the number of students who dropped out will provide a clear picture of the retention or survival rate.

Technical relates to the practical use of machinery scientific apparatus in industry. It refers to special, usually learned skills or knowledge especially in science and engineering. Thus, technical and scientific training aims at providing learners with technical skills and practical knowledge essential for the world of work; either as formal or informal sector employees.

1.9 Structure of the report

This report has five chapters. Chapter one covers the introduction, statement of the problem, objectives, research questions, significance of the study, theoretical framework and operational definitions. Chapter two deals with the review of literature related to the study. Chapter three discusses the methodology, which also covers the problems encountered and limitations of the study. Chapter four deals with the presentation and discussion of the research findings while chapter five covers the conclusion and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter presents a review of literature related to the study. Section 2.1 discusses female participation in higher education. Section 2.2 discusses the influence of the sexual division of labour on subject specialisation and occupational segregation. Section 2.3 presents gender imbalances in technical and scientific training at global, regional and national levels. Section 2.4 gives the historical background to differential access to technical and scientific training in developed and developing countries including Zambia.

The literature presented is significant to this study because it shows the levels and dynamics of gender inequalities in lower and higher education in Zambia, Africa and the world.

2.1 Female Participation and Involvement in Higher Education

It must be mentioned that much of the literature on education enrolment and progression has focussed on the lower levels of education. At the time of this study, not much work had been done to study inequalities in technical and scientific training in higher education in Zambia from a gender perspective. Therefore, some of the sources consulted dealt with female participation and involvement in general education. A number of studies (Assani, 1999; Bazargan, 2002; UNESCO, 2003) were identified to be of particular relevance because they provided greater insight into the genesis and nature of gender inequalities in higher education.

Assani (1999) explored the factors affecting women enrolled in the Department of Technical Education at the University of Zimbabwe and found that the classroom dynamics were gender neutral. He argued that historical and cultural factors and practices such as gender stereotyping encouraged girls to pursue traditionally feminine courses such as home economics and typing and thus contributed to female under representation in technical fields. However, Assani's study did not show the pattern of enrolment and retention in these courses.

Bazargan's (2002) study investigated female access to both public and private higher education institutions in Iran from 1978/9 to 1998/9. According to Bazargan (2002), comparing the proportion of female students to the total number of students is a useful indicator in measuring access to higher education. He observed that there was an increase in female access to higher education due to the formulation and implementation of policies such as selection policy changes geared at promoting female enrolment and participation in tertiary education and found that the proportion of female students in public and private higher education institutions increased from 29.6 percent and 37 percent in 1978-1979 to 41.9 percent and 46 percent respectively in 1998-1999. Similarly, the proportion of female applications and admissions to tertiary education rose from 21 percent in 1989 to 57 percent in 1999. However, Bazargan's study did not show the proportion of females admitted into various disciplines such as humanities, engineering, law, medicine and natural sciences. Another gap noted was that there was no discussion of the drop-out rates (attrition) of female and male students, thus no clear indication of the proportion of female students graduating from these institutions could be shown.

This study addressed these issues by focussing on female enrolment, retention and obstacles that hamper female participation in technical and scientific training. The relative performance of male and female students was also studied and finally the measures instituted by government to promote female participation in technical and scientific training were investigated.

UNESCO's (2003) 'Education for All Global Monitoring Report for 2003/4' revealed that female participation in traditionally feminine fields such as social sciences, 'service and health related programmes' has continued to record remarkable growth. The report also shows that growth took place in 'natural sciences and engineering and -outside Africa- in agriculture' even though the gender gap was still wide (UNESCO, 2003:82). However, UNESCO (2003) revealed that gender disparities were in favour of girls in some countries, notably in Latin America and the Caribbean, Europe and some Southern African countries. They presented evidence suggesting that countries such as South Africa, Namibia, Lesotho, Mauritius and the Comoros had comparatively high female enrolment in post-primary education, with females constituting a high percentage of student enrolment in science and technical courses.

They also found that Swaziland, Madagascar, Botswana and Kenya were approaching parity as females accounted for over 40 percent of total enrolment in tertiary education.

2.2 Influence of the Sexual Division of Labour on Subject Specialisation and Occupational Segregation

This section discusses the influence of gender-based division of labour on subject specialisation and occupational segregation. Since the study was concerned with technical and scientific courses, which used to be male preserves, two concerns emerged. Firstly, within the framework of the study, the researcher sought to understand how the female gender was alienated from science based fields. Secondly, an attempt was made to show how the division of labour and male dominance influenced the selection of fields of study and occupations on the basis of sex and ultimately contributed to gender imbalances in technical and scientific training.

The sexual division of labour refers to the allocation of work at home and in formal employment on the basis of sex differences. It identifies men with the public sphere and women with the private or domestic sphere of life. Assani's (1999) study examined constraints that impinged on female enrolment and performance in the technical education degree programme at the University of Zimbabwe. Assani established the academic background of female and male students and further argued that the sexual division of labour designates what should be considered work or non-work, production or consumption. Through this division of labour, the different social roles assigned differently to men and women at the household level were duplicated at the community level resulting in occupational segregation (in the workplace) and subject specialization (in educational institutions) on the basis of sex. Wilson and Boldizar (1990), Atchoarena and Delluc (2002) and UNESCO (2003) also showed that disparities in access to technical and vocational training as well as gender segregation in higher education were a reflection of the sexual division of labour, which allocates different tasks to males and females on the basis of the prevailing cultural norms, values and attitudes.

Lowe and Hubbard (1983) argued that the sexual division of labour designated the productive tasks, which women and men should pursue. These gender role

expectations influenced males and females to follow the paths that defined their masculinity and femininity, according to existing social convention. Thus, even before their reproductive sex differences appeared, children were socialised to accept the idea that there was ideal work for men and women, (Lowe and Hubbard, 1983). This is reinforced by Meena (1992) in her study of 'conceptual and theoretical issues in gender' in Southern Africa. She also found that gender stereotyping was a significant factor affecting female participation in education. Rogers (1980), Lowe and Hubbard (1983), and research by Mbilinyi and Omari (1996) on gender relations and the subordinate position of women in Tanzania reported that the trivialisation and undervaluing of women's work emanated from the sexual division of labour, through the social structures set up by patriarchal society. Noting that the sexual division of labour was a historical and social construct, Assani (1999) argued that there was nothing in a particular job that made it inherently male or female.

According to Rogers (1980), the sexual division of labour is both the cause and effect of the apparent dominance that males have had in socio-economic spheres of modern society. This system of male dominance undermined the self-esteem of the female gender and caused what Salper (1972) termed "psychic mutilations" and "trained incapacities" that undermined the position of women in all social relationships. Blakemore and Cooksey (1981) went on to argue that gender inequalities in education were a reflection of the unequal power relations between males and females in which males had the monopoly over higher positions in socio-economic and political spheres of life. They also point out that the largest gender gaps in educational enrolment are found in rural areas due to the importance of the sexual division of labour in village life.

Rogers (1980) further argued that it was with that position of dominance that the male promulgated ideas of what sex-appropriate behaviour females and males were to undertake in society and expected females to conform to the male stereotype of an 'ideal woman'. For example, owing to the notion that a woman's place was in the kitchen, it was expected that females would perform domestic chores while males took charge of the highly valued socio-economic roles and tasks. In a nutshell, studies by Rogers (1980) found out that this division of labour made males dominant and defined the gender roles, which females were expected to perform and these became

powerful constraints on girls or women's behaviour, translating into what Lowe and Hubbard (1983) termed "self-fulfilling prophecies".

The literature reviewed has demonstrated that these gender role expectations advanced by the dominant male set limitations on what females should aspire for by equipping them with skills that prepared them for service roles closely linked to their care-giving roles as wives and mothers, and also discouraged them from aspiring for roles and tasks that were deemed masculine. Salper (1972) for instance, observed that the female's tasks outside the home were usually connected to service and care-giving roles such as nursing. Similarly, a recent survey of non-formal training institutions in Lusaka from 1996 to 2003 by Mbae (2006) found that vocational training among women was concentrated in fields connected to their perceived household responsibilities. However, she also observed that there was a significant positive change as a few women were found to have enrolled in male dominated courses such as carpentry and electronics.

Therefore, the current streaming of girls and boys into arts and science, and occupational segregation are consequences of male dominance and the sexual division of labour within the home and family. This sex differentiation evident in subject specialisation at secondary and post-secondary levels of education led to female training programmes concentrating on fields that reflected their role as care-givers and underpin the sexual division of labour. In a nutshell, as observed by Salper (1972), this had a telling effect on educational and training opportunities, as women tended to develop skills associated with their role as wives and mothers. This was because the tools women used were defined by the skills and work they were allowed or expected to perform. Thus, the sexual division of labour traditionally pushed women into activities that were predominantly connected to unpaid work (at home) or low status positions. The sexual division of labour and male dominance, therefore, have been found to play an important role in the marginalisation of women in society, and hampered female involvement and participation in development, including education and training programmes.

Game and Pringle (1983), cited in Assani (1999) argued that on the basis of the sexual division of labour, fixed differences exist between women's work and men's

work. In conforming to the standards set through the prevailing cultural norms and values, females were in this case expected to choose different behaviour patterns from boys by fulfilling roles and functions considered appropriate to their status and position in socio-economic spheres of life. It was therefore expected that female students would select or aspire for training programmes or careers associated with their domestic and care-giving roles while non-domestic productive tasks such as technical and scientific jobs were considered to be male domains. But with the advances made by the feminist movement in promoting women's empowerment and challenging stereotyped beliefs and practices, one aspect of the current debate on gender disparities in the selection of fields of study is whether the challenges brought by the women's movement in the last 20 years can lead to serious changes in career choices and aspirations among women and men or be completely ignored.

UNESCO (2003) points out and rightly so, that an analysis of the 'gender patterns' in the selection of, or orientation towards specific areas of study was vital in understanding whether differences in the gender pattern in enrolment in different fields of study in higher education reflected gender preferences or were a direct consequence of social and cultural biases. This dissertation examined gender imbalances in technical and scientific training in Zambia and also sought to explore whether females were, like their male counterparts, offered equal opportunities to pursue training in fields that were scientific and technological in nature and thus opted for training in non-technical instead of technical fields out of preference or choice.

2.3 Gender Disparities in Technical and Scientific Training

2.3.1 Global Level

A growing body of research has shown that females were under-represented in subject areas that were scientific and mathematical in nature and thus making these fields traditionally male dominated (McGrath, 1976; Fishel and Pottker, 1977; Wilson and Boldizar, 1990; Tietjen, 1991; UNESCO, 2003). McGrath (1976), in an article entitled "The Unfinished Assignment: Equal Education for Women", argued that in many developing countries, girls had limited access to technical and scientific training and were mainly confined to 'domestic courses'. Similarly, Fishel and Pottker (1977) reported that a study done by Steiger and Cooper in the United States of America showed that less than 10 percent of females were enrolled in technical and vocational

training, equipping them to work in traditionally male dominated fields. Wilson and Boldizar's (1990) study on gender segregation in higher education examined the factors that accounted for the distribution of women and men across college curricular in the United States of America and found that women were underrepresented in fields that were mathematical in nature.

A more recent study by UNESCO (2003) revealed that, on a global scale, female participation and involvement was generally low in engineering and natural science based courses. For instance, the report showed that female tertiary students constituted less than 25 percent of total enrolment in technical and scientific programmes while those in art-related programmes accounted for about 38 percent of total enrolment.

In Indonesia, Hermawati and Luhulima (2000) studied women's involvement in science, engineering and technology in public and private universities in 1998 and 1999. They showed that there was high female enrolment and retention in mathematics, medicine, natural and social sciences, and under-representation in technology and engineering courses in both public and private universities. Female enrolment constituted 53 percent of total enrolment in mathematics and natural sciences, 43 percent in agricultural sciences, 61 percent in medical sciences, 49 percent in social sciences and 25 percent in engineering and technology in public universities in 1997. In 1998, enrolment in private universities was approaching parity, with female enrolment at 44 percent in medical sciences, 41 percent in agricultural sciences, 36 percent in social sciences while male dominance was evident in engineering and technology with a paltry 18 percent female enrolment (Hermawati and Luhulima, 2000).

2.3.2 Africa

Odu (1986), in her study of the changing cultural concepts in women's lives showed that female enrolment in Nigerian universities was high in the faculties of arts, social sciences and education whereas engineering, agriculture and veterinary medicine were predominantly male fields. For instance, she reported that female enrolment at the University of Benin was particularly low in engineering (2.5 %), medicine (16.4 %), and science (22.9 %) while education had a relatively higher female enrolment with

43.7 percent of total enrolment in 1982. A study carried out by Chawanje (1991) on women's involvement in science and technology in developing countries also reported that female students were under-represented in technical and science-based courses and occupations in many African countries as fewer girls accessed technical training.

Tietjen's (1991) study examined strategies required to increase female access, achievement and continuity in education. She found that repetition and drop-out rates in many African countries were higher for females than males, particularly in post-primary education and argued that this resulted in low female entry into the "more remunerative.... and perhaps productive fields such as science and mathematics", (Tietjen, 1991:1).

2.3.3 Zambia

A considerable volume of research has examined the genesis and occurrence of inequalities in education, especially those arising from segregation on the basis of race and gender. Mwanakatwe (1974), Snelson (1990) and Kelly (1999) suggested that historically, females have been poorly represented in post-primary education in Zambia, and critically so in traditionally male dominated programmes. With regard to enrolment and progression rates, a number of studies (Ministry of Education, 2002; Ministry of Finance and National Planning (MOFNP), 2002; Carmody, 2004) have also shown that gender disparities were highly marked at secondary and tertiary levels despite the enormous gains of the late 1990's made in increasing female participation in education in Zambia.

The literature reviewed on the level of female involvement in technical and scientific training demonstrated a low level of female enrolment and participation. For instance, Malambo and Ntalasha (1999) in their study of the enrolment pattern of pupils pursuing skills training programmes offered by the Department of Continuing Education in Zambia between 1991 and 1996 observed that craft courses such as carpentry and welding were male dominated. Kelly (1999) and Carmody (2004) also found that female enrolment in tertiary education in Zambia was particularly low in the 'hard sciences'. At university level, Carmody (2004) observed that females accounted for about 20 percent of university enrolment while only 5 percent of these were in science related programmes. At secondary school level, Sachingongu's (2002)

study observed that student enrolment in technical and pure science classes in technical secondary schools was predominantly male. Mbae's (2006) study of non-formal training institutions in Lusaka found that most women chose courses such as home economics, nutrition, pre-school teaching and tailoring while courses of a technical nature such as carpentry, radio and television repair were male domains.

2.4 Factors Accounting for Gender Disparities in Technical and Scientific Training

Research studies on gender inequalities in technical training (Harding, 1986; Chawanje, 1991 and Van Nostrand, 1993) identified a variety of factors that accounted for gender imbalances in education and training. Harding's (1986) study of barriers to female involvement in science and technology in the United Kingdom, Chawanje's report on women's involvement in scientific and technical projects in Africa and research by Van Nostrand (1993) on 'detecting gender bias, implementing intervention' have all demonstrated that the factors that constrained female participation in technical and scientific training rarely presented themselves overtly but operated covertly, a phenomenon referred to as the 'hidden curriculum'.

According to Odu (1986), traditionalism had been a major obstacle to the provision of girls' education in Africa. She echoed Boserup's (1970) argument that women's low levels of education emanating from the discriminatory educational policies of the early Europeans were worsened by the traditional ideology which saw the role of women as 'innate rather than cultural', resulting in a negative attitude towards girls' education among parents (Odu, 1986:225).

Studies by other scholars (Snelson, 1990; Kelly, 1999; and Malambo and Ntalasha, 1999) have also provided useful perspectives on the genesis of gender gaps in access to training and reported that inequalities in education were an offshoot of historical, cultural and political developments that have helped to marginalise women in Africa partly through education and training in exclusively domestic oriented programmes such as needlework and cookery. This is the background to the bias against girls evident in the development of curriculum tailored to prepare girls for domestic and care-giving roles while boys were availed opportunities to enter technical and scientific fields such as engineering, building work and carpentry.

Chawanje (1991) further argued that most African societies had widely held stereotypes that women could not do as well as men in science subjects and this reinforced female involvement in domestic and care-giving roles such as nursing, secretarial and home management and other fields deemed feminine. Similarly, citing examples of covert displays of male chauvinism in some technical institutes in the United States of America, Van Nostrand (1993) observed that male bias stereotyped women's interest and thus curtailed career preferences of female students in male dominated courses. She also argued that lack of female role models and the fact that males outnumbered females in education and training institutions resulted in feelings of isolation and alienation among women. Mbae's (2006) Lusaka based study on the 'impact of non-formal training on income generation and its gender implications' echoed this with the assertion that there were no female instructors in traditionally male courses resulting in lack of role models to draw women into such fields.

Harding (1986) and Malambo and Ntalasha (1999) went further to demonstrate that subject specialisation on the basis of sex was commonly practised in secondary schools, resulting in notable gender imbalances in technical and scientific training at higher levels of education. For example, Malambo and Ntalasha (1999) reported that as an offshoot of the colonial legacy, it was a common practice for boys' schools in post-independence Zambia to offer industrial arts and not have home economics facilities whereas the opposite was true for girls' schools. They further observed that arising from the 1986 curriculum review in Zambia which entailed the provision of equal opportunities for boys and girls, divisions or subject specialisation on the basis of gender were significantly minimised at the lower end of the educational spectrum.

Whyte (1995) reported that a school project known as 'Girls Into Science and Technology' (GIST) was established in the United Kingdom to investigate the reasons for girls' under-achievement in science and technology, and ultimately improve girls' performance in these fields by addressing among other things the problem of sex stereotypes at school. The study observed that three times as many boys as girls took physics at school while more than 90 percent of all entries in technical subjects were from boys. According to Whyte, this entailed that many schoolgirls were not eligible

for a variety of science related courses in tertiary education and thus unable to enter "occupations requiring a scientific and technical base" (1995:77).

Gesinde's (1986) study in Nigeria explored the influence of the student's socio-cultural background on career aspirations and choices; and posits that the family's socio-economic status impacts on family values, aspirations and in turn influenced career preferences and choices. In line with his postulation, he found that 56 percent of students in a Nigerian technical college were influenced by their parents and associates to pursue particular courses (Gesinde, 1986:211). Furthermore, Gesinde's (1986) review of the influence of type of school and curriculum on career preferences and choices showed that secondary school curricula content had been a significant factor influencing the choice of occupations among students in a commercial institute in Nigeria.

Blakemore and Cooksey's (1981) study looked at the factors that affected the provision of education in Africa and argued that gender inequalities in education needed to be analysed within the framework of general social, political and economic inequalities. Dauber and Cain (1981), and UNESCO (2003) supported this conclusion with the argument that, the structure of education in many countries negated female entry into scientific and technical fields in favour of fields traditionally considered feminine. They further concluded that female education rarely prepared the recipients for scientific and technical fields despite the recognition that science, technology and vocational training were essential for increased productivity and entrepreneurship in society.

The review of literature has shown the diversity and multiplicity of factors that account for gender imbalances in technical and scientific training, and a number of these factors were similar to those observed in this study. Of particular relevance to this study are historical and cultural factors and practices such as gender stereotyping and curricular content that encouraged girls to pursue traditionally feminine fields such as home economics, typing, and thus contributed to female under representation in technical and scientific fields. This study therefore aimed at establishing the gender gaps and factors that constrain female participation and success in such fields and account for gender disparities in technical and scientific training in Zambia.

CHAPTER THREE: METHODOLOGY

3.0 Introduction

This chapter presents the research methodology used in the study; the research design, sampling procedures as well as methods employed in data collection and data analysis are discussed.

3.1 Research Design

A descriptive study was carried out to enable the systematic collection of data. This also provided a clear picture of gender disparities in technical and scientific training by highlighting the gender gaps in enrolment, retention and performance in the period under study.

3.2 Study Site

The study was conducted in Lusaka and covered two selected colleges offering technical and scientific courses, namely ZASTI and Lusaka Business and Technical College.

3.3 Study Population

The study population consisted of female and male students and members of staff from the two colleges. Student respondents included male and female students doing technical and scientific courses and female students in art-related or non-technical courses. Administrative and academic staff handling technical and scientific courses were included as key informants.

3.4 Sample Size and Sampling Procedure

A total sample size of sixty-six students and twenty administrative and academic staff was used. There were twenty-two female and twenty-two male students doing technical and scientific courses, and twenty-two female students in art-related or non-technical courses.

A list of technical and vocational training colleges was got from the Ministry of Science, Technology and Vocational Training and on the basis of the courses offered, Lusaka Business and Technical College was selected because it offers a variety of

technical and art-related (non-technical) courses while ZASTI which only offers technical and scientific courses was selected to provide a contrast in the experiences of female students in technical programmes. At institutional level, enrolment lists were used to draw a random sample of participants in art-related (non-technical) courses and males in technical and scientific courses. Purposive sampling was used to select female respondents in technical and scientific courses with only one or two female students in order to draw on the experiences of female students in courses that were almost exclusively male. Stratified random sampling was used to draw the remaining number of female students in technical and scientific courses in order to ensure that the sample was representative. All technical and scientific courses (in Departments of Engineering and Civil Aviation) at ZASTI and all technical courses (in the Engineering Department) at LBTC were sampled.

3.5 Data Collection

The main research instruments were in-depth interviews and self-administered questionnaires. In-depth interviews were conducted for 22 female respondents pursuing technical and scientific courses in order for the participants to express themselves verbally and highlight their experiences. Administrative and academic members of staff were also interviewed. In-depth interviews were found to be appropriate in eliciting information that would depict the personal experiences of the respondents and illustrate their views on issues relating to female participation and progression in technical and scientific courses. To assess the attitude of other students towards female students doing technical and scientific courses, questionnaires were given to 22 female students in art related (non-technical) courses and 22 male students in technical and scientific courses. Questionnaires were also found to be an appropriate tool for data collection in this study because the respondents were literate and could therefore respond adequately to the issues raised in the questionnaire. Quantitative data was collected by reviewing registers, enrolment lists and examination records.

3.6 Pilot Study

In order to test the efficacy of the instruments selected for data collection, a pre-test was carried out at Zambia Air Services Training Institute (ZASTI) in September 2005. The data collection tools used were in-depth interviews, questionnaires and

focus group discussion. The pilot study was a small-scale version of the study, which helped to provide useful information for improving the main study. The data from the pilot study was scrutinised and appropriate changes were effected. Some items were deleted from the research instruments while others were rephrased for the sake of clarity. Arising from the pre-test, it was observed that the use of the in-depth interview and questionnaire as the main data collection tools generated enough data for the study. Hence, the focus group discussion was not used as a data collection tool in the main study.

3.7 Data Analysis

Data analysis commenced during the course of data collection. Research questions helped the researcher in identifying the major emerging themes arising from the data collection. Descriptive statistics were used to analyse numerical data through summaries such as frequency distributions, percentages and tables. The data collected was grouped according to data collection tools used. Statistical analysis was done using the Statistical Package for Social Sciences (SPSS). Microsoft excel was used to create graphs.

3.8 Ethical Considerations

Anonymity in this study was assured by not asking the respondents to show their names on the questionnaire. This helped in enlisting honest responses. To ensure that subjects participated voluntarily, informed consent was sought and details concerning the purpose of the study and the tasks inherent in participation were availed to all the participants.

The value of the research study as regards policy changes and evaluation was clearly spelt out. Attention was paid to privacy by ensuring that discussions took place in an environment that was conducive. Thus, focus group discussions discussed general issues and not personal disclosures. The researcher endeavoured to give a public voice to the findings by sharing participants' own voices.

3.9 Study Limitations and Problems Encountered During Data Collection

This study was limited by inadequate financial resources, which confined it to two TEVETA accredited training institutions providing technical and scientific training.

Therefore, the inclusion of more technical and scientific training colleges would have given more validity to the findings of the study.

Poor record keeping in the selected colleges hampered the smooth conduct of the study and made the collection of quantitative data difficult and time consuming. Enrolment data for non-technical programmes at LBTC was not available for 2000 and 2001, thus limiting the comparative analysis of student enrolment for non-technical programmes to the period 2002 to 2004.

CHAPTER FOUR: PRESENTATION AND DISCUSSION OF THE FINDINGS

4.0 Introduction

This chapter discusses the findings based on the objectives of the study. Section 4.1 presents the demographic and socio-economic characteristics of the respondents. Section 4.2 discusses the pattern of enrolment and retention while section 4.3 gives an overview of the relative performance of male and female students in technical and scientific courses at ZASTI and LBTC. Section 4.4 presents the attitudes of staff and students towards female education in technical and scientific training. Section 4.5 discusses the barriers and obstacles that hinder female education in technical and scientific training in Zambia. Lastly, section 4.6 presents findings of the investigation into the effectiveness of strategies instituted to promote female enrolment in technical and scientific fields.

4.1 Demographic and Socio-Economic Characteristics of Student Respondents

4.1.1 Age and Sex Distribution

The sample consisted of 66 respondents, namely 22 female students pursuing technical and scientific courses, 22 males in technical and scientific programmes, and 22 females doing art-related (non-technical) programmes. The respondents were all above 16years and below 36 years. Table 1 illustrates the age distribution of the respondents.

Table 1: Age structure by sex and courses, ZASTI and LBTC

Age Years	Females- Technical & Scientific courses		Females- Non Technical courses		Males-Technical & Scientific courses	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
16-20	5	22.7	1	4.5	2	9.1
21-25	16	72.8	18	81.9	15	68.2
26-30	1	4.5	3	13.6	4	18.2
31-35	0	0	0	0	1	4.5
Over 36	0	0	0	0	0	0
Total	22	100	22	100	22	100

Source: Field data

According to Table 1, the majority of the respondents were in the 21-25 years age group, accounting for 72.8 percent of females in technical and scientific courses, 81.9 percent of females in non-technical courses and 68.2 percent of males in technical and scientific courses. The 16-20 years age group had 22.7 percent females in technical and scientific programmes, 4.5 percent females in art-related or non-technical programmes and 9.1 percent males in technical and scientific programmes. In the 26-30 years age group, there were 18.2 percent males in technical and scientific programmes, 13.6 percent females in non-technical programmes and 4.5 percent females in technical and scientific courses. The least number of respondents was in the age group 31-35 years, that is, 4.5 percent for males in technical and scientific programmes and none for females in both technical and non-technical programmes.

Table 1 shows that female students in technical programmes were predominantly in the age groups below 25 years, with female technical students and their male counterparts constituting 95.5 percent and 77.3 percent of the sample respectively. There were also no students in the age groups above 36 years. Thus, female students in technical and scientific programmes were comparatively younger than their male counterparts, perhaps an indication that older women were less likely to aspire for and enter into technical and scientific programmes. There were also comparatively older students among females in non-technical programmes.

4.1.2 Marital Status

Information on the marital status was vital as a way of determining the family relationships or household obligations that students had during the course of their studies.

Table 2:Marital Status by sex and course, ZASTI and LBTC

Marital status	Male-Technical courses		Female-Technical courses		Female-Non technical courses	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
Single	22	100	21	95.5	18	81.9
Married	0	0	1	4.5	3	13.6
Divorced	0	0	0	0	1	4.5
Total	22	100	22	100	22	100

Source: Field data

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	Freq.	Percent	Freq.	Percent	Freq.	Percent
Single	22	100	21	95.5	18	81.9
Married	0	0	1	4.5	3	13.6
Divorced	0	0	0	0	1	4.5
Total	22	100	22	100	22	100

Source: Field data

Table 2 presents the marital status of male and female students in technical and scientific courses as well as females enrolled in non-technical courses and shows that (100 %) or all the male respondents were single while 95.5 percent and 81.9 percent of females in technical and non-technical programmes respectively were single. 4.5 percent and 13.6 percent of females in technical and non-technical courses respectively were married while one (4.5 %) of the females in non-technical courses was divorced. The findings show that there were more married women in non-technical programmes than those in technical courses, an indication that married women were more likely to aspire for or enrol in non-technical programmes due to the short duration of some non-technical courses which comprised six months, one year and two year programmes whereas technical and scientific courses were relatively longer, ranging from two to three years.

4.1.3 Occupational Status of Respondents in Technical and Scientific Programmes

The occupational status of respondents and their immediate families (parents or guardians) is shown in Table 3 and 4. Other comparisons based on the socio-economic status of respondents are shown in Table 5.

Table 3: Occupations of female students and their relatives

Occupations/ Family background	Mother		Father		Guardian		Self	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Formal employment	8	36.4	19	86.4	4	18.2	1	4.5
Informal employment	0	0	0	0	0	0	0	0
Unemployed	7	31.8	1	4.5	0	0	21	95.5
Entrepreneur	7	31.8	1	4.5	0	0	0	0
Deceased (N/A)*	0	0	1	4.5	18*	81.8*	0	0
Total	22	100	22	100	22	100	22	100

Source: Field data

Table 3 indicates that the majority of female students (95.5 % of respondents) were unemployed and therefore engaged in pre-employment training. However, the majority of respondents' fathers (86.4 %) were in formal employment while 36.4 percent and 18.2 percent of their mothers and guardians were in formal employment

respectively. None of the female students had parents or guardians engaged in informal sector employment while 31.8 percent and 4.5 percent of mothers and fathers respectively were unemployed. Table 3 also shows that 4.5 percent of female respondents were single orphans (lost their father) while 18.2 percent of female respondents received financial support from their guardians.

Table 4: Occupation of male students and their relations

Occupations/ Family background	Mother		Father		Guardian		Self	
	Freq	%	Freq	%	Freq	%	Freq	%
Formal employment	7	31.8	14	63.7	7	31.8	1	4.5
Informal employment	1	4.5	0	0	1	4.5	0	0
Unemployed	10	45.5	2	9.1	0	0	21	95.5
Entrepreneur	2	9.1	1	4.5	0	0	0	0
Deceased (N/A)*	2	9.1	5	22.7	14*	63.7*	0	0
Total	22	100	22	100	22	100	22	100

Source: Field data

Table 4 shows that 95.5 percent of male respondents were unemployed and therefore engaged in pre-employment training. However, 63.7 percent of their fathers, 31.8 percent of mothers and 31.8 percent of their guardians were in formal employment. A small proportion (4.5 %) of male students had mothers and guardians who were in informal employment. Table 4 indicates that there were more orphans among male respondents (9.1 % lost mothers and 22.7 % had no fathers) compared to 4.5 percent of female respondents who were single orphans (lost their father).

The findings also reveal that the majority of the students were unemployed and had parents or guardians who provided financial and material support to enable them pursue their studies. This demonstrates that the socio-economic status of the family and the availability of financial and material support could have had an influence on training and career aspirations of both male and female students in technical and scientific programmes. This is because the availability of finances to pay school fees and buy the required necessities was an essential factor enabling students enrol and pursue their studies. The study also found that the high cost of some aviation training programmes such as the pilot course affected the capacity of many people to apply

and pursue such training programmes at ZASTI. Although a few scholarships were available for vulnerable and needy students, these bursaries only catered for less expensive courses such as meteorology and air fixed operators. At LBTC, financial help (100 % and 75 % bursary schemes) was offered to students who failed to progress with education due to financial problems. Although gender neutrality was practised in the provision of bursaries to needy students, none of the female respondents in technical and scientific programmes were on a bursary with the exception of one of the female respondents who had secured sponsorship from her employers while 22.7 percent of male respondents were on a bursary. The standard procedure was that needy students would be identified after enrolment and commencement of the course. There was an indication that there were more needy students among male respondents than females who applied for assistance and were ultimately given bursaries.

4.1.4 Residence

Table 5 below shows the areas of residence of male and female respondents pursuing technical and scientific training at ZASTI and LBTC.

Table 5: Area of residence of Technical students by sex, ZASTI and LBTC

District / Residential area	Male students		Female students	
	Frequency	Percent	Frequency	Percent
Urban	20	90.9	22	100
Rural	2	9.1	0	0
Total	22	100	22	100
Low cost	2	9.1	0	0
Medium cost	12	54.5	14	63.6
High cost	8	36.4	8	36.4
Total	22	100	22	100

Source: Field data

Table 5 shows that the majority of students in technical courses lived in urban areas with males constituting 90.9 percent while 9.1 percent of males lived in rural areas. All the female students lived in urban areas. It also demonstrates that the majority of

respondents (54.5 % of male and 59.1 % of female) in technical programmes lived in medium cost residential areas. Low cost residential areas had the lowest number of students with 9.0 percent of male students and none for female students. Respondents from high cost residential areas constituted 36.3 percent of males and 39.1 percent of females in technical courses.

Table 5 shows that there were no female students in technical and scientific courses from rural districts and low cost residential areas, an indication that females from rural areas and low cost residential areas had limited access to technical and scientific programmes offered by the training institutions covered by this study. The study reveals that female students were mainly from middle and high class backgrounds while males came from all socio-economic backgrounds, with representation from low, middle and upper class families. This shows that females from underprivileged families had limited access to technical training. This is in line with Gesinde's (1986) finding that the socio-economic status and family background influenced people's values and affected their future career choices or aspirations. In a study on the determinants of vocational preferences among secondary students in Nigeria, Gesinde (1986) observed that 56 percent of students in technical colleges chose those vocational programmes owing to the influence of their parents and other people.

4.2 The Pattern of Enrolment and Retention in Technical and Scientific Training

In this section, the researcher disaggregated the data and discussed the pattern of enrolment and retention in technical and scientific programmes at ZASTI and LBTC.

4.2.1 Female Enrolment as a Proportion of Total Enrolment in Technical and Scientific Training

Table 6 presents female enrolment as a percentage of total enrolment in technical and scientific programmes at LBTC and ZASTI while Table 7 presents female enrolment as a percentage of total enrolment in non-technical courses at LBTC.

Table 6: Female Enrolment in Technical and Scientific Training, LBTC and ZASTI (2000-2004).

Institution	Year	2000	2001	2002	2003	2004
LBTC	Total Enrolment	175	168	244	253	287
	Female Enrolment	16	16	19	26	29
	Percentage of total	9	9.5	8	10	10
ZASTI	Total Enrolment	73	79	72	85	131
	Female Enrolment	12	9	11	15	28
	Percentage of total	16	11	15	18	21

Source: Field data

Table 6 above shows that there was generally low enrolment of female students in technical and scientific courses, as female enrolment did not exceed 10 percent and 21 percent at LBTC and ZASTI respectively. For instance, female enrolment as a percentage of total enrolment at LBTC was 10 percent in 2004, 10 percent in 2003, 8 percent in 2002, 9.5 percent in 2001 and 9 percent in 2000. Enrolment figures show that there was a gradual increase in female participation in technical and scientific programmes, with female enrolment rising from 16 students in 2000 to 29 students in 2004. However, the gap between female and male enrolment was still high because there was a substantial increase in male enrolment with increase in total enrolment after 2002. This explains why there was a slight decrease in the proportion of female enrolment (from 9.5 % in 2001 to 8 % in 2002) even though there was a relative increase in female enrolment figures from 16 to 19 students in 2002. Administrative and academic staff attributed the increase in the number of female students to the selection policy, which allocated 30 percent of places to female applicants who met the minimum requirements for admission.

Table 7: Female Enrolment as a Percentage of Total Enrolment in Non-technical Courses, LBTC (2002-2004).

Department/ Courses	2002			2003			2004		
SPECIAL EDUCATION	Total	Female	%	Total	Female	%	Total	Female	%
Food Production	22	21	95	22	21	95	22	18	82
Food and Beverage	16	14	88	19	19	100	18	15	83
Hair Dressing	9	9	100	9	9	100	12	11	92
Front Office	8	8	100	8	8	100	8	8	100
TOTAL	56	53	**95**	57	56	**98**	60	52	**87**
BUSINESS STUDIES									
Information Technology	8	3	38	5	3	60	37	16	43
Computer Studies	12	5	42	15	7	47	14	2	14
Human Resource Mgt	9	3	33	12	5	42	13	2	15
CCMA	11	4	36	10	4	40	37	13	35
Short hand (Secretarial)	28	28	100	24	24	100	29	29	100
TOTAL	68	43	**63**	66	43	**65**	130	62	**48**

Source: Field data

Table 6 demonstrates that technical and scientific programmes at LBTC were predominantly male as enrolment figures were around or in excess of 90 percent of total enrolment for males. By contrast, Table 7 shows that student enrolment in non-technical programmes such as secretarial, front office operations, food production and beverage was predominantly female, constituting 87 percent in 2004, 98 percent in 2003 and 95 percent in 2002. Some non-technical courses were exclusively female as there was no male enrolled in secretarial and front office operations while food production, and hair dressing and cosmetology were predominantly made up of female students. Thus, the study found that the highest proportion of female enrolment at LBTC was in non-technical programmes such as front office operations, hair dressing and cosmetology, food production, food and beverage and secretarial offered by the 'Special Education' and Business Studies departments.

Table 6 further shows that female enrolment in technical and scientific courses at ZASTI constituted 21 percent of total enrolment in 2004, 18 percent in 2003, 15 percent in 2002, 11 percent in 2001 and 16 percent in 2000. Enrolment figures during the period in which this study was undertaken show that there was a gradual improvement in female participation and involvement in technical and scientific training at ZASTI as the number of female students enrolled more than doubled, rising from 12 students in 2000 to 28 students in 2004. The study found that administrative and academic staff attributed the slight drop in enrolment figures (15 %

in 2002 and 11 % in 2001) to the small number of female applicants who met the minimum requirements for admission, which included passes in mathematics and science.

A comparative analysis of female and male enrolment at ZASTI and LBTC showed that the proportion of students enrolled varied based on the type of courses and gender. For example, at ZASTI, there was no female enrolment in aeronautical electronics in 2001, aircraft maintenance engineering in 2002 and 2003, private pilot course from 2000 to 2003, and rescue fire services in 2000, 2001 and 2003. The largest proportion of female enrolment at ZASTI was in courses such as meteorology and aeronautical fixed Operators.

As reflected by Table 7 which highlights female enrolment as a percentage of total enrolment in non-technical courses at LBTC, this study demonstrates that females were well represented in all training programmes that were domestic oriented or deemed feminine (enabling them to fulfil their stereotyped roles). This supports findings by Wilson and Boldizar (1990), and Tietjen (1991) who argued that female enrolment in scientific and mathematical programmes was low, making these subjects traditionally male dominated.

A comparative analysis of female and male enrolment at LBTC and ZASTI also shows that courses such as engineering which were considered masculine were male dominated whereas those deemed feminine were female dominated, for example secretarial. The findings on the pattern of enrolment in technical and scientific courses generally demonstrated a close relationship between the sexual division of labour, which holds that work is allocated to males and females on the basis of their sex differences. In line with that argument, female students at LBTC were predominantly engaged in domestic oriented or feminine courses, which defined their role as mothers and care-givers. Conversely, males were predominantly engaged in technical and scientific courses and to a large extent in business studies courses such as human resource management and accounts, which defined their role as dominant players in the public domain. However, the situation at ZASTI presented a positive picture as the number of female students in technical and scientific programmes increased

substantially from 16 percent in 2000 to 21 percent in 2004, an indication that females were close to taking the 30 percent places reserved for girls.

4.2.2 Drop-out Rate as a Percentage of the Total Number of Females and Males by Course per Year, 2000-2004

Tables 8 and 9 present the drop-out rate as a proportion of the total enrolment in technical and scientific programmes at ZASTI and LBTC, disaggregated on the basis of gender. The drop-out rate was computed from the number of male or female students who dropped out of a certain technical and scientific course in a particular year over the total number of male or female students in each course.

Table 8: Attrition in Technical Courses as a Percentage of Total Number of Female and Male Students, 2000-2004, LBTC

	Drop-out rates in Technical Courses, per year (percentage)													
Year	P/Electrical		A/Mechanical		A/ Electrical		Plush		Machining		Wops		**Total (%)**	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M
2000	17	21	33	13	-	8	-	29	0	13	-	-	**19**	**14**
2001	33	10	33	29	-	17	0	5	0	14	20	6	**20**	**16**
2002	0	9	50	11	0	9	-	0	25	42	0	12	**15**	**11**
2003	6	9	-	37	25	16	0	5	67	36	0	13	**15**	**20**
2004	21	22	50	49	-	11	33	16	33	15	0	0	**24**	**25**

Source: Field data

Table 8 demonstrates that the proportion of female students who dropped out of technical courses at LBTC in 2000 was higher than for males; that is, (19 % compared to 14 % for males), (20 % compared to 16 % for males) in 2001 and (15 % compared to 11 % for males) in 2002. However, the percentage of male drop-outs was higher (20 % compared to 15 % for females in 2003 and 25 % compared to 24 % for females in 2004). The main reason accounting for the high drop-out rates for both male and female students was failure to pass the theory and practical examinations, though one female student dropped out due to pregnancy and got married.

Female students performed poorly in auto mechanics, with the proportion of female students who dropped out being higher than for males in each academic year except 2003 when there were no females enrolled, though 2004 saw the male drop-out rate rise sharply to within one percentage point difference with the female drop-out rate,

which stood at 50 percent. The table also shows that the highest female drop-out rate in technical courses at LBTC was 67 percent compared to 36 percent for males in machining in 2003, suggesting that the completion rate for female students in this course had been reduced to a paltry 33 percent.

Table 8 further shows that there were comparatively high drop-out rates among female students in auto electrical and power electrical programmes while relatively lower drop-out rates were seen in water operations (wops), plumbing and sheet metal (plush) and to some extent in machining. For example, total female drop-out rates in auto mechanics were 33 percent compared to 13 percent for males in 2000, 33 percent compared to 29 percent in 2001, 50 percent compared to 11 percent in 2002, 50 percent compared to 49 percent in 2004 and in machining it was 67 percent compared to 36 percent for males in 2003. However, male drop-out rates were higher than for females in some courses, particularly in wops; that is 12 percent compared to none (0 %) for females in 2002, 13 percent compared to none in 2003. Similarly, it was 13 percent compared to none for females in 2000, 14 percent compared to none in 2001, 42 percent compared to 25 percent for females in 2002 in machining, 21 percent compared to 17 percent for females in 2000 and 9 percent compared to 6 percent for females in 2003 in power electrical.

The findings also show that there were no female drop-outs from technical programmes such as wops from 2002-2004; plush (2000, 2003); machining (2000, 2001); power electrical (2002) and auto electrical (2002). This suggests that female students successfully participated in technical training since the rate of attrition from technical courses equally affected male students negatively. In other words, though the number of male students in technical programmes was comparatively higher, the number of males dropping out from technical courses was also high.

Table 9: Attrition in Technical and Scientific Courses as a Percentage of Total Number of Male and Female Students, 2000-2004, ZASTI

Year	A/Maint. Engineer		A/Electronic Engineering		Meteorology		A/Traffic Control		A/Fixed Operators		Rescue Fire Service		Private Pilot		**Total (%)**	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
2000	0	33	50	5	33	17	0	0	20	15	-	0	-	0	**25**	**12**
2001	0	50	-	14	25	9	5 0	9	0	0	-	0	-	33	**22**	**9**
2002	-	0	0	10	10	0	0	0	0	16	33	18	-	0	**9**	**10**
2003	-	33	50	42	0	0	13	11	0	0	-	8	-	0	**13**	**14**
2004	-	-	25	17	0	8	33	4	12	9	33	25	0	0	**18**	**12**

Source: Field data

Table 9 above shows that the number of female students who dropped out from technical and scientific courses at ZASTI was higher than for males in 2000, 2001 and 2004. It was 25 percent compared to 10 percent for males in 2000, 22 percent compared to 9 percent for males in 2001 and 18 percent compared to 12 percent for males in 2004. The table also demonstrates that the largest proportion of attrition rates were observed among female students: 25 percent for females compared to 12 percent for males, and 22 percent for females compared to 9 percent for males recorded in 2000 and 2001 respectively.

However, the proportion of male students who dropped out of technical and scientific courses was higher than for female students in 2002 (10 % compared to 9 % for females) and in 2003 (14 % compared to 13 % for female students). The findings also show that in the year 2002 and 2003, the difference between the proportion of male and female drop-out rates was low. This suggests that there were relatively fewer male drop-outs than females when compared to the total number of male and female students pursuing technical and scientific courses at ZASTI.

Table 9 shows that variations were also noted based on courses, as females did not drop out of a number of courses. For instance, no female students dropped-out from the following courses in the periods shown: aeronautical fixed operators (2001-2003); air traffic control (2000, 2002); meteorology (2003-2004); aircraft maintenance engineering (2000, 2001) and private pilot course (2004). The high pass mark (50 % of the examinations, practical and coursework) accounted for the high drop-out rates in aeronautical electronic engineering, air traffic control and aircraft

maintenance engineering. Thus failure to meet the set pass mark resulted in many students (both male and female) dropping out. The fact that females did not drop-out from some technical and scientific courses signifies that females were capable of successfully pursuing male dominated courses like aircraft maintenance engineering. The findings also show that there was no female involvement and participation in technical programmes like private pilot course from 2000 to 2003 and aircraft maintenance engineering from 2002 to 2004.

From Table 9, it was observed that the highest female drop-out rates were in air traffic control and aeronautical electronic engineering, were females performed poorly in 2001, 2003 and 2004. Half the number of females (one out of two) enrolled in air traffic control dropped out compared to 9 percent for males in 2001. Similarly, 50 percent of female students dropped out of aeronautical electronic engineering in 2003 while in 2004 the drop-out rate was 25 percent compared to 17 percent for males.

The findings further revealed that these high female drop-out rates were recorded in courses where female enrolment was comparatively lower, with as few as two or three female students. Feedback from the only female student in the pilot course and four in aeronautical electronic engineering suggested that the fewer numbers of female students in some courses brought the feeling of isolation among female students and made the learning environment less friendly as all except one of the lecturers in technical and scientific programmes were male. Interviewee one observed that: *With the cultural misconception that technical and scientific courses and jobs are for men, as the only girl doing the course you sometimes see that men there look at you as the weaker vessel and not as capable as men.* In line with this, interviewee two added: *So, if a girl does not adjust to such an environment, she may find it difficult to interact with her classmates and fail to consult even when she has problems but as human beings we all learn from one another.*

4.3. Relative Performance of Students in Technical and Scientific Courses

The relative performance of both male and female students at ZASTI and LBTC was obtained from a review of examination records for each technical and scientific course in the period covered by the study. The two main indicators used to give a comparative view of male and female performance were the course percentage pass

for each year and the total (aggregate) annual percentage pass for all technical and scientific courses in each institution. The course percentage pass was calculated on the basis of the number of male and female students who passed their examinations compared to the total number of students in a particular course. In order to give an overall impression of the relative performance of male and female students, the total annual percentage pass at LBTC and ZASTI was calculated at institutional level from the summation of all passes in technical and scientific courses compared to the number of examination candidates. Tables 10 and 11 below present disaggregated data on the course percentage pass as well as the total percentage passes for each year in the period covered by the study.

Table 10: Pass Percentage in Technical Programmes by Course and Sex, 2000-2004, LBTC

	2000		2001		2002		2003		2004	
Courses	M	F	M	F	M	F	M	F	M	F
P/Electrical	78	83	89	67	90	100	91	94	78	79
A/Mechanic	90	67	71	67	89	50	63	-	51	50
A/Electrical	92	-	83	-	90	100	84	75	93	-
Plush	82	-	95	100	100	-	95	100	84	100
Machining	87	100	86	83	58	75	64	33	85	67
Wops	-	-	100	80	88	100	87	100	100	100
Total	**86**	**83**	**84**	**80**	**88**	**84**	**80**	**86**	**75**	**76**

Source: Field data

Table 10 demonstrates that the total percentage pass in technical programmes at LBTC was higher for males than females in 2000 (86 % compared to 83 %), 2001 (84 % compared to 80 %), in 2002 (88 % compared to 84 %). Conversely, the total percentage pass for females was higher than for males in 2003 (86 % compared to 80 %) and 2004 (76 % compared to 75 %). This shows that male performance was well above that of female students from 2000 to 2002 but lower in 2003 and 2004. This signifies that female students were as capable as male students and could therefore excel in technical and scientific courses. However, a comparative analysis of Table 10 also indicates that in 2004 both female and male students produced their poorest results in the period under study.

The percentage pass for individual courses shows that the pattern of students' performance was similar to that reflected by the total percentage pass for all technical

programmes, denoting that there were instances when the female course percentage pass was higher than for males and vice versa. For example, the course percentage pass for males was comparatively higher than for females in machining in 2003 (64 % compared to 33 %) and in power electrical in 2001 (89 % compared to 67 %). Similarly, the male percentage pass in auto electrical was higher than for females in 2003 but lower than for females in 2002 (100 % compared to 90 %). Conversely, the female percentage pass in power electrical was comparatively higher than for males in 2000 (83 % compared to 78 %), 2002 (100 % to 90 %), 2003 (94 to 91 %) and 2004 (79 % to 78 %). The findings reveal that female students performed exceptionally well in some technical courses, and even recorded 100 percent pass rates. The findings also indicate that some female students excelled at individual level and performed better than men. For instance, a female student obtained the best results in Wops in 2003 and received an award from Lusaka Water and Sewerage Company for outstanding performance. This demonstrates that there were instances where female students in technical courses outperformed their male colleagues despite the fact that males performed generally better than females, particularly from 2000 to 2002.

Table 11: Pass Percentage in Technical and Scientific Programmes by Course and Sex, 2000-2004, ZASTI

	2000		2001		2002		2003		2004	
Courses	M	F	M	F	M	F	M	F	M	F
A/M Engineering	67	100	50	100	100	-	67	-	-	-
A/Electronic Eng.	95	50	86	-	80	100	58	50	83	75
Meteorology	83	67	91	75	100	90	100	100	92	83
Air/T. Control	100	100	91	50	100	100	89	87	96	67
A/F Operators	85	80	100	100	86	100	100	100	89	80
R/Fire Service	90	-	100	-	82	67	92	-	91	89
P/Pilot	100	-	67	-	100	-	100	-	100	100
Total	**90**	**75**	**91**	**78**	**90**	**91**	**86**	**87**	**88**	**82**

Source: Field data

Table 11 shows that the total percentage pass for males was higher than for females in 2000 (90 % to 75 %), 2001 (91 % to 78 %) and 2004 (88 % to 82 %). Conversely, the total percentage pass was slightly higher for females than males in 2002 (91 % to 90 %) and 2003 (87 % to 86 %). A comparative analysis of the course percentage passes for male and female students shows that the performance of males was better than for females, with higher pass rates recorded for males in electronic engineering, meteorology, air traffic control, aeronautical fixed operators and fire rescue service.

There were a number of cases where females outperformed males, for instance in aeronautical fixed operators in 2002 (100 % compared to 86 % for males), aircraft maintenance engineering in 2000 (100 % compared to 67 % for males) and 2001 (100 % compared 50 % percent for males), and aeronautical electronic engineering in 2002 (100 % compared to 80 % for males). The fact that female students performed better than male students is significant because it demystifies the notion that women cannot do better than men in technical and scientific courses. This may be an indication that female participation and progression in these male dominated programmes is taking root, and thus challenging gender biases that such fields are not ideal for women.

4.4 Attitude of Staff and Students towards Female Participation and Involvement in Technical and Scientific Training

A study of the attitudes of staff and students towards female education in technical and scientific training helped to provide a thorough understanding of the conditions and environment in which training took place, and therefore highlighted some of the factors that influence or affect female participation, progression and continuity in these male dominated courses.

4.4.1. Attitudes of Male and Female Students towards Female Participation and Involvement in Technical and Scientific Training

Male students in technical and scientific courses and female students in non-technical courses were essential to this study because they form an integral part of the community in institutions providing technical and scientific training. Thus, their attitudes towards female training in technical and scientific courses have a bearing on the environment and conditions female students pursuing such programmes have to contend with during their training programme. Efforts were therefore made to assess the attitudes of male students (in technical and scientific courses) and female students (in non-technical courses) towards female participation and involvement in technical and scientific training in Zambia and the findings are presented below in Tables 12 to 15.

Table 12: Response to the statement that technical courses are more useful or suitable for boys than girls.

Response	Strongly agree/ Agree		Not sure		Strongly disagree/ Disagree	
Respondent	Frequency	%	Frequency	%	Frequency	%
Males- technical courses (n=22)	4	18.2	2	9.1	16	72.7
Females-non technical courses (n=22)	0	0	4	18.2	18	81.8
Total (n=44)	4	9.1	6	13.6	34	77.3

Source: Field data

Table 13: Response to the statement that girls need as much education as boys

Response	Strongly agree/ agree		Not sure		Strongly disagree/ Disagree	
Respondent	Frequency	%	Frequency	%	Frequency	%
Males -technical courses (n=22)	20	90.9	0	0	2	9.1
Females -non-technical courses (n=22)	22	100	0	0	0	0
Total (n=44)	42	95.5	0	0	2	4.5

Source: Field data

Table 12 shows that the majority of the respondents (72.7 % of males in technical courses and 81.8 % of females in non-technical courses) did not hold the view that technical courses were more suitable for boys than girls while 18.2 percent of male respondents agreed. Interestingly, none of the female students in art-related or non-technical courses considered technical courses to be useful or suitable for boys than girls. They also observed that the challenge they faced as girls was the difficulty nature of science and mathematics, and lack of exposure to technical subjects in secondary schools. This is an indication that gender awareness has increased and helped to demystify the notion that technical and scientific courses are masculine disciplines. The findings from Table 13 reveal that all female respondents in non-technical programmes and 90.9 percent of males in technical programmes held that girls needed as much education as boys, though 9.1 percent of male respondents

disagreed and contended that girls did not require technical skills. This suggests that the majority of the respondents were in favour of female participation in technical and scientific training though a small proportion of males (18.2 %) considered technical and scientific programmes to be male domains and thus not suitable for females. This perhaps signifies the need for more gender sensitization among males in order curtail such biases.

Table 14: Response to the statement that girls cannot manage technical/scientific courses because they are difficult (i.e. girls had no ability to take such courses)

Response	Strongly agree/ agree		Not sure		Strongly disagree/ Disagree	
Respondent	Frequency	%	Frequency	%	Frequency	%
Males -technical courses (n=22)	2	9.1	1	4.5	19	86.4
Females -non-technical courses (n=22)	3	13.6	0	0	19	86.4
Total (n=44)	5	11.3	1	2.3	38	86.4

Source: Field data

In order to assess the views of the respondents on female participation and involvement in technical and scientific training, both male students in technical and scientific courses and females in non-technical programmes were asked whether girls do not have the required abilities to take technical and scientific courses. The responses highlighted in Table 14 point out that 86.4 percent of male and female respondents disagreed with the notion that girls cannot manage technical and scientific courses because they are difficult courses. However, a small proportion of both female (13.6 %) and male (9.1 %) students accepted the view that girls cannot manage technical and scientific courses because they are difficult. When asked to give an account for their position, (13.6 % and 9.1 % of female and male respondents) contended that technical and scientific courses involved a lot of mathematics and science, in which girls performed poorly. In justifying their positions, one of the male respondents stated that: *A lot of girls have no interest in things to do with science and mathematics. Another issue is the fact that technical and scientific courses are difficult and so girls feel they cannot do them.* Similarly, it was noted by one of the female respondents in non-technical courses that: *Girls do not do not have the ability*

to take technical courses because even from a tender age, girls are not encouraged to take technical courses. Hence, girls usually choose careers like nursing and teaching.

The findings also reveal that more female respondents in non-technical programmes than males in technical and scientific courses held that technical and scientific courses were difficult for girls due to their mathematical and scientific nature while non-technical courses were easy for girls. This negative perception among female students in non-technical courses arose from their experience of having had difficulties with mathematics and physical sciences but performed well in other subjects at secondary school. One of the female respondents in a non-technical course summed up this matter with the assertion that: *Girls consider science and mathematics to be difficult even before they do them and so ladies do not have the courage to do technical courses. In fact, girls undermine themselves because they are defeated psychologically.* This is an indication that the attitudes of females and males towards subjects that were scientific and technical in nature were affected or influenced by gender stereotyping, as exemplified by the perception or view that technical and scientific fields were difficult for girls.

Table 15: Response to the statement that girls in male dominated courses become unmarriageable (or are not likely to be married)

Response	Strongly agree/ agree		Not sure		Strongly disagree/ Disagree	
Respondent	Frequency	%	Frequency	%	Frequency	%
Males -technical courses (n=22)	4	18.2	4	18.2	14	63.6
Females -non-technical courses (n=22)	0	0	3	13.6	19	86.4
Total (n=44)	4	9.1	7	15.9	33	75

Source: Field data

Male and female students were asked if they thought that female participation in male dominated fields such as technical and scientific training affected the chances of girls getting married. Table 15 demonstrates that a fairly small proportion (18.2 %) of male respondents held that girls who took male dominated courses like technical and

scientific courses become unmarriageable (were less likely to be married) due to the fact that the demands of a full time career in such fields entailed that their marriage and families would suffer. However, the majority (86.4 %) of female respondents and (63.6 %) of male respondents disagreed with that proposition whereas 18.2 percent were not sure.

The findings show that the views of male and female students differed slightly regarding their attitude towards marriage and the demands of a full time career in technical and scientific fields. The study reveals that the majority of female students did not accept the stereotype that marriage would suffer owing to female participation in training and modern occupations such as technical and scientific fields. This shows that female respondents rejected the traditional view that a woman's place was in the kitchen as held by a small proportion of male students. The findings further revealed that a large proportion of female students were eager to fully participate in the formal sector of the modern economy.

4.4.2 Attitudes of Academic and Administrative Staff

This section discusses the attitudes of administrative and academic staff towards female participation and involvement in technical and scientific training. All the administrative and academic staff interviewed were men as the only female lecturer in a technical field was on leave and not available during the data collection period.

Table16: Response to the statement that technical courses are too difficult for girls to manage.

Response	Frequency	%
Agreed	3	15
Disagreed	17	85
Not sure	0	0
Total	20	100

Table 17: Response to the statement that some subjects are more useful or suitable for men than women.

Response	Frequency	%
Agreed	5	25
Disagreed	15	75
Not sure	0	0
Total	20	100

Source: Field data

Tables 16 and 17 show the responses of academic and administrative staff to the statements that technical and scientific courses are too difficult for girls to manage and that some subjects are more useful for men than women. A comparative analysis of Tables 16 and 17 shows that the majority (85 %) of academic and administrative

staff disagreed with the statement that technical courses were too difficult for girls to manage whereas 15 percent agreed. Similarly, three quarters of administrative and academic staff disagreed with the statement that some subjects were more suitable for men than women and vice versa while 25 percent agreed. This negative perception by lecturers who considered some subjects to be more useful for men than women undermines and constrains female participation in male dominated fields such as science and technology. This shows that more effort is required to improve access and promote female participation in technical and scientific training.

When asked to give reasons to support their views that some courses were more suitable for men than women, their responses brought to the fore socio-cultural stereotypes related to the attitude of teachers which Chawanje's (1991) study argued influenced girls' performance in technical and science subjects. Among the views highlighted by one of the lecturers was the stereotyped argument that: *even when more girls were admitted into technical courses, some stayed away due to the 'white-collar job mentality'*. The other two lecturers also argued that girls admitted into technical programmes had feelings of inferiority due to the demanding and physical nature of some technical jobs such as auto mechanic and plumbing while men found things easy because they faced challenges better than women. Such sex-stereotyped beliefs helped to promote and perpetuate the notion that science and technical subjects were not suitable for girls. This suggests that training institutions should create a girl-friendly learning environment by stamping out such biases through gender sensitization of lecturers and members of staff.

Generally, the findings at ZASTI and LBTC showed that the majority of administrative and academic staff were in favour of female participation in technical and scientific programmes as they did not hold negative views or support discriminatory practices that could hinder access to and progression in training programmes offered by technical institutes. Gender neutrality was widely practiced as illustrated by the statement that: *Once girls are admitted, the available facilities and lectures are accorded to them equally.* The study found that the majority of administrative and academic staff contended that historical and cultural factors accounted for female under-representation in technical and scientific fields; noting that females were as capable as males in pursuing training in such fields of study.

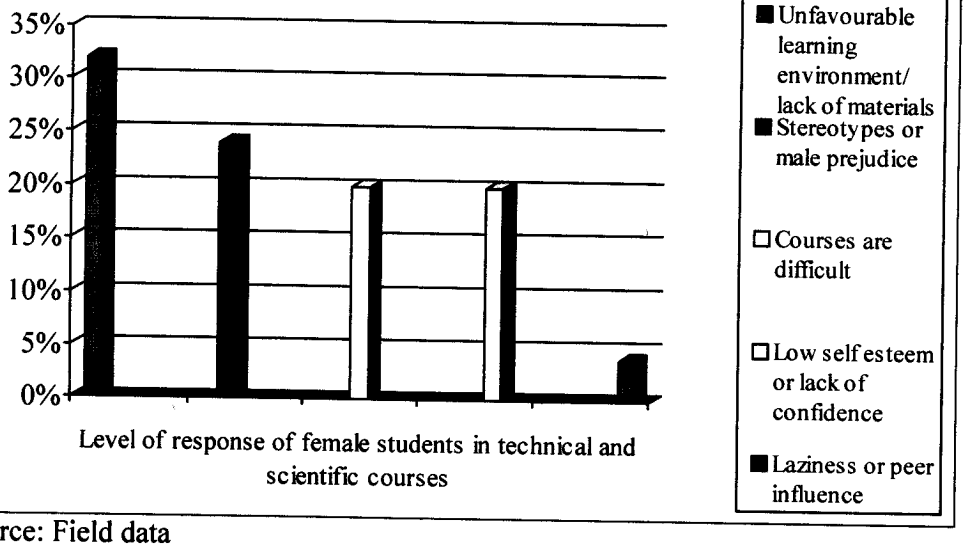
4.5 Obstacles that Hinder Female Participation and Involvement in Technical and Scientific Training

In this section, the researcher discusses the problems faced by female students pursuing technical and scientific courses. Female students in non-technical courses, female and male students in technical and scientific courses as well as academic and administrative staff were asked to highlight the major problems hindering female training in technical and scientific programmes since they all constitute an integral sector of population that directly or indirectly shape the learning environment in which technical and scientific training occurs.

4.5.1 Problems that Hinder Females from Pursuing Technical and Scientific Training

Given the background where technical and scientific courses in higher institutions of learning had fewer girls, female students pursuing technical and scientific courses were asked why this was so, and about what they thought were the major problems affecting girls' choice, entry and participation in technical and scientific courses and careers. Female respondents in technical and scientific programmes were asked to identify the problems that hinder female participation and involvement in technical and scientific training at school or college. On average each respondent identified two to three problems and the findings were expressed in figure 1 below.

Fig. 1: Problems affecting female participation and involvement in technical and scientific training (at school and college)



Source: Field data

Fig. 1 shows that among all the problems affecting female participation in technical and scientific training, the unfavourable learning environment compounded by lack of materials, and social and cultural barriers relating to sex-stereotypes were the most dominant; with 32 percent and 24 percent of female respondents suggesting that these were serious impediments to female participation in technical and scientific training due to the masculine image of science and male prejudice respectively.

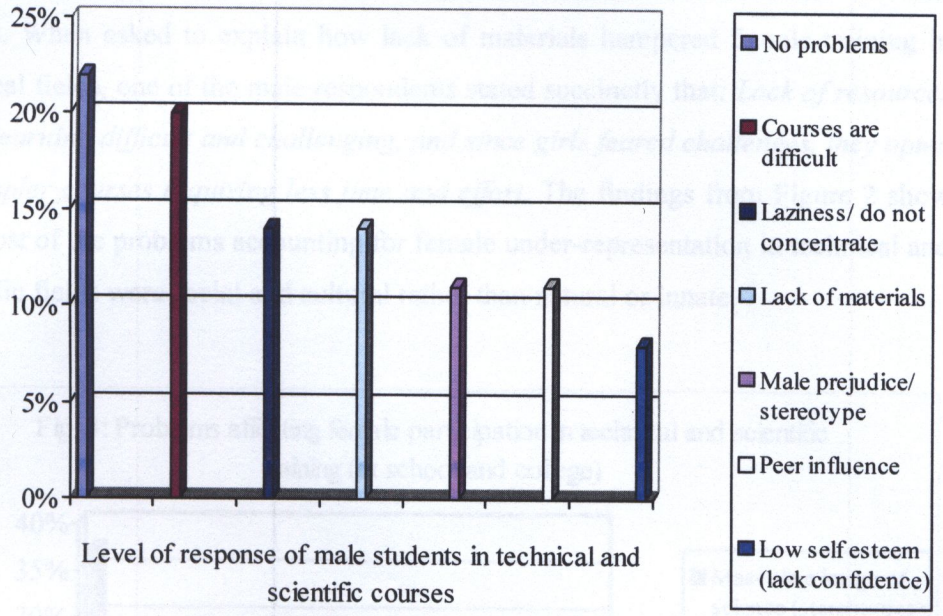
Other constraints identified were that courses were deemed difficult owing to their scientific and mathematical nature (resulting in many girls opting for non-technical courses) representing 20 percent of respondents, low self esteem or lack of confidence cited by 20 percent of respondents and finally peer influence or laziness on the part of girls to take up the challenges that go with technical and scientific courses, representing 4 percent of the respondents. Female students in technical and scientific courses observed that the fewer number of females in these fields culminated into a less friendly environment especially that there was a lot of practical work and assignments that required frequent interaction and collaboration with peers and classmates after lessons and laboratory or workshop sessions, such that if a student was alone in a class of males there would be no such opportunity to consult others particularly at night. Relating an experience of how the learning environment could be

unfavourable for girls, a female student in a technical programme observed that there was a situation where a male colleague asked for help from a male lecturer and it was rendered but when the girl asked for help from the same lecturer, he responded negatively with the assertion that: *...you thought it was easy, you came here alone.* Situations such as those highlighted above were bound to injure girls' self-esteem and adversely affect female participation and success in male dominated fields.

The findings demonstrated that female training in male dominated courses is affected by socio-cultural biases, which encourage women to aspire for areas considered feminine such as home economics, secretarial and nursing. The majority of female respondents identified unfavourable learning environment (partly due to the masculine image of science and fewer numbers of females) and gender stereotypes or male prejudice as major hindrances to female participation and involvement in technical and scientific training. This is in line with the findings by Harding (1986) and Chawanje (1991) who argued that the misconception that technical drawing, mathematics and science are masculine disciplines while home economics and other non-technical or art subjects are feminine.

On the basis of the information gathered from the pilot study (pre-test of data collection tools), on problems that hampered female education in technical and scientific training, male respondents in technical and female respondents in non-technical programmes were asked to identify the problems that hindered female participation and involvement in technical and scientific training at school or college and asked to rank the problems in order of severity. The responses or findings were expressed in figures 2 and 3 below.

Fig. 2: Problems affecting female participation in technical and scientific training (at school and college)



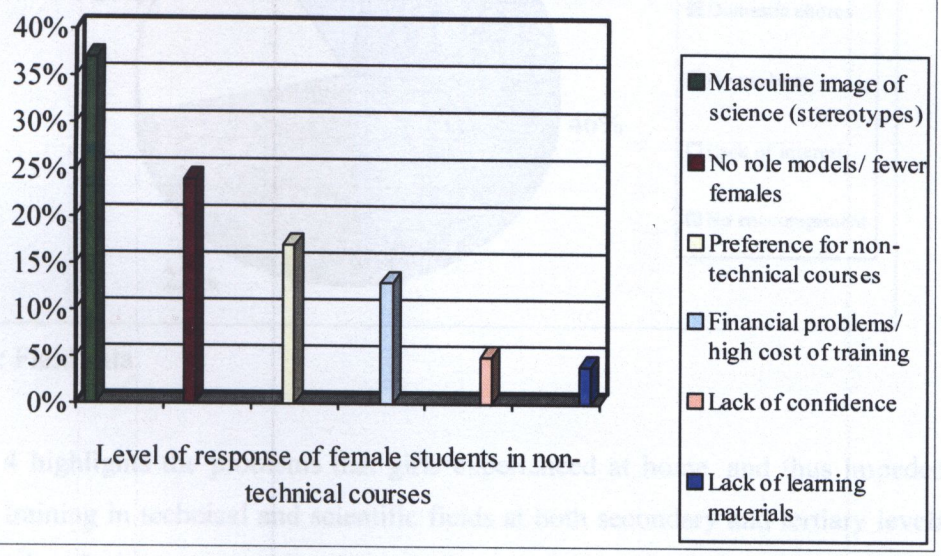
Source: Field data

Figures 1, 2 and 3 illustrate the different views held by females in technical and scientific programmes, males in technical and scientific programmes and female respondents in non-technical programmes regarding the major problems that affected female students at school or college, in relation to their participation in technical and scientific training. For instance, 32 and 24 percent of females in technical and scientific programmes cited the unfavourable learning environment and socio-cultural barriers relating to gender stereotypes as serious impediments while about 22 percent of male respondents were of the view that there were no problems hampering female participation and involvement in technical and scientific training. However, all female respondents identified numerous problems that hampered female performance and progression in technical and scientific training.

Figure 2 further demonstrates that 20 percent of male respondents observed that the most outstanding problems were the difficult nature of the courses, followed by laziness (14 %), lack of materials (14 %), male prejudice (11 %), peer influence as females were easily distracted (11 %), and lastly, low self esteem or lack of confidence (8 %). The study found that most of the male respondents observed that

the difficult nature of the courses arose from the fact that girls' performance in mathematics and science was poor starting from secondary school. Others stated that girls undermined themselves due to laziness and failure to concentrate on their studies. When asked to explain how lack of materials hampered female training in technical fields, one of the male respondents stated succinctly that: *Lack of resources made learning difficult and challenging, and since girls feared challenges, they opted for simpler courses requiring less time and effort.* The findings from Figure 2 show that most of the problems accounting for female under-representation in technical and scientific fields were social and cultural rather than natural or innate.

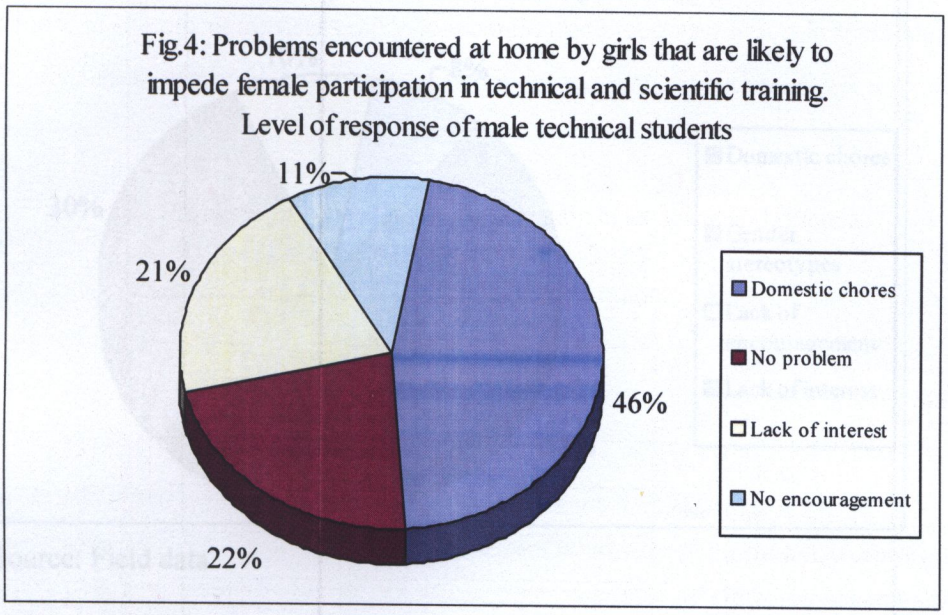
Fig. 3: Problems affecting female participation in technical and scientific training (at school and college)



Source: Field data

From figure 3, it is noted that about 37 percent and 24 percent of female respondents observed that the gender stereotypes (or specifically the masculine image of science) and the problem connected to lack of female role models respectively were the most outstanding problems. Others were preference for non-technical courses (17 %), financial problems or high cost of training (13 %), lack of confidence (5 %) and lastly, lack of learning materials (4 %).

Male respondents in technical and scientific programmes were asked to identify problems encountered at home by girls, which impeded female participation in technical and scientific training. Each respondent was asked to identify what they considered to be the most serious obstacle to female participation and success in technical and scientific training and the findings were expressed in figure 4 below.



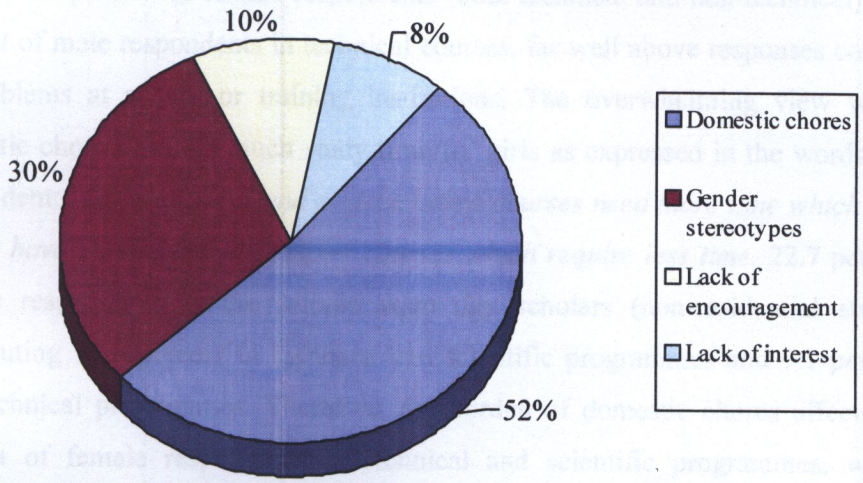
Source: Field data

Figure 4 highlights the problems that girls experienced at home, and thus impeded female training in technical and scientific fields at both secondary and tertiary levels of education. It demonstrates that the majority of male respondents (46 %) identified the burden of domestic chores as a serious impediment to female training in technical and scientific fields while 22 percent contended that there were no problems, followed by a small proportion, 21 percent and 11 percent who observed that lack of interest in technical courses and lack encouragement or discrimination respectively were notable obstacles to female participation and success in technical and scientific training.

Females in both technical and scientific and non-technical programmes were also asked to identify problems that girls encountered at home, and thus impeded female participation in technical and scientific training. Each respondent was asked to identify what they considered to be the most serious obstacle to female participation

and success in technical and scientific training and the findings were expressed in figure 5 below.

Fig. 5: Problems encountered at home by girls that are likely to impede female participation in technical and scientific training. Level of response of all female respondents



Source: Field data

Figure 5 shows that all female respondents noted that there were specific problems that hindered female training in technical and scientific fields. For example, 52 percent of female respondents suggested that domestic chores were a major hindrance to female entry, participation and success in technical and scientific fields, followed by 30 percent who observed that gender stereotypes drawn from the cultural background undermined girls' self esteem by giving girls an impression that they had no ability to take technical and scientific courses. Commenting on how the burden of domestic chores affected girls and women, one female respondent in a technical programme observed that: *As a woman you are expected to do a lot of household chores and care for the family and so you wake up early in the morning to do all the housework while boys and men are asleep. After that you start off for work or school together but when you come back home, men will relax or continue with tasks related to their work or school while you continue with household chores.* Figure 5 also shows that other problems cited were lack of encouragement (10 %) and lack of

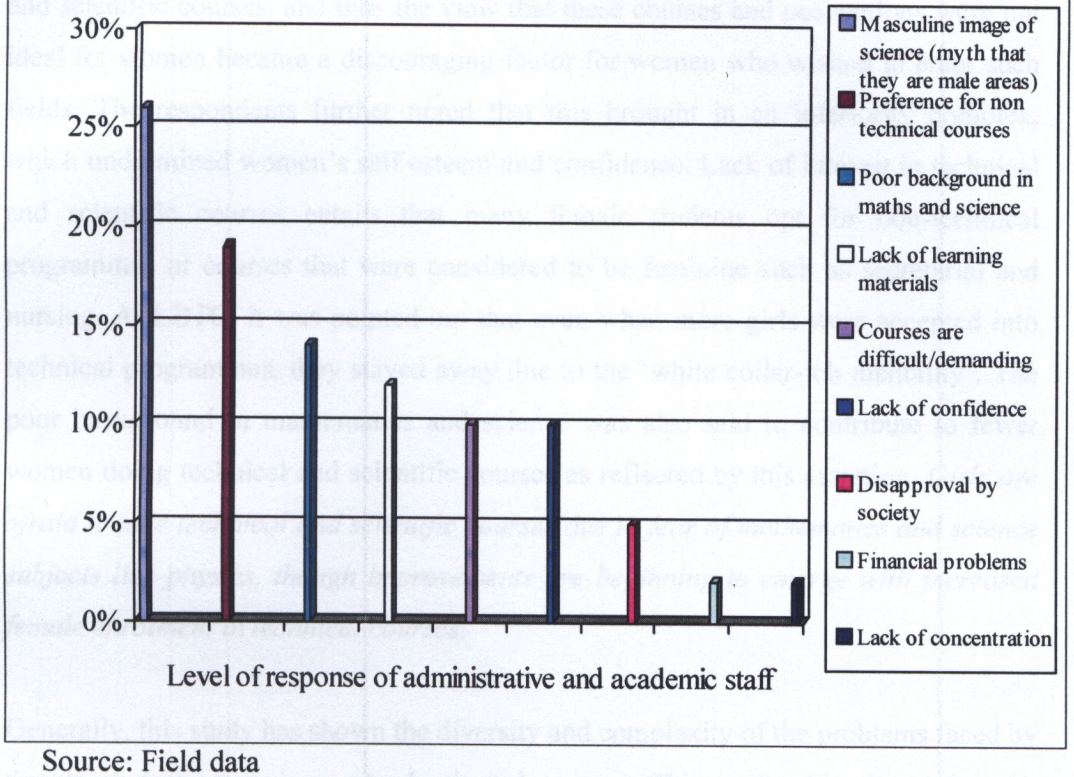
interest (8 %). In justifying how lack of interest affected female training in technical fields, one of the female students in a non-technical course aptly noted that: *It is the preference for other courses such as nursing, teaching and secretarial that results in fewer females in technical and scientific programmes.*

The study also shows that the obstacles faced by female students in college and at home differed. The burden of domestic chores was the most outstanding problem cited by 52 percent of female respondents (both technical and non-technical) and 46 percent of male respondents in technical courses, far well above responses connected to problems at school or training institutions. The overwhelming view was that domestic chores take up much study time for girls as expressed in the words of one respondent: *Since technical and science based courses need more time which women do not have, so they go for simpler courses which require less time.* 22.7 percent of female respondents in the sample were day scholars (non-residential students), constituting 13.6 percent in technical and scientific programmes and 9.1 percent in non-technical programmes. Therefore, the burden of domestic chores affected 13.6 percent of female respondents in technical and scientific programmes, with 9.2 percent who had not secured college accommodation and 4.5 percent were married and had a family to take care of. Similarly, 27.3 percent of male respondents were non-residential students but were not affected by the burden of domestic chores, as observed from the assertion of one male respondent at LBTC: *Culturally, the set up in our homes is that women do most of the housework and stay at home, and so as a man my school work is not affected or inconvenienced by domestic chores.* The fact that domestic chores are not shared equally within the family as females take the brunt of housework and childcare shows the existence of inequalities in gender relations at household level. The findings suggest that the home environment was deemed less favourable to female training in technical and scientific fields while the college environment provided female students with an opportunity to concentrate on their studies without the distraction of domestic chores.

The views of administrative and academic staff were also essential to this study because of the responsibilities, roles and influence they exert on their students in training institutions. As key informants, administrative and academic staff were asked

to identify problems that hinder female participation and involvement in technical and scientific training. On average each interviewee identified two problems.

Fig. 6: Obstacles hindering female participation in technical and scientific training



Source: Field data

Figure 6 above shows the obstacles that hinder female participation and performance in technical and scientific training, according to administrative and academic staff. The major constraints were closely associated with external factors such as social and cultural barriers. The main problems cited by most administrative and academic staff were the masculine image of science (26 %), followed by lack of interest in technical fields or preference for non-technical courses (19 %), poor background in mathematics and science (14 %), lack of learning materials (12 %), courses being difficult and demanding (10 %). Other constraints were minimal and included disapproval by society exemplified by employers' doubt or prejudice against female graduates (5 %), financial problems (2 %) and lack of concentration (2 %).

The findings indicate that socio-cultural biases such as the masculine image of science (myth that science based courses are male fields) and the poor background in mathematics and science impeded female entry and success in technical and scientific training and occupations. In this study, administrative and academic staff indicated that, arising from historical and cultural factors, few women have pursued technical and scientific courses, and thus the view that these courses and occupations were not ideal for women became a discouraging factor for women who wished to enter such fields. The respondents further noted that this brought in an inferiority complex, which undermined women's self esteem and confidence. Lack of interest in technical and scientific courses entails that many female students opt for non-technical programmes or courses that were considered to be feminine such as secretarial and nursing. At LBTC, it was pointed out that even when more girls were accepted into technical programmes, they stayed away due to the 'white collar-job mentality'. The poor background in mathematics and science was also said to contribute to fewer women doing technical and scientific courses as reflected by this assertion: *Girls are afraid to take technical and scientific courses due to fear of mathematics and science subjects like physics, though improvements are beginning to emerge with increased female enrolment in technical courses.*

Generally, this study has shown the diversity and complexity of the problems faced by female students pursuing male dominated courses. This study also shows that the burden of domestic chores, the masculine image of science, the poor background in mathematics and science coupled with the lack of confidence (sense of inferiority) and preference for non-technical courses and occupations affects female entry and success in technical and scientific training. This supports Chawanje's (1991) argument that the female is considered inferior to the male and therefore not expected to do as well as men in such male dominated fields.

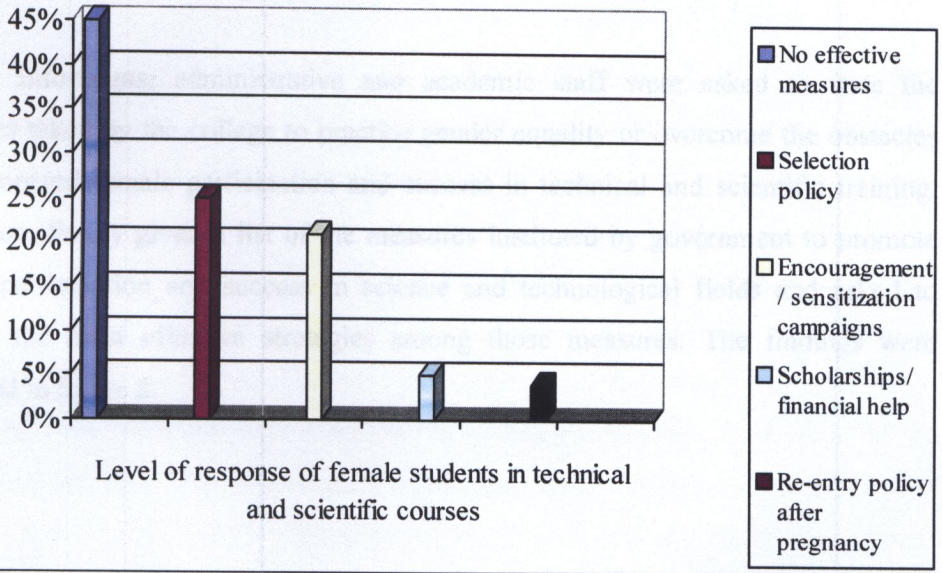
4.6 Investigation of the Measures Instituted to Promote Female Participation in Technical and Scientific Training

This section discusses the effectiveness of the strategies instituted to promote female enrolment in technical and scientific programmes at tertiary level. With the adoption of the National Gender Policy of 2000, the Zambian Government put measures in place to address the factors, which constrain female participation and success in

science and technological fields, (GIDD, 2000). The main strategies include expansion of technical and scientific training institutions to take in more female students; selection policy entailing that thirty percent of places are reserved for girls; provision of scholarships to assist girls pursue technical and scientific courses; re-entry policy after pregnancy, and encouraging female participation in technical and scientific fields through sensitization and awareness campaigns.

Female respondents in technical and scientific programmes were asked whether they were aware of any measures instituted to address the factors which hindered female participation and success in science and technological fields, and were later given a list of the measures initiated by government and asked to identify the most effective strategy among the measures instituted to promote female participation and success in technical and scientific training. The findings were presented in figure 7 below.

Fig. 7: Response of female students on effectiveness of measures instituted to promote female training in technical and scientific courses



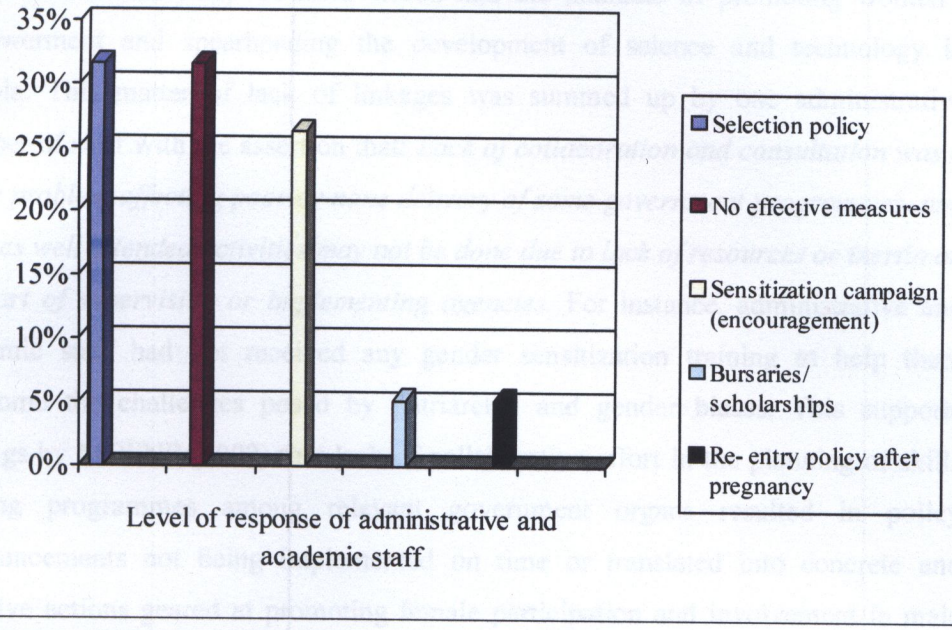
Source: Field data

Figure 7 presents the views of female respondents in technical and scientific programmes on the effectiveness or success of the measures instituted to promote female enrolment and progression in technical and scientific programmes. It showed that about 45 percent of female respondents contended that there were no effective

measures taken by the relevant authorities to promote gender equality. The overwhelming view was that policy pronouncements needed to be translated into practical steps geared at empowering women in training provision by removing impediments to female entry and progression in technical and scientific fields. One of the female respondents summed up the matter of ineffective strategies with the contention that: *...not enough is done to encourage female participation in technical and scientific training, for the problem to be dealt with there should be more enrolment of girls into technical and science classes and more career talks at high school level.* There were, however, a number of measures identified to be effective in promoting female enrolment in technical and scientific training. For instance, a quarter of female respondents identified the selection policy, which reserved 30 percent of places for female students while 21 percent identified encouragement to work hard and sensitization campaigns as effective measures. A small proportion, 5 percent and 4 percent observed that financial assistance through bursaries or scholarships and the re-entry policy after pregnancy respectively were effective measures helping to improve female participation and involvement in technical and scientific training.

As key informants, administrative and academic staff were asked to state the measures taken by the college to practice gender equality or overcome the obstacles that hampered female participation and success in technical and scientific training. They were finally given a list of the measures instituted by government to promote female participation and success in science and technological fields and asked to identify the most effective strategies among those measures. The findings were presented in figure 8.

Fig. 8: Response of administrative and academic staff on effectiveness of measures instituted to promote female participation in technical and scientific training.



Source: Field data

Among administrative and academic staff, 31.6 percent identified the selection policy as a notable measure whereas 26.3 percent identified sensitization campaigns and encouragement to work hard as significant efforts instituted to help reduce the gender gap in educational attainment and training provision in technical and scientific fields. A small proportion (5.2 %) held that the re-entry policy after pregnancy and financial assistance through bursaries (scholarships) respectively were effective measures in overcoming gender imbalances in technical and scientific training. However, 31.6 percent of administrative and academic staff strongly believed that none of the measures offered any effective remedy in reducing gender disparities in technical and scientific training because they failed to adequately deal with the causal factors such as poor background in mathematics and science at lower levels of education as well as gender stereotyping. They also pointed out that the proposed expansion of technical and scientific training institutions to take in more female students was a good policy pronouncement, which had not been implemented due to lack of financial and material resources.

Administrative and academic staff also observed that there were no linkages between higher institutions of learning as training providers and government institutions and statutory bodies such as Gender In Development Division (GIDD) and National Science and Technology Council, which had the mandate of promoting women's empowerment and spearheading the development of science and technology in Zambia. This matter of lack of linkages was summed up by one administrative member of staff with the assertion that: *Lack of collaboration and consultation was a major problem affecting poor or none delivery of some government programmes, and at times well intended activities may not be done due to lack of resources or inertia on the part of supervising or implementing agencies.* For instance, administrative and academic staff had not received any gender sensitization training to help them overcome the challenges posed by patriarchal and gender biases. This supports findings by MOFNP (2002) that lack of collaborative effort in the planning of skills training programmes among relevant government organs resulted in policy pronouncements not being implemented on time or translated into concrete and effective actions geared at promoting female participation and involvement in male dominated fields such as technical and scientific courses.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.0 CONCLUSION

This chapter discusses the conclusions of the study as outlined in the objectives. The study had an overall goal of investigating gender imbalances in enrolment and retention in technical and scientific training at ZASTI and LBTC. It specifically sought to identify the barriers and obstacles that hinder female participation and progression in technical and scientific training in Zambia. An assessment of the drop-out rate and the relative performance of male and female students in technical and scientific courses was also made. The attitude of staff and students towards female education in technical and scientific training was assessed and, the strategies instituted to promote female participation and involvement in technical and scientific fields, were investigated. Finally, on the basis of the findings of the study, the researcher made recommendations.

The findings show that the pattern of enrolment and retention in technical and scientific training at ZASTI and LBTC was skewed in favour of males since there were low levels of female participation and progression in such fields. During the period of the study, female enrolment as a proportion of total enrolment in technical and scientific courses was generally low and did not exceed 10 percent for LBTC and 21 percent for ZASTI, resulting in these courses being male dominated. Conversely, the largest proportion of female enrolment at LBTC was in non-technical programmes such as secretarial, food production and beverage, front office operations and hair dressing, with 98 percent of total enrolment in 2003. The findings therefore demonstrated that care-giving and domestic oriented courses such as secretarial, front office operations, hair dressing, food production and beverage were predominantly female programmes at LBTC, with secretarial being an exclusively female programme. Females were therefore well represented in non-technical or domestic oriented programmes that enabled them fulfil stereotyped roles and practices that were deemed feminine, in accordance with the prevailing sexual division of labour.

A comparative analysis of female and male attrition rates showed that the proportion of female drop-outs at LBTC was higher than for males (except in 2003 and 2004), with the highest attrition rate having a five-percentage point difference in 2000.

Similarly, the proportion of female students at ZASTI who dropped out from technical and scientific courses was higher than for males (except in 2002 and 2003), with the highest attrition rates having a twelve-percentage point difference in 2001. Attrition for both male and female students was mainly associated with poor results or failure to reach the pass mark set for candidates in both practical and theory examinations.

A comparative analysis of total percentage passes of student performance at LBTC showed that males outperformed females from 2000 to 2002. However, female percentage passes were comparatively higher in 2003 and 2004, an indication that women were as capable as men and could sometimes obtain better results than men. At ZASTI, males performed better than females in 2000, 2001 and 2004 whereas females performed slightly better than males in 2002 and 2003. The findings suggest that this exceptional performance by female students in relation to their male counterparts significantly challenges the myth that technical and scientific courses and careers are male preserves and also undermines the cultural bias that women cannot do better than men in technical and scientific programmes.

Evidence in the study suggests that social and cultural biases such as society's expectation that domestic and care-giving roles were female domains and the masculine image of science were among the major obstacles, which covertly undermined or constrained female participation in male dominated fields despite the removal of formal barriers that historically hampered female entry, participation and progression in technical and scientific courses and occupations.

The study demonstrated that gender biases stereotyped women's interest and encouraged females to aspire for subjects and courses deemed traditionally feminine resulting in male dominance in technical and scientific courses and occupations. An assessment of attitudes towards female participation in technical and scientific training revealed that 97 percent of all respondents asserted that girls needed as much education as boys, though 25 percent of male students contended that technical and scientific training was more suitable for boys than girls. Although a large proportion (85 %) of administrative and academic staff disagreed with the contention that technical and scientific courses were too difficult for girls to manage, 15 percent of

the staff held that some subjects were more suitable for men than women and thus perpetuating the myth that technical and scientific courses and occupations were not suitable for women.

By and large, the findings suggest that other serious impediments to female entry and participation in technical and scientific fields include preference for non-technical courses and the poor background in mathematics and science. Female preference for non-technical courses and occupations was attributed to be partly due to the poor background in science and mathematics resulting in a sense of inferiority and lack of confidence among female students. The findings further reveal that the burden of domestic chores made the home environment a less favourable place for females pursuing training in technical and scientific fields than the college environment, which accorded females more time and opportunity to concentrate on their studies.

Females from rural areas were further disadvantaged as all female students pursuing technical and scientific courses at ZASTI and LBTC were from urban areas. The majority of male students in technical and scientific courses were also from urban areas while about 9.1 percent were from rural areas. Female students pursuing technical and scientific courses were either from middle or high class backgrounds while males were spread over the whole spectrum including low class background. This is an indication that females from privileged backgrounds had increased access to training opportunities in male dominated programmes, and therefore the strategies initiated to promote female participation in technical and scientific training should address the concerns and challenges that negatively affect females from underprivileged backgrounds.

5.1 RECOMMENDATIONS

5.1.1.1. At national level, Government and statutory bodies such as TEVETA and National Science and Technology Council should mainstream gender in all their programmes in order to remove gender biases in policies and activities including technical and scientific training.

5.1.1.2. At national level, TEVETA and National Science and Technology Council should step up awareness and sensitization campaigns in order to overcome or counter prejudices and stereotypes that technical and scientific courses and occupations are male preserves.

5.1.1.3. At school level, guidance and career talks should be organised to stimulate girls' interest in technical and scientific courses.

5.1.2.1. Higher institutions of learning offering technical and scientific programmes should improve the learning environment through provision of the required learning and teaching materials and facilities in training institutions.

5.1.2.2. In order to overcome the challenge posed by the poor background in mathematics and science, educational authorities in both government and private schools should promote and improve the teaching of mathematics, science and technical subjects in basic and secondary schools.

5.1.2.3. The Ministry of Education should provide learning materials such as textbooks and laboratory facilities in basic schools that have been upgraded into high schools so as to enhance learning of mathematics, science and other practical subjects at both lower and higher levels of education.

5.1.3.1. Educational authorities and other stakeholders should increase the amount of financial and material resources and thus provide more support for girls' education especially at basic and secondary school levels where financial problems are likely to undermine girls' performance in school.

5.1.3.2. To improve female access to technical and scientific training, colleges should provide special scholarships (bursaries) to encourage needy female applicants to enroll since financial resources may deter needy girls from applying to pursue technical and scientific programmes due to long periods of training and the added cost tied to practicals and projects.

5.1.4.1. Government and the private sector should provide employment opportunities for female graduates so as to increase the number of female role models in technical and scientific fields.

5.1.4.2. The training providers should institute a tracer system where follow-up visits on graduates are arranged to assess the performance of graduates in industry so as to integrate more girls into technical and scientific fields.

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APPENDICES

APPENDIX ONE

INTERVIEW GUIDE FOR ADMINISTRATIVE AND ACADEMIC STAFF

Date:.....

Time:.....

Position held:.....

(Greet the respondent. Introduce yourself and state the purpose of the interview)

SECTION ONE

1. How long have you served as a lecturer in technical and scientific training?
2. How long have you served as an administrator? Length of service as Principal, Head of Department?
3. What professional qualifications do you hold?
4. Have you ever attended any gender sensitisation training?
   a) Yes [ ]. b) No [ ]

SECTION TWO

5. Are there any programmes that aim to encourage female participation in technical and scientific training?

6. Does the college provide equal access to technical and scientific training to both male and female applicants?

7(a). What problems hinder female participation and involvement in technical and scientific training at school or college?

(b). What are the major obstacles to the retention of female students in technical and scientific courses offered by the college?

8. Do you think some subjects are more suitable for men or women, and why?

9. What measures has the college taken to sensitise lecturers on gender issues or practice equality?

10. Are you aware of any measures instituted by government to address problems that hamper female participation in technical and scientific training? Yes[ ] No [ ]

11. Listed below are measures instituted by government to promote female participation and involvement in technological and scientific fields in Zambia. Among the measures, which **one** of the following strategies do you consider the most effective?

i. Scholarships (financial assistance) to help underprivileged girls. [ ]
ii. Re-entry policy after pregnancy to allow girls continue with their studies [ ]
iii. Sensitisation and awareness campaigns to encourage female participation. [ ]
iv. Expansion of technical colleges to take in more female students. [ ]
v. None, no effective measures or strategies. [ ]

12. What changes would you like to see in the provision of training to male and female students in technical and scientific programmes in Zambia?

END OF INTERVIEW

Thank you for your time and cooperation

APPENDIX TWO

INTERVIEW SCHEDULE FOR STUDENTS IN TECHNICAL COURSES

Date:.....

Time:.....

Institution:.....

SECTION ONE

1. Sex: Male [ ]. Female [ ]
2. Age:.....years
3. Marital Status:

   Single [ ]. Married [ ]. Divorced [ ]. Widowed [ ]. Separated [ ]
4. Occupation of: (Please specify, state type of work or source of livelihood)

   a. Mother.....

   b. Father.....

   c. Self.....

   d. Guardian.....
5. Area of residence: District.....Residential area.....
6. Religion:

   Christian [ ] Muslim [ ] Hindu [ ] Buddhist [ ] Other [ ] None [ ]
7. a. Last school attended.....

   b. School Status: (i) Boarding [ ] Day [ ]. (ii) Co-education [ ] Girls only [ ]

SECTION TWO

8. Why did you choose to do this course?

9. Did you have encouragement from family and friends?

10(a). What problems, if any, hinder female participation and involvement in technical and scientific training at school or college?

(b). What problems, if any, hinder female participation and involvement in technical and scientific training at home?

(c). Do male students have the same problems?

11. What is your opinion on the view that technical courses are more useful for boys than girls?

12. Do girls need as much education and training as boys?

13. Does this college provide equal access to technical and scientific training to both male and female applicants?

14. Are you aware of any measures instituted by government to address problems that hamper female participation in technical and scientific training? Yes[ ] No [ ]

15. Listed below are measures instituted by government to promote female participation and involvement in technological and scientific fields in Zambia. Among the measures, which **one** of the following strategies do you consider the most effective?

i. Scholarships (financial assistance) to help underprivileged girls. [ ]
ii. Re-entry policy after pregnancy to allow girls continue with their studies [ ]
iii. Sensitisation and awareness campaigns to encourage female participation. [ ]
iv. Expansion of technical colleges to take in more female students. [ ]
v. None, no effective measures or strategies. [ ]

16. How can female access to technical and scientific training be improved?

End of interview

APPENDIX THREE

QUESTIONNAIRE

INTRODUCTION

I am a student pursuing a Master of Arts degree programme in Gender studies at the University of Zambia. One of the requirements of this programme is to conduct research in a relevant field. Therefore, this study is being conducted for academic purposes.

INSTRUCTIONS

There are 20 questions that should be answered by either by putting a tick in the appropriate box or writing your answer in the spaces provided. There are no right or wrong answers and be rest assured that your responses will be treated as strictly confidential.

SECTION ONE

1. Sex: Male [ ]. Female [ ]

2. Age 16 – 20 years [ ] 21 – 25 years [ ] 26 – 30 years [ ]
   31 – 35 years [ ] 36 – 40 years [ ] Over 41 years [ ]
3. Marital Status:
   Single [ ]. Married [ ]. Divorced [ ]. Widowed [ ]. Separated [ ]

4. Occupation of: (Please specify, state type of work or source of livelihood)
   a. Mother.....
   b. Father.....
   c. Self.....
   d. Guardian.....

5. Area of residence: District.....Residential area.....

6. Religion: Christian [ ] Muslim [ ] Hindu [ ] Buddhist [ ] Other [ ]

SECTION TWO

7. What problems hinder female participation and involvement in technical courses at school/college?.....

.....

8. What problems hinder female participation and involvement in technical courses at home?.....

.....

9. Do you accept the view that domestic responsibilities suffer in cases where a girl or woman is enrolled in technical and scientific training on full-time basis?

Yes [ ] No [ ]

Explain your answer to question 9.....

.....

.....

10. What is your opinion of the view that technical courses more useful for boys than girls? Yes [ ] No [ ]

Explain your answer to question 10.....

.....

.....

11. Do you agree with the view that girls need as much education as and training as boys?

Yes [ ] No [ ]

Explain your answer to question 11.....

.....

.....

12. What kind of skills training programmes should be developed for girls or women?

.....

.....

13 (a). Are there any problems that hinder female participation and success in technical and scientific training at college? ..... Yes [ ] No [ ]

13 (b). Do the problems listed below hinder female participation and success in technical and scientific training at college?..... Yes [ ] No [ ] If the answer to question 13 (b) is **No**, proceed to question 14.

List of problems

i. Lack of learning materials [ ]

ii. Difficult nature of courses [ ]
iii. Lack of confidence (low self esteem) [ ]
iv. Preference for non-technical courses (lack of interest in technical fields) [ ]
v. Gender stereotypes (masculine image of science) [ ]
vi. Unfavourable learning environment (lack of role models) [ ]
vii. Laziness (peer influence) [ ]
viii. Lack of encouragement [ ]
ix. None [ ]
x. Others (please specify below)

.....[ ]
.....[ ]
.....[ ]

13 (c). If the answer is **yes**, rank the problems listed above in increasing order (e.g. mark [1] for the most serious problem and [5] for the least; write [N/A] if you think it does not in any way hinder female participation and success in technical and scientific training.

14 (a). Are there any problems that hinder female participation and success in technical and scientific training at home? ..... Yes [ ] No [ ]

14 (b). Do the problems listed below hinder female participation and success in technical and scientific training at college? ..... Yes [ ] No [ ] If the answer to question 14 (b) is **No**, proceed to question 15.

List of problems

i. Lack of interest in technical and scientific courses/fields [ ]
ii. Gender stereotypes [ ]
iii. Lack of encouragement [ ]
iv. Domestic chores (household responsibilities) [ ]
v. None [ ]
vi. Others (please specify below)

.....[ ]
.....[ ]
.....[ ]

14 (c) If the answer is **yes**, rank the problems listed above in increasing order (e.g. mark [1] for the most serious problem and [5] for the least; write [N/A] if you think it does not in any way hinder female participation and success in technical and scientific training.

SECTION THREE (For each question below, choose **only one** option)

!5. Do girls need as much education and training as boys?

Strongly agree [ ]. Agree [ ]. Not sure [ ]. Disagree [ ]. Strongly disagree [ ]

16. Girls cannot manage technical and scientific courses because they are difficult.

Strongly agree [ ]. Agree [ ]. Not sure [ ]. Disagree [ ]. Strongly disagree [ ]

17. Is it true that girls who take 'male dominated' subjects like technical courses become unmarriageable, i.e. they are not likely to be married?

Strongly agree [ ]. Agree [ ]. Not sure [ ]. Disagree [ ]. Strongly disagree [ ]

18. Girls do not have the abilities to take technical and scientific courses.

Strongly agree [ ]. Agree [ ]. Not sure [ ]. Disagree [ ]. Strongly disagree [ ]

19. Girls or women do not need to trouble themselves with difficult courses because they are going to get married or are already married.

Strongly agree [ ]. Agree [ ]. Not sure [ ]. Disagree [ ]. Strongly disagree [ ]

20. Is training in technical courses more useful for boys/ men than girls/ women?

Strongly agree [ ]. Agree [ ]. Not sure [ ]. Disagree [ ]. Strongly disagree [ ]

End of questionnaire

Thank you for your time and cooperation.