

**ACCESS TO AND PARTICIPATION OF WOMEN IN SCIENCE-  
ORIENTED VOCATION EDUCATION AND TRAINING PROGRAMMES  
IN KENYA**

**By**

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## DECLARATION

This thesis is my original work and has not been submitted for a degree in any other University

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## **DEDICATION**

To my late mother, Leah Wanjue, for the love and care she accorded me and for teaching me the value of hard work.

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**ABBREVIATIONS AND ACRONYMS**

<b>8-4-4</b>	Education System of 8 years Primary,4 years secondary and 4 years University
<b>CBS</b>	Central Bureau of Statistics
<b>FAWE</b>	Forum for African Women Educationalists
<b>FGD</b>	Focus Group Discussion
<b>GOK</b>	Government of Kenya
<b>ICT</b>	Information Communication Technology
<b>IT</b>	Information Technology
<b>JKUAT</b>	Jomo Kenyatta University of Agriculture and Technology
<b>KESSP</b>	Kenya Educational Sector Support Programme
<b>SCOT</b>	Social Constructivist of Technology
<b>SPSS</b>	Statistical Package for Social Science.
<b>SST</b>	Social Shaping of Technology
<b>UN</b>	United Nations
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>VET</b>	Vocational Education and Training

## ABSTRACT

Since the women's decade conference in Nairobi, various efforts have been made by governments and international donors to increase women's participation in formal schooling and the labour market. However, evidence still persists that women in most parts of the world face numerous challenges. The objective of this study was to explore persisting challenges that exclude women students from pursuing science and mathematics programmes in Kenya's vocational training institutes. The study sought to investigate factors influencing women's access to and participation in science oriented Vocational Education and Training (VET) programmes in selected Technical Institutes in Nairobi. To realise the purpose of the study, a survey design was adopted. Primary data was collected by use of questionnaire and interview schedule. The questionnaire contained both open ended and structured questions. Informal discussions were held to seek clarification and additional information from the respondents. The Statistical Package for Social Sciences (SPSS) version 11.5 was used for data processing and analysis. The study revealed that the general enrolment of females in VET institutions in Nairobi is lower than males and in particular they are under-represented in science oriented courses. However, the study showed that majority of female students who enter the VET institutions aspire to pursue science based occupations such as Engineering and Laboratory Technology. The study further showed that the main factors that contribute to low female enrolment in science oriented courses are: the negative attitude females have towards sciences, the belief that science is a man's world, females find sciences to be difficult, peer influence, poor performance by girls in the foundation subjects, gender stereotype by the society and prospective employers, lack of female role models, lack of proper information on science oriented careers, and high school dropout rate due to early pregnancy. The study also revealed that there were various interventions that can be made in order to increase female enrolment in science oriented courses. These were: girls at primary and secondary schools be guided and counselled on the benefits of pursuing science oriented careers as well as advised to change their attitudes towards science subjects, teachers at secondary schools should focus on building a strong foundation for girls in mathematics and science subjects, provision of equal job opportunities, girls should have more opportunities to observe female role models in science based careers, the government should establish special science and technology institutes to cater for the needs of female students, the school curriculum be made relevant to respond to the needs of girls, and lowering entry points for females in science oriented courses. In conclusion, it is evident that female enrolment in science oriented courses in VET institutions in Nairobi is very low. The study recommends that all stake holders should support and initiate programmes and activities aimed at increasing female enrolment in science oriented courses.

## CHAPTER ONE

### INTRODUCTION

#### 1.1 Background

Although there has been measurable progress over the past 30 years, global pattern whereby women are under-represented in all sections of education persists. The gender imbalance is particularly strong in the areas of science-oriented courses. The widest gap by gender is seen in South Asia, the Middle East and Africa. While an overview of educational statistics in Africa indicates that tremendous gains have been made in increasing female access and participation in education since 1960, this has not reversed the trend of girls participation levels remaining lower than boys especially in the areas of mathematics, the physical sciences and engineering (Odaga & Heneveld, 1993).

This situation continues to raise a lot of concern because of the benefits that arise from girls' education. The lack of female participation in mainstream science and technology disciplines means that many countries currently realize only a portion of their potential in these areas. The claim by many African countries to be enthusiastic about increasing girls' participation indicates limited impact on the ground (World Bank, 2000). Even where some governments have come out with explicit policy statements to increase girls' participation in education and particularly science-oriented courses or where some practical action has been

taken, the overall impact has been limited by lack of contextual analysis and unsystematic strategies to address girls' problems that hinder them from taking up opportunities in science and technology disciplines.

In Kenya, despite government focus on gender equality on admissions and more so lowering of girl's entry points to the university, enrolment of females in science-oriented courses remains discouragingly low. Among the females admitted to public universities between 1988 and 1995, those enrolled in science-related faculties were 19.5% in 1988, 23.85% in 1989, 12.53% in 1990, 26.59% in 1991 and 25.47% in 1992. This is an indication of under enrolment by females in the technical and science-related courses (Karani, 1995).

Statistics from the Ministry of Education (2005) on the total enrolment in public universities by university and gender in the years 2000/2001-2004/2005 indicate that enrolment trends were significantly lower among females compared to males. This was even more pronounced in science oriented universities as shown in table 1.1 below.

**Table 1.1 Total Enrolments in Public Universities by University and Gender  
2000/2001-2004/2005**

<b>University</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>	<b>% Female</b>
Nairobi	45860	21875	67735	32.29
Kenyatta	24400	16713	41113	40.65
Moi	20609	15943	36552	43.62
Egerton	30196	10487	40683	25.78
JKUAT	7174	3086	10260	30.08
Maseno	11838	7748	19586	39.56
<b>Total</b>	<b>140077</b>	<b>75852</b>	<b>215929</b>	<b>35.33</b>

Source: Commission for Higher Education, 2005

As regards female enrolment in public universities in the period 2000/2001 to 2004/2005, Moi University had the highest proportion (43.6 per cent) followed by Kenyatta (40.7), while Egerton had the lowest of 25.8 per cent followed by JKUAT with 30.1 per cent (Table 1.1) The universities with a strong leaning towards science and mathematics programmes (JKUAT and Egerton) have the lowest female enrolment while those with strong leaning towards humanities and education (Kenyatta) have the highest.

Other than under enrolment in science oriented courses at the universities, there is also the case of general under enrolment by gender. An analysis of student enrolment in higher education reveals low female enrolment in science and mathematics-based programmes. Females from marginalized backgrounds in general are even more disadvantaged particularly in these critical fields. At post-graduate level, this pattern is not only reproduced but also magnified.

Africa's education system is pyramidal in the sense that it has a broad base at the primary level where enrolment rates by females is high, then it moves gradually through the secondary level to a narrow apex at post-secondary tier (Ominde, 1999).

The concern with the decreasing number of females at post-secondary tier is that the small percentage that proceed are mostly in non-science and non-technical courses, a fact that gives them less leverage in the labour market compared to their male counterparts. Considering that science and technology oriented courses at the tertiary level deals with high-level manpower training in these areas, participation of women is crucial in determining the extent to which women will participate and be represented in the complex technologically oriented global economy.(Kane, 2004)

In Kenya, while other aspects of education are well-funded, technical and vocational training is grossly under-funded. The end result is that technical and vocational training institutions do not have adequate and modern equipment and other learning and teaching resources that are critical for preparing high calibre graduates. At the same time, technical and vocational training operates without clear legal frameworks and policy guidelines. There is hence, no single unit to coordinate the programmes to ensure standards and harmony. Instead, technical and vocational training has been scattered across various government departments with the result being that the sector is highly segmented and uncoordinated. Consequently, hardly do the departments work together to formulate joint strategies to enhance technical and vocational training.

These are some of the flaws that undermine technical and vocational training that were discussed at the National Conference on Education and Training held in Nairobi in November 2003. In this conference, there was consensus that the various departments dealing with technical and vocational training ought to harmonise their operations as a matter of urgency and jointly work towards revamping the sector.

The technical and vocational training institutions include national polytechnics, technical training institutes, institutes of technology, youth polytechnics, industrial training centres as well as commercial colleges. The conference

recommended that the government should establish a national steering committee to coordinate and spearhead the development of a national skills training strategy as well as carrying out an audit of the existing training programmes with a view to re-defining and re-designing the courses to make them relevant to the market needs. It would also formulate policies, develop criteria for admissions, set standards and provide guidelines for implementing, examining and certifying them. (Republic of Kenya, 2003).

Ultimately, the aim was to standardize training and have a scenario where employers and everybody else are able to gauge the competencies that go with particular qualifications. As it is to date, people come out of the training institutions with all sorts of certificates and it is difficult to match them with the skills acquired. The conference also recommended that the government should increase the annual budgetary allocation to technical and vocational training to enable the institutions to rehabilitate, expand and improve their facilities so that they can provide quality education and training.

Due to inadequate resources, most technical and vocational training institutions operate without the necessary teaching and learning resources. This has had a bearing on the quality of training with some of the graduates not having the practical experiences in their chosen careers. (Ministry of Education, 2006)

The conference was also concerned that the technical and vocational institutions were left out in regard to loans and bursaries for needy students. While secondary and university students benefited from government bursary schemes and loans, those in technical and vocational training institutions and other middle-level colleges did not. This has had a negative impact on access as it means that qualified students from poor backgrounds, who are unable to raise the fees, cannot train at the institutions. Thus, it was recommended that funding to the Higher Education Loans Board be increased so that it could give loans and bursaries to technical and vocational students.

Significantly, the conference took issue with the fact that the curriculum offered by the technical and vocational training was out of tune with the requirements of the market. Part of the reason for this was that the institutions had rigid structures that did not allow them to make changes as frequently and instantaneously as may be required. The institutions continued to provide training in traditional areas like motor mechanics, masonry, building and construction, among others and using rudimentary technology at a time when the trend is on precision industry and use of computers for product design and development.

Related to this, many private colleges have sprung up purporting to be offering technical and vocational training when in the actual sense, they do not have

qualified personnel, appropriate curriculum and modern equipment to provide quality training.

The 8-4-4 education system in Kenya was partly meant to vocationalize the education curriculum at all tiers, and increase the number of students (both males and females) studying science and technical oriented courses due to its focus on science and technical subjects. Hence, with the launch of the 8-4-4, system of education, recommendations were made to the effect that VET should be made functional. This implied the inclusion of programmes of study in technical and applied sciences that provide both basic and specialized skills related to a vocation. For women, this recommendation meant, that functional training had to move from the provision of skills in traditional areas like basket weaving and home science. In fact, the 8-4-4 system of education was expected to lead to an increased number of female students admitted into technical training institutions. However, by 1994, for example, only 31% of the Kenya polytechnic enrolment was female (Republic of Kenya, 2005).

According to the Kenyan's, Ministry of Education, the objectives of the vocational and technical education in Kenya include among others:

- ❖ The provision of increased training opportunities for school leavers that can enable them to be self-supporting.

- ❖ The development of practical skills and attitudes that can lead to income-generating activities in urban and rural areas through salaried or self-employment.
- ❖ To provide technical knowledge and vocational skills necessary for the growth of agriculture, industry and commerce.
- ❖ To provide people who can apply scientific knowledge to the solution of environmental problems. Ministry of Education Science and Technology (2003).

The above objectives embrace areas where women are mostly involved in. This is in terms of them being the majority of the population and the fact that most tend to reside in the rural areas, engaged in informal activities. In this respect, vocational education and training that emphasize more on the participation of women especially in science-oriented courses will not only increase their participation in the labour market, but will have an impact on such development sectors as agriculture, trade and environmental conservation.

The broad-based 8-4-4 system of education was intended to address women's poor participation in science and mathematics courses. The expectations have, therefore, been that with most female students being exposed to mathematics and applied science subjects from the lower levels of the educational system, their enrolment in VET institutions and participation in the labour market would improve.

However, the enrolment still remains low. This implies that, there may still be unforeseen bottlenecks militating against the realization of this aim.

Although, there has been some slight upward trend in enrolment of female students in VET institutions, they are concentrated on a few traditionally “women” courses such as secretarial, home science, Business Education and education. Few female students access or enrol in pure science and Mathematics based courses such as engineering. This has tended to lower their competitive edge in the labour market. According to the Republic of Kenya (1999) on post-secondary and higher education institutions, women are not only the minority but also the most enrolled in Arts and Humanities-based courses. Statistics reveal that in Africa, more males than females have access to higher education by a factor of almost three times, males dominate in all fields of study, except Home Economics. Even in arts faculties where the largest proportions of females are enrolled, males still dominate in absolute terms.

The participation of female students in technical training institutions should be encouraged to take up training skills that give them more options and opportunities for employment. They should be assisted to undertake training in non-traditional female occupations. According to Kasente (1995), women desire to be trained, however, there are barriers that discourage them from going for training in science based courses which offer better opportunities for the job market.

These include cultural values that do not allow females to take up certain roles, gender ideology, parents' educational levels, individual attributes such as attitudes towards science oriented, aspirations towards science courses and abilities in sciences. There are also school based factors like the school type, subject option, labelling process and gender stereotyping and curriculum and classrooms.

### **1.2 Statement of the Problem**

Whereas the Kenya government is making some appreciable efforts to improve the status of women in formal education at all levels, women still remain under-represented in VET institutions and more so in science and technology-related courses (RoK, 1999). Despite this under representation, vocational education and training of girls in Kenya and in Africa continues to offer the society an opportunity to equalise labour force participation, the distribution of resources, reduce absolute poverty and develop human resources. To women, science and technology-oriented courses offer them opportunity to better careers, which translates into stable and secure life for themselves and their family.

At the same time, a pool of female professionals especially scientists in a country will provide positive role models and result in narrowing of the gender gap in science and technology and a simultaneous enhancement of national scientific achievement. The current technology driven global economy requires human resource trained in science and technological oriented fields.

There is, therefore, need for the government and all stakeholders in education to urgently explore ways of removing the barriers to women's participation in hitherto male- dominated science and technological fields. In 1999, the World Conference on Science in Budapest stressed the need for special efforts to be made to ensure full participation of women and girls in science and technology (UNESCO, 1999). But at the same time here are clear social pressures on women to pursue traditionally "female" subjects in the humanities, education, and nursing at the expense of science and technology disciplines.

The central concern of this study is that though the factors responsible for the disparities between women and men in educational system, and especially in science-based causes appear to be broadly known, there are no systematic data that analyse the access and participation of female students in science-oriented courses in technical training programmes. Studies have not also explained adequately why despite a series of policy interventions, the problems still persist and in some instances, seem to worsen.

It is against this background that this study investigated the factors influencing women's access and participation in science-oriented VET programmes in Nairobi Technical Institutes.

### **1.3 Purpose of the Study**

The main purpose of this study was to establish the factors influencing women's access and participation in science-oriented VET programmes in Kenya. In

particular, the study sought to carry out an investigation into the gender dynamics influencing accessibility and participation of women in VET programmes in selected institutions in Nairobi.

#### **1.4 Objectives of the Study**

Specifically, the research was guided by the following objectives:

1. To establish female enrolment trends in the different science-oriented courses in the selected VET institutions for the last four years and their aspirations in the VET institutions in Nairobi.
2. To establish the factors that influence females' choice and enrolment in science-oriented VET programmes in selected Technical Institutes in Nairobi.
3. To identify the policy interventions that can be made to increase females' enrolment in science-oriented courses.

#### **1.5 Research Questions**

The study was guided by the following research questions:

1. What have been the enrolment trends and career aspirations of women in the different science-oriented VET programmes in the selected institutions in Nairobi over the last four years?

2. What are the factors that influence females' choice and enrolment in science-oriented VET programmes in selected technical institutes in Nairobi?
3. What policy interventions can be designed made to increase the enrolment and achievement of female in VET programmes in Kenya?

### **1.6 Assumptions of the Study**

The study was guided by the following assumption:

1. Female students have been socialized to see courses in a gendered dichotomy.
2. The identified participants would volunteer without fear or intimidation.

### **1.7 Significance of the Study**

This study has the following significance:

1. This study has generated information on the factors influencing women's access and participation in science-based VET courses.

It is hoped therefore, that this will be beneficial to the society and the policy-makers to improve female access and participation in science-based courses in technical training institutions.

2. This study contributes to the existing body of knowledge in the field of education studies as well as prompts further studies.
3. To the female students, the findings of the present study provide further evidence of their low enrolment ratios in VET programmes. Hopefully these findings will raise more awareness among the female students in particular and the institutions in general on the need to direct more individual and institutional efforts to encouraging women enrolment in VET programs. This will eventually contribute to achieving gender parity in the country's workforce.

### **1.8 Scope and Limitations of the Study**

The scope of this study was limited to three technical training institutes within Nairobi Province. Specifically, these are Nairobi Technical Training Institute, Kabete Technical Training Institute, and Kinyanjui Technical Training Institute. These institutes in Nairobi purposively sampled offered a wide range of science and technology oriented courses and were better equipped in terms of facilities, as well as the fact that they were more accessible to the researcher. The study was limited in the following areas:

1. The study focused on only technical training institutes. The results may therefore, only be sparingly applied to other tertiary courses.

2. The study was limited to a sampled number of public technical vocational institutions. The results may not automatically apply to private technical vocational institutions.

### **1.9 Theoretical Framework**

This study was guided by two main theoretical orientations. These were: Social Shaping of Technology (SST) and the Social Construction of Technology (SCOT) theories. This being the case, gender and technology relations formed the central focus of the study while other social categories were read through this techno-gender lens. The two theories merged into a composite theory which, broadly speaking, is a constructivist orientation towards understanding both gender and technology. The influence of gender on technology has also been identified and indicated by Cockburn, (1991), who has noted that men and technology are so often placed together that some of the defining characteristics of masculine culture are welded with technology: male technological competence and know-how, skill and interest. Such images prevail in the everyday life (for example, men and heavy machinery: bulldozers, men and sophisticated technology, computers).

Feminist researchers have also shown occupational and educational segregation in regard to men, women and technology. Such studies include Cockburn, (1991), Webster, J (1989). A constructivist approach to understanding gender means deconstructing essentialist ideas of what it means to be masculine or feminine and

instead, concentrates on how gender identities are achieved through daily practices and discourses in specific contexts. For instance, such constructivist theorists argue that it is by way of how the socialization process through the various agents such as the family, school and even the peer group introduce the young ones to these roles that makes them develop certain attitudes, positive or negative, in relation to certain roles and eventually, the associated careers. In the same way, a constructivist approach to understanding technology inquires not merely into what the technology is but rather what it becomes and how, for example, what a Vocational Education and Training course means to different people (males and females) in different contexts. In this way, technology, much like gender, is not only complexly designed but also cannot be “closed off” at the design stage. It enters “careers” in the consumption phrases (Ibid p. 46).

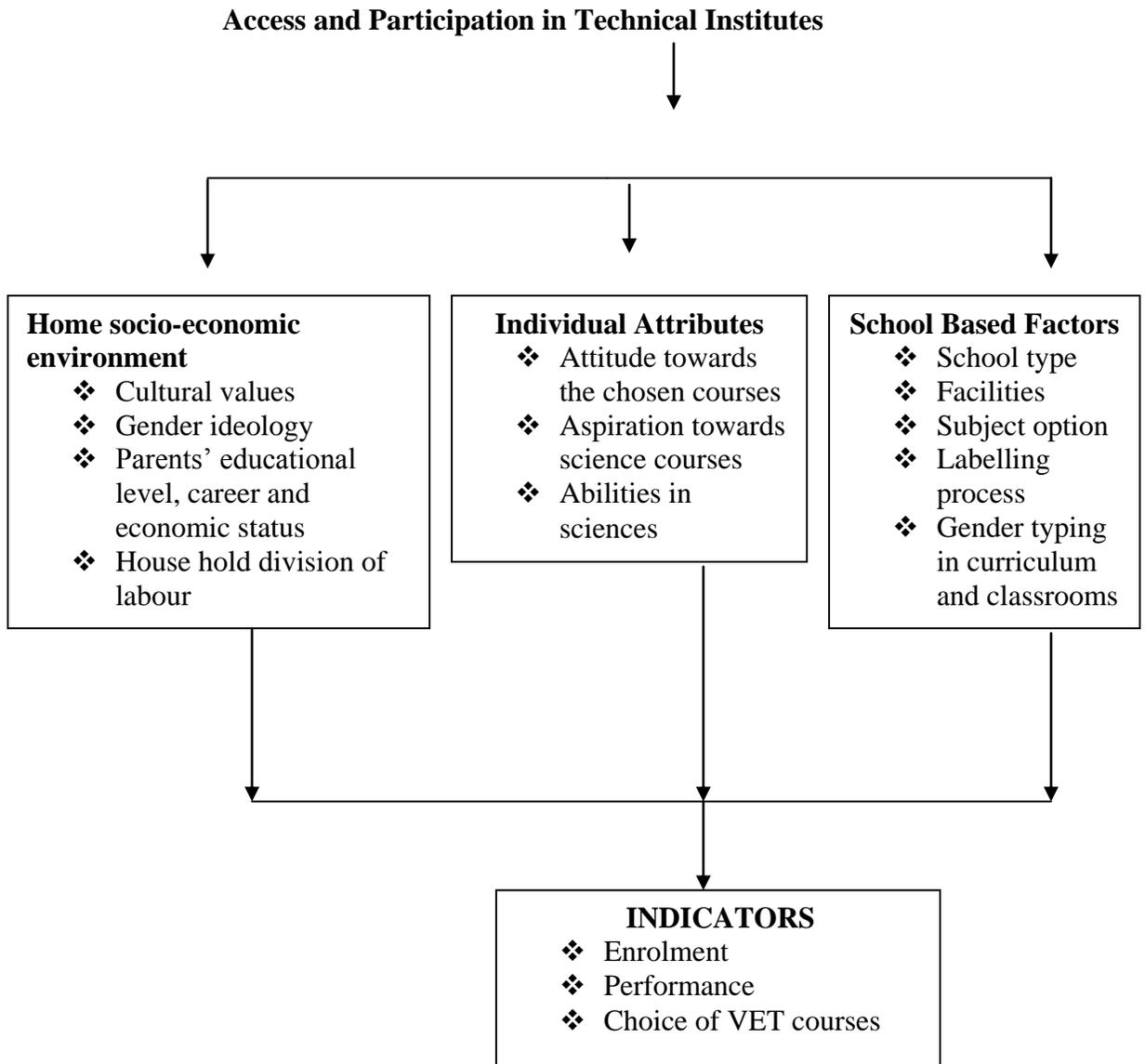
In the unfolding scenario, a constructivist approach to both gender and technology means understanding how both the gender and the technology are mutually shaped in relation to one another. In this study the two theoretical orientations were used to explain how gender and technology are interwoven in the practices of everyday life especially with reference to science-oriented courses in the context of education and training.

A social shaping or constructivist approach to technology therefore, means locating technology as being thoroughly social, a product of social interaction. This differs substantially from mainstream understanding of technology which

perceives technology as being distinct from social life, but which can radically change our lives in a certain manner.

This blend of the Social Shaping of Technology (SST) and the Social Construction of Technology (SCOT) theories gives rise to a feminist constructivist approach which helps the researcher to keep an eye on how both gender and technology are constructed and reconstructed with respect to educational opportunities in science-oriented and vocational educational and training programmes in Kenya. The interaction of these components and indicators are shown in figure 1.1 below.

**Figure 1.1: The Conceptual Framework Model**



*Source: Researcher's own*

From the conceptual framework, women's access and participation in science-oriented courses are constrained by: home socio-economic environment such as parental career, education level and economic status, cultural values , dominant

gender ideology in most communities and household division of labour; it is also constrained by individual attributes such as attitude, aspiration and abilities towards sciences; and lastly, by school, based factors like facilities available in the school, gender typing in curriculum and classrooms, and labelling process. This leads to not only low enrolment of females in VET institutions but gendered choice of VET courses, where women dominate the traditional women courses such as secretarial. These constraints arise mainly as a result of stereotyping, where women are generally assumed to be the weaker sex and not capable of pursuing challenging courses such as science-oriented courses. The society inculcates this ideology (weaker sex) through its practices, which in turn affects the individual girl's attitude and aspiration towards science courses.

In general, enrolment patterns in technical training institutes at the post-secondary level clearly reveal the gender bias in courses pursued with the males dominating in science and mathematics-oriented subjects while their female counterparts dominate in garments making, and tailoring, food and beverages, general agriculture and business education. This disparity has largely been associated with lack of adequate preparation in mathematics and science in their earlier years of schooling due to the nature of socialisation, societal and individual attitudes. These factors negatively impact on the general enrolment, performance and choice of VET courses.

### 1.10 Operational Definition of Terms

**Access:** Getting a chance to take science-oriented courses

**Gender:** This refers to the socially/culturally determined power relations, roles, responsibilities and entitlements for men and women ;girls and boys. The social constructs vary between cultures as well as over time

**Gender discrimination:** Refers to unequal or preferential treatment of individuals or groups on the basis of their gender that result in reduced access to or control of resources and opportunities.

**Gender Equality:** Refers to the equal treatment of women and men, girls and boys so that they can enjoy the benefits of development including access to and control of opportunities and resources.

**Gender Equity:** Refers to the practice of fairness and justice in the distribution of benefits, access to and control of resources, responsibilities, power, opportunities and services. It is essentially, the elimination of all forms of discrimination based on gender.

**Gender Roles:** Socially assigned roles and responsibilities as opposed to biologically determined functions.

**Gender-role stereotyping:** The assigning roles, tasks and responsibilities to men and women, boys and girls on the basis of preconceived prejudices.

**Opportunity:** Circumstances, events or situations that offer women and men the chance to achieve or acquire higher education

**Participation:** A general term used to refer to active involvement in enrolment retention, progression, and transition.

**Science and technology oriented courses:** Are courses in areas such as mathematics, engineering, physical sciences, and computers

**Social constructivism:** a theory that emphasizes the importance of culture and context in understanding what occurs in society and constructing knowledge based on this understanding, in this case, the way both gender and technology are constructed and reconstructed with respect to educational opportunities in science-oriented and vocational educational and training programmes in Kenya.

**Socialization:** The process of sociocultural learning, of values, the acquisition of knowledge, skills and dispositions that make women and men integrated members of the society.

**Technical and Vocational Education:** The kind of education that is offered by technical institutions and which emphasizes on technical skills.

**Weaker Sex:** a social constructivist perspective of female human beings as less superior to their male counterparts in terms of academic performance especially in science oriented courses and other social roles.

## CHAPTER TWO

### REVIEW OF RELATED LITERATURE

#### 2.0 Introduction

This chapter gives a summary of relevant literature used to conceptualize the research theme. The review gives an overview of female education as a tool for social change, female under-enrolment in education in general, female education in relation to labour market, factors affecting female participation in education and finally, efforts made towards equity in science and technology-oriented courses. The review of these studies thus locates this study in the growing body of literature on women and education, identifying the existing gaps.

By about 1980, there were some rather consistent findings from research on gender and mathematics. For instance, in the United States, when studying mathematics became optional in the secondary schools, fewer females than males were electing to study mathematics; young women did not believe that mathematics was particularly useful and tended to have less confidence in themselves as learners of mathematics. There was, therefore, strong evidence that boys stereotyped mathematics as a male domain and so societal influences that suggested that mathematics learning was not particularly appropriate for girls were identified.

Generally, research has provided rich documentation of and knowledge about variables that are related to gender and mathematics and other related science and vocational subjects.

In New Zealand, it was observed that one of the largest groups entering tertiary education is that of women seeking to retool for workforce, many of whom enrolled in computer- based courses. However, while research identifies these women as feeling quite comfortable with information communication technologies (ICTs), they still largely perceive Information Technology (IT) as a ‘male domain’ (Hutchinson, 2004). As such, fewer women than men are studying Information Technology (IT) at a tertiary level in New Zealand as well as in many other Western countries. In spite of many intervention programmes over the years and a higher growth in female tertiary education enrolments generally (NZ Statistics, 1999), women’s participation rate in such courses has not greatly improved, particularly in comparison with other disciplines such as law and medicine. There has also been a major fall in numbers of all students graduating with IT qualifications since the “dotcom crash” in 2001 (Griffin, 2004).

A recurring concern in the literature reviewed is that the number of women entering technological courses has declined for the last twenty years and that more men than women are studying IT courses and choosing the IT industry as a career (Margolis & Fisher, 2002).

This is of concern because not only are some of the fastest growing job categories computer related and have the highest average pay rates, but women need to be part of an industry that is shaping their lives in profound ways.

One explanation for differences between female and male participation in computer-related courses has been in the general historical and though more recently to a lesser extent ongoing social conditioning and stereotyping of females and males in relation to technology which commonly genders its creation and programming as 'masculine' domain. Consequently, where there has been a focus on the technical aspects of computing (as opposed to the practical uses) males have been more likely to be drawn to the field (Freedman, 1997). It is, therefore, important that further research is undertaken to identify the factors for women in the IT industry that helped and hindered them in their careers to date so that strategies could be developed to ensure they are not lost to the industry.

## **2.1 Female Education as Tool for Social and Economic Development**

Education is not only a means for social development but also has economic implication. Education is important in that it equips a person with relevant skills, knowledge and values to enable one to survive and actively participate in national development (MoEST, 2004). It has been considered internationally a human

right thus, the emphasis on education for all by the year 2000, a policy still pursued to date.

The social benefits of education include lower mortality rate, lower fertility rate, improved nutrition, increased life expectancy, and better opportunities for the children in the next generation. The economic implication of education are; that education leads to higher output, higher wages, changes in distribution of earned income between the rich and the poor and leads to economic mobility ( Colclough, 1993; Schult, 1989).

Education of girls according to Grant (1984) outweighs all other factors, including income; it impacts on a range of development related behaviours concerning childcare, nutrition and health. Subbarao and Raney (1992) point out that increased girl education to secondary school is not only associated with economic and social benefits but is the single most effective way to achieve lower fertility and reduce infant mortality. Thus, the continuing restrictions on the educational opportunities available to women are not only a matter of inequality but constitute a serious retarding factor on national development (Ominde, 1999). The benefits that come from educating women are undeniable. The current study sought to identify factors, which retard women opportunities to tertiary education with an aim of exploring intervention strategies to improve enrolment by women in vocational and technical education.

## **2.2 Under Enrolment by Females in Education**

Research findings indicate that girl-child education generates benefits not only at the personal and family level but is also important for social and national economic development. Educated women make a significant contribution to the labour market and increase national productivity. The education of girls has multiple impacts on the society as mothers, bringing up healthier families and their children have, especially girls, a greater probability of attaining higher levels of education. This makes educating women an important strategy not only for poverty alleviation but also tapping the talents and the potential they represent. Higher education in particular empowers women to participate in the social, political and economic lives of their communities and countries as leaders in business, professions and politics. Women's access to higher education is a prerequisite for gender equity and equality in society. In spite of the value of education, the trend in Kenya is that female students have been under represented at all tiers of education.

Despite impressive quantitative expansion of tertiary education, several studies indicate that it is most withheld from women particularly in developing countries (Acker & Piper, 1984; Boserup, 1970; Foster, 1997). A growing awareness that women must play a central role in all aspects of the development process is pointed out by some scholars (Duncan, 1989). Regardless of all the demonstrated importance of education for both male and female, women remain under-

represented, starting from upper primary institution. According to FAWE (1995), females constitute nearly 50% of the children enrolled in grade/class one in Kenya, Zambia and Nigeria. This enrolment however, decreases the higher one ascend to education hierarchy.

While not all boys attend primary school in developing countries, male enrolments, as a percentage of their age group are more than double those of females (Deble, 1980; Bolman & Anderson, 1982).

Despite resolutions and recommendations made by various international and regional bodies, it is apparent that education systems in Africa and elsewhere continue systematically to provide better opportunities for boys than girls (UN, 1984). This is in spite of the demonstrated substantial economic and social returns to female education (Gachukia, 1992). Paradoxically, it is the poorer countries that need these returns most which also have poor track records in girls' education.

Enrolment in technical training institutes at the post secondary tier depicts more clearly the gender bias in course pursued. Males dominate over 90% in mechanical; engineering and automatic engineering on the other hand females dominate in garments making, and tailoring, food and beverages, general agriculture and business education. This disparity has largely been associated with lack of adequate preparation in mathematics and science in their earlier years of schooling. Enrolment in technical and vocational institution requires the

candidates who have passed in mathematics and sciences. (EASSRR. Vol. xv 1, January 1999).

Some of these enrolment trends follow some regional patterns. Regional imbalances in access to educational opportunities in Kenya have strong historical, cultural, economic and political roots that have been the subject of various historical and educational studies. The patterns of colonial economic penetration and settlements, and the African response to the encounter; the evangelizing and educational activities of the Christian missionaries; and the policies of the colonial government towards the colonized, have left an indelible mark on the mosaic of uneven development of education in the country. Regions and communities that had concentrated missionary attention, government schools and active local authorities have had a definite headstart in provision of education. The centralization of education provision on attainment of political independence did not alter the initial advantages, but rather consolidated earlier gains by these regions through their access to economic and political power. The initial advantages were also supplemented and reinforced by Harambee movement initiatives undertaken in the first three decades of independence (Kihumba, 2000).

While in the past some groups' cultural attitudes and practices led to limited participation in formal education, low completion rates and poor educational achievements among pastoral communities and especially in arid and semi arid districts, the continued political neglect of these areas, the high level of poverty

coupled with slow pace of economic development, ethnic and clan conflicts and occasional droughts and famine, have perpetuated low enrolments. These factors have accentuated regional and gender imbalances in access to and provision of basic education opportunities that is reflected in subsequent levels.

Additionally, the existing pockets of poverty in high potential districts and urban areas (slums and squatter settlements) have also severely curtailed access to basic education of poor and orphaned children from these areas. The available opportunities to them are often of poor quality making it difficult to achieve high level performances needed to compete for education and training opportunities at the next level of education. Hence, students who come from poor households irrespective of the socio- economic ranking of their regions and districts tend to perform poorly in KCSE examinations, and are therefore unable to compete fairly for the limited opportunities in higher (Education Ministry of Education, 2005)

### **2.3 Female Education, Labour Markets and Professions**

The main purpose of higher education in Africa is to train high-level human resource for national development (World Bank, 1988). However, trends in male and female representation in employment, in decision making positions and other positions that set the gender for national development, indicate that women are seriously under-represented worldwide, with the ratios of women to men showing highest disparities in developing countries. The reasons for women under-

representation in professional and leadership positions are many and complex, the biggest single reason given for their smaller numbers, compared to those of men, is that they are under-represented in education and skills training and therefore, they will automatically be under-represented in the labour force.

The labour markets of most developing countries are characterized by low rates of female labour force. Participation in the modern economic sector follows occupational segregation patterns that cluster women in a limited number of occupations. Part of the explanation is that this occupational segregation is higher in developing than developed countries may lie in the late entry of women into the formal sector. Graduate women also lack options in employment promotion and upward mobility because of discrimination, and because of their domestic roles. However, it is argued by others (Namuddu, 1992) that the experience of African countries does not support that reasoning that the under-representation of women in management and decision-making at senior levels is the result of their under-representation in higher education. It is argued that factors other than access and achievement in higher education determine where men and women without higher education will work.

The structure of the labour market and perceptions of available job opportunities are related not only to occupational aspiration and expectations, but also to school performance. Although the environment of the labour market is beyond the scope

of this study, the study will look at how job aspiration of females affects their placement in different technical programmes.

#### **2.4 Factors Affecting Female Participation in Education**

Some of the factors to explain persistent gender disparity in education are indicated to be due to the socio-cultural environment. It is argued that all cultures convey images and values about men and women and the roles appropriate for them. The exact nature of these images and roles varies between countries, but generally reflects the idea that women are inferior to men. The views and general role expectations that exist for women can be expected to affect the performance of girls in school and placement into different fields of study (Duncan 1989, Dupout, 1981). Society has through the socialization process established specific roles for males and females. Formal education and training is the modern strategy for preparing the youth for the future roles in society. Female students in institutes of technology are expected to take courses that will prepare them for appropriate occupations. Sometimes traditional beliefs and taboos are invoked whenever necessary to discourage girls from taking certain courses (EASSR Vol. XV January 1999). Due to women's under-representation in science and technology-based subjects they are likely to become increasingly marginalized and possibly excluded from the mainstream of national development.

A major adverse effect of sex-related attitudes is that they largely influence the career choices of girls. Girls have to sacrifice their individual potentials, which are not necessarily sex determined, to take up the sex appropriate roles.

According to Stenworth (1983), such attitudes affect success and in turn affect the possibility of future higher education training and ultimate careers. This was supported by Reed *et al.*, (1977) who saw sex-related attitudes as a major stumbling block preventing boys and girls from achieving their fullest potential development. Sex-related attitudes according to social scientists are constructs acquired mainly through the socialization process.

Biraimah (1985), Maccoby (1966) and Marland (1933) in discussing the school as the sexist promoter and amplifier recognized it as a social institution creating and strengthening sex stereotyped attitudes. Sivard (1985) observes that in all cultures, the way teachers treat the subjects in the curriculum and their reactions to pupils of both sexes can suppress or perpetuate sex bias. Observations by Stenworth (1983) show that in mixed classes, the style of teaching may incline pupils to believe that a subject is more appropriate for one sex than the other, the development of sex-related attitudes is not only confined within the school. The society is a sex-role learning modes that provides a wide range of experiences that perpetuate sex bias in children. Parents may, as Scanzoni (1978), observes scarcely be aware that they praise their children for behaviours, which are identified with their sex and scorn them otherwise. This practice precipitates in

children sex stereotyped attitudes. The importance of attitudes in the learning process is a widely discussed subject, but the actual situation has not been adequately investigated despite the many innovative reforms that the educational system has undergone.

Ongeti (1986) carried out a study on the attitudes of standard eight pupils and teachers' attitudes towards vocational subjects. The study revealed favourable attitudes but did not show whether these attitudes differed on the basis of sex. However, the studies point to the possibility of teachers wasting time in teaching what boys and girls believe are irrelevant skills that are only appropriate to the opposite sex. Home science in particular is one of the subjects in which sex segregation has been most pronounced in the history of vocational education (Kenya colony and protectorate, 1949). Right from its early inception in Kenya, home science has been understood to be appropriate for women only. Sheffield (1964) reports that domestic science (home science) was intended to prepare young women for their roles as future wives. This observation, therefore, explains why there exist sex differences in courses taken in technical training institutions. This is because students' and performance at primary and secondary levels dictates the courses one will pursue at post-secondary tier and it follows then that boys take up science-based courses while girls take up art-based courses.

According to Keino (1986), differentiation in course choice based on gender is not biological; but it is rooted in sex-stereotyping the world over. First, female trainees may be presumed unprepared to cope with science and technical subjects or lack of confidence in pursuing 'masculine' courses. Second, the school structure and attitudes in co-education institutions may not be supportive of female taking hi-tech subjects.

Third, lack of female teachers to act as role models in courses such as mechanical engineering, electrical engineering, building construction, wood and metal technology, motor mechanics and plumbing may aptitude to venture into any of them. Fourth, due to the fact that there are few women in technical training institutes, those who wish to venture into the male-dominated courses may become discouraged when they find they are the only one or two female(s) in the course. This study solicited opinions from the respondents, regarding factors, which influence low enrolment by females in technical training institutes and possible intervention strategies to curb the situation.

The poor performance of girls in mathematics and science-related subjects in primary and secondary levels of education is another factor that has been cited to explain why they do not qualify for science-based courses in vocational and technical institutions. Highlights of the benefits accruing from education to the individual mainly come through the studies that have focused on the destiny of groups that have differential access to education (Lipman-Blumen, 1984). Indeed,

withholding education and especially mathematics and science-based courses from women has been a big concern for feminists and politicians who point out that women's limited access to education has provided a potent mechanism for keeping the unequal power relationships between women and men in balance (Duncan 1989, Lipman-Blumen 1984).

Kasente, (1996), analyses the factors that contribute to gender differences in access to post-secondary institutions in Uganda. She identifies the factors as; social cultural attitudes and practices, early pregnancy, lack of appropriate role models, high rate of dropout by females at primary and secondary levels and low enrolment of girls at lower levels of education. No comprehensive study at least known to the researcher has been done on the access and participation of female students in technical training programmes in vocational institutions in Kenya. It is in view of this gap that this study was designed to investigate the determinants of access and participation of female students in technical training programmes in vocational institutions in Kenya.

### **2.5 Efforts to Equity in Technical and Vocational Education**

It was also thought to be necessary, to examine any efforts towards reducing the under- representation, in technical and vocational education. Globally technical, women tend to be under-represented in science and technology (Royal Society of Chemistry, 2000). This could be partly due to the choice of subjects they make at secondary levels of their education. In Kenya, women constitute 55% of the

population (Population Council, CBS, MoH and ORC, 2004). The Kamunge Report (1988) had called for the strengthening and expansion of science equipment production unit. Later, the Koech commission report of 1999 underlined the vitality of science as a requirement for industrialization adding that a sound technological education and training demands that a good science background be provided. Further than this, the report advocated for the inclusion of women in efforts towards industrialization (Koech Report, 1999).

Although an equal opportunity education policy exists in the country, the under-representation of women and girls in mathematics and science and technology-oriented careers at tertiary levels of education is so far low. Technical Education leads to improved production in industry, agriculture, trade and commerce (Shiundu & Omulando, 1992). VET is the end process which involves, in addition to the general education, the study of technologies and related sciences, that is, the acquisition of practical skills and knowledge relating to occupation in various sectors in economic life, formal and informal, rural and urban. Indeed, Kenya has made great achievements in the area of VET since the introduction of 8-4-4 with the steady increase in the numbers of those enrolled. However, gender disparities in the choice of courses taken cannot be ignored. Below is a table showing the enrolment pattern by gender in the tertiary technical institutions in Kenya, 2000 – 2004.

**Table 2.1: Enrolment pattern in Kenya (2000-2004)**

Polytechnics	2000		2001		2002		2003		2004	
	Male	Female								
<b>Kenya</b>	2979	1228	4323	1385	4586	1984	4488	2016	4937	2268
<b>Mombasa</b>	1943	801	3567	1092	3149	1401	2647	1390	2778	2436
<b>Kisumu</b>	646	266	785	240	947	410	937	421	1124	476
<b>Eldoret</b>	833	343	647	515	1527	660	1523	684	1675	752
<b>Subtotal</b>	6400	2638	9522	3232	10209	4455	9595	4511	10514	5882
<b>Other Technical Training Institutes</b>										
<b>TTIs</b>	4960	3280	5295	4160	5547	4539	7436	5648	9653	8350
<b>IT</b>	4380	2895	4674	3674	4898	4007	4799	3927	4715	3755
<b>Subtotal</b>	9340	6175	9969	7832	10445	8546	12235	9575	14368	12105
<b>Total</b>	15740	8813	19491	11064	20654	13001	21830	14368	24882	77987
<b>Grand Total</b>	<b>24554</b>		<b>30555</b>		<b>33655</b>		<b>35916</b>		<b>42869</b>	

Source MoEST Economic Survey 2005

The curriculum and methodology of essential subject area that provide the foundation for technical and vocational education should be more attractive and interesting. Science and mathematics should be more 'alive' and taught in relation to the interest of students daily lives in the real world of work (UNESCO, 1996) because the subjects allow access to a range of opportunities. By opting out of science course, girls subsequently become male-dominated and thus denied a basic understanding of matters that will concern them as future parents, citizens and decision-makers (Maccoby, 1998).

While the battle for the equality of opportunities in technical and vocational education and workforce participation requires a long-term commitment, all our efforts must be made to eliminate prejudices and biases detrimental to globalist development of women. The empowerment of women is the goal for all interventions which in turn will lead to equality of status in society (UNEVOC, 1996).

The objective of the new system of education is to ensure that students graduating at every level have some scientific and practical knowledge that can be utilized for either self-employment, salaried employment or for training. Vocational education is not new in Kenya and indeed the whole of East Africa. In East Africa, it was first introduced during the period of the East African Protectorate (1895-1920) in order to promote a sense of humility, training of hand and eye, and to develop and encourage manual labour among the Africans. At all levels of the

new education system, utility oriented subjects were incorporated into the curriculum such that pupils whose education at any stage of the system becomes terminal, can always find something to do for employment in the society (GoK, 1981).

Efforts have been made both by international organizations and individual states with some recorded successes particularly at tertiary level moving girls enrolment worldwide from 32% to 43% from 1959 to 1984 (Namuddu, 1992). But studies from different African countries indicate that boys' post-secondary enrolment outnumbered that of females by a factor of two to none (Gachukia, 1992, Namuddu 1992, Mbilinyi 1991, World Bank, 1988). In the fields of science and technology, men dominate worldwide ((Duncan 1989).

Efforts towards gender parity in education have been tried with a commendable degree of success in Kenya (Mukudi 1992, Wamahiu 1992). Girls' persistent under-representation in science-related subjects should cause concern because women are the backbone of small-scale farming and management (Krystal, 1976). They are more than half of the Kenyan population according to 1979 census. Thus, their under-representation in the science field is a loss to the Kenyan government and the nation.

Raban (1992) acknowledges the 8-4-4 system of education for its remarkable features in response to the problem of unemployment of school leavers by vocationalization of the school curriculum. He says that the subjects offered are

intended to provide knowledge skills and positive attitudes towards the world of work and he states clearly that the new education system has made all subjects compulsory to both sexes. He does not, however, elaborate the differences that exist in the access and participation of female students in science based courses in technical training programmes.

The process of education itself has come into focus as a main contributing factor to the dropping out of female from the education system. This may not be happening deliberately, but nevertheless, the system seems to cater for homogeneous students, whose needs are identical and show opportunities are the basis, demands on their time for domestic work, sexual harassment and a number of many other factors are not considered. There is need to make the education system sensitive to both females and males requirements in order to reduce gender imbalances. Females soon discover that schools are not friendly to their needs and some parents' decisions not to invest in girls education can also get influenced by similar perceptions. Studies outside Africa have consistently shown how pupils resist school when they judge it not to be a noble project in their daily and future lives (Namuddu, 1992).

## **2.6 Summary**

The reviewed literature has revealed that women all over the world and especially in developing countries remain under-represented in all sectors of education. The gender imbalance is particularly strong in the areas of science and technology

oriented disciplines. It has also revealed that the lack of female participation in these disciplines means that many countries currently do not exploit the full potential in their populations. This is because the potentials in the women in these countries are never fully unlocked because of the earlier mentioned barriers thus, only a portion of their potential in these areas is realized. This, therefore, calls for developing countries to urgently explore ways to promote the participation of women in sciences. It is in view of this that the current study sought to investigate the factors influencing women's access to and participation in science-oriented VET programmes in Kenya with an aim of giving suggestions for alleviating the problem.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

The chapter discusses the procedures and strategies used in the study. Research design, locale, target population, the sample and sampling procedures, data collection, data analysis and presentation are also discussed.

#### **3.2 Research Design**

The design of this study was a descriptive survey. Descriptive survey research studies are designed to obtain pertinent and precise information concerning the current status of phenomena and whenever possible to draw valid general conclusions from the facts discovered (Lokesh, 1984). Surveys also aim at obtaining information, which can be analysed, patterns extracted and comparison made (Bell, 1993), hence its choice for this study. The methods are non-experimental as they deal with the relationships among non-manipulated variables. Since the events or conditions have already occurred or exist, the researcher merely selected the relevant variables for analysis of their relationships (Best and Khan, 1993).

### **3.3 Locale**

The study was conducted in all the three technical training institutes in Nairobi Province, which were Nairobi Technical Training Institute, Kabete Technical Training Institute, and Kinyanjui Technical Training Institute. Nairobi Province was chosen because the province had three out of the twenty technical training institutes in the country that offered a wide spectrum of science and technology-oriented courses. Because of the cosmopolitan nature of the province, the three institutes in Nairobi offered a diversity of programmes tailored on the job, skill training, focusing on specific labour market conditions, and were well equipped in terms of facilities and manpower with high student enrolments. The institutes also draw students from all the regions of the country.

### **3.4 Sample and Sampling Techniques**

The study comprised students, heads of departments and heads of the institutes in the three technical training institutes in Nairobi Province. A sample of 212 female students was selected through simple random sampling methods. The respondents were distributed as follows: 88 respondents from Kabete Technical Institute, 80 from Nairobi Technical Institute, and 44 from Kinyanjui Technical Institute. The choice of the number of respondents from each institute was based on the enrolment of the students. The higher the number of students, the higher the number of the respondents relative to the sample size. All the three heads of the

institutes and 15 heads of departments, that is, five heads per institution, were included in the study sample.

**Table 3.1 Table showing sample distribution**

<b>Type of Respondent</b>	<b>Kabete</b>	<b>Nairobi</b>	<b>Kinyanjui</b>	<b>Total</b>
Students	88	80	44	<b>212</b>
Head of Institutions	1	1	1	<b>3</b>
Head of Department	5	5	5	<b>15</b>
<b>Total</b>	<b>94</b>	<b>86</b>	<b>50</b>	<b>230</b>

### **3.4.1 Sampling Procedure**

The sample of students was obtained from all the three technical training institutes by using simple random sampling. A list of the female student names in all the departments from each institute was obtained from the departmental heads with details of age and year of study. A sample of 30% of the total female student population in the three institutes was drawn. The researcher folded papers with numbers and asked those who had picked numbers within the range of the sample size and these are the ones that were asked to participate in the study. According to Kerlinger (1973), a sample drawn at random is unbiased in the sense that no member of the population has any more chance of being selected than the other members are.

All the heads of the three institutes and 15 heads of departments were used in the study. This was to gain insight into their views as professionals on the factors that influence women's access and participation in science-oriented courses and possible remedies to this problem.

### **3.5 Research Instruments**

The following instruments were used to collect data

#### *a. Questionnaires*

Three sets of questionnaires were used. Students' questionnaire sought information on socio-economic background of the students, occupational aspirations, views on women access and participation in technical training and recommendations. Heads of institutes and departments questionnaire provided information on their views on what contributes to low enrolment of women in science-oriented courses and possible recommendations to alleviate this situation. The researcher administered the questionnaires personally to ensure high response rate.

#### *b. Documents analysis*

The researcher analysed institutional records for the last five years (between 2000 and 2004) to establish the ratio of women to men, the courses they enrol in, and their academic performance. Among the documents analysed were the Kenya Education Sector Support Programme (KESSP), the Education Strategic Plan and

the Ministry of Education Gender Policy. These are documents that provide policy guidelines in the provision of education and more so, technical and vocational education in Kenya. This was used as a supplementary method of gathering information especially from institutional records for the last 5 years (between 2000- 2004), relevant policy documents e.g. KESSP, Education Strategic Plan and the MoE gender policy.

*c. Focus group discussions*

A total of three FGDs were conducted, one in each institution and which comprised of 7-10 female students selected from across the offered courses in that institution. This sought information on courses the students enrolled in, their views regarding why the gender differences in the courses they enrolled in, their ways of explaining this gender differences in the course enrolment and how these differences can be addressed.

### **3.6 Pilot Study**

Piloting was conducted to determine the reliability and validity of the instruments. The piloting also helped in modifying and to remove ambiguous items on the instruments. The drafted instruments were piloted at Thika Technical Institute. A purposive sample of 30 female students was used in piloting. Thika Technical Institute was purposively chosen due to its proximity to the technical institute in Nairobi.

### **3.7 Ethical Considerations**

In conducting research, it is important that ethic consideration be given due attention in an ethically responsible manner. (Robson, 2002). Bassey (1999) also contends that in any piece of research in the social sciences ethical considerations are necessary in conducting and reporting the research in respect of democracy, respect for truth and respect for persons.

Permission to carry out the research was obtained from the Office of the President as required by law. Permission and introductory letter to the heads of the technical institutes was obtained from the Provincial Technical Training Officer, Nairobi. A preliminary visit was made to the three technical institutes to inform the heads of the institutes of the intended research. A date to administer the instruments was arranged. The research was conducted in an ethical manner and all participants treated with dignity and outmost respect. All participants were directly asked for permission to participate in the study. The researcher self-administered the instruments to respondents, a fact that helped achieve a good return ratio. It also gave the respondents a chance to seek clarification on items that proved difficult.

### **3.8 Data Analysis and Presentation**

This study collected data from three main sources, namely FGDs, student questionnaire and secondary data. This were generated both qualitative and

quantitative data, hence descriptive statistics were used to analyse the data obtained. Data from FGDs were analysed by way of making inferences from the qualitative expressions and the opinions of the respondents. After the analysis, this data were thematically presented in narrative form and where possible tabular form. Content analysis yielded data in form of trends such as enrolment trends over the years. These were presented in form of tables and percentages. The questionnaires gave rise to quantitative data that were analysed using the statistical package for social sciences (SPSS version 11.5). This analysis mainly involved descriptive statistics which made use of frequencies, totals, percentages, and tabulation. For example, students' enrolments per department per year, year of study, socio-economic background, among others.

## CHAPTER FOUR

### DATA ANALYSIS, INTERPRETATION AND PRESENTATION

#### 4.0 Introduction

This chapter presents an analysis and interpretation of data that were collected during fieldwork. The analysis and interpretation were done within the framework of the core objectives that the study sought to address. The core objective of the study was to establish trends in women's access and participation in science-oriented vocational education and training programmes in Kenya. The study was conducted in three selected technical institutes situated around Nairobi. These were Kabete Technical Institute, Nairobi Technical Institute and Kinyanjui Technical Training Institute. The respondents included samples of female students drawn from science-oriented programmes in the institutions. Ten percent of students were sampled from each of the institutions. While studies on gender and schooling participation have been carried out in Kenya, most of them have been concentrated on primary schooling and the university sector of higher education. This has left gender aspects of participation in middle level colleges unexplored. This is despite the fact that middle level colleges in Kenya play an important role in workforce development. Studying women participation in such middle level colleges therefore, makes important contributions to understanding certain gendered aspects of labour force participation in Kenya.

Data presented was organized into five themes based on the key research questions that guided fieldwork for the study. These were;

- a) Trends in women enrolment in vocational education and training institutions in Kenya.
- b) Performance trends of women students in science-oriented courses from the selected institutions.
- c) Factors influencing choice and placement of women into science courses in the selected institutions.
- d) Career aspirations of women students from the selected institutions.
- e) Suggested interventions to increase women's enrolment and participation in science-oriented courses in vocational training institutions in Kenya.

#### **4.1 Trends in Women's Enrolment in Vocational Education and Training in Kenya**

The first issue that the study sought to establish was the general trend in women's enrolment in vocational education and training institutions in Kenya. (In terms of the policy environment, the Kenya government and education practitioners have in the last two decades lobbied for gender equity in educational institutions. There have also been interventions to increase female participation in sciences. The government now has in place a gender policy and a policy that encourages female students to access technical institutions for science and mathematics based courses through scholarship programmes. The government's commitment to

pursuing such gender sensitive policies in education has been articulated through session paper of 2006 and the Kenya education sector Support programme (KESSP) document). Hence it was important to establish how the various policy interventions were influencing patterns of gender access to Vocational and technical institutions in the country. This was important because of the important role played by vocational institutions in preparing workforce in technical areas such as computing, electronics and mechanics. Since these are the areas that seem to provide more employment opportunities, it is important that the proportion of women attending these courses be established as a way of determining their inclusion into emerging labour markets. Opportunities in vocational training institutions can only be open to women if the institutional cultures permit their participation. Data on this issue were collected through content analysis of enrolment trends in technical and vocational training institutions. These were synchronized with the data collected from the sampled institutions. Table 4.1 below provides a summary of the enrolment trends for the years 1999-2003 in all the technical and vocational training institutions in Kenya.

**Table 4.1 Student Enrolment by Gender in Technical Institutions-1999-2003**

<b>National polytechnics</b>	1999		2000		2001		2002		2003	
	M	F	M	F	M	F	M	F	M	F
Kenya	2,720	1,739	2,979	1,228	4,523	1,385	4,586	1,984	4,488	2,016
Mombasa	1,784	1,141	1,943	801	3,567	1,092	3,149	1,401	2,647	1,390
Kisumu	689	441	646	266	785	240	947	410	937	421
Eldoret	664	425	833	343	647	515	1,527	660	1,523	684
<b>Total</b>	<b>5,858</b>	<b>3,745</b>	<b>6,400</b>	<b>2,639</b>	<b>9,522</b>	<b>3,232</b>	<b>10,209</b>	<b>4,455</b>	<b>9,595</b>	<b>4,511</b>
<b>Other TTIs</b>										
Technical training institutes	5,942	3,799	4,960	3,280	5,295	4,160	5,547	4,539	5,436	4,448
Institutes of technology	4,875	2,040	4,380	2,895	4,674	3,672	4,898	4,007	4,800	3,927
<b>Total</b>	<b>10,817</b>	<b>5,839</b>	<b>9,340</b>	<b>6,175</b>	<b>9,969</b>	<b>7,832</b>	<b>10,445</b>	<b>8,546</b>	<b>10,236</b>	<b>8,375</b>
<b>TOTAL</b>	16,675	9,584	15,740	8,814	19,491	11,064	20,654	13,001	19,831	12,887
<b>GRAND TOTAL</b>	<b>26,259</b>		<b>24,554</b>		<b>30,555</b>		<b>33,655</b>		<b>32,718</b>	

*Source: Ministry of Education Science and Technology, statistics*

Table 4.1 shows that though women's enrolment in technical education and vocational training institutions appeared to rise slightly over the 5-year period,

their numbers were still far below those of males. In the four polytechnics of Kenya, Mombasa, Kisumu and Eldoret, women enrolment accounted for 39%, 29%, 25%, 30% and 31% of the enrolments in the years 1999 to 2003, in that order. This presented a situation where the total number of women students in the institutions declined consistently from 39% in 1999, to 31% in 2003, with the years 2000 and 2001, recording the steepest decline to 29% and 25% respectively. Women's enrolment in the technical training institutions, the second segment of technical education in Kenya, averaged 44% within the same period. The Institutes of Technology also accounted for an average women enrolment of 40% within the same period. Overall, the percentage of women enrolled in the three segments of technical training in the country averaged 36% from the years 1999 to 2003.

The above results show that the representation of women as students in technical and vocational institutions in Kenya is far less in the more advanced polytechnics compared with technical training institutes and institutes of technology. Since polytechnics offer more superior training at the diploma and national diploma levels, the results imply that women are disadvantaged in this respect and are more concentrated in the certificate awarding technical training institutes and institutes of technology. Even here, their numbers do not even match those of male students though the percentages are higher than in the polytechnics.

The critical component of the study, however, was two-fold. First, to establish trends in women enrolment from the three sampled institutions since given their location in Kenya's capital city, and considering their long history, it was hoped that the institutions could have programme to promote the participation of women, in tandem with gender equity trends promoted by the Kenya Ministry of Education. Second was to establish the type of courses women students enrolled for in the various technical and vocational training institutions. This was important as the study sought to establish if more women students were venturing into mathematics and science courses that have traditionally been seen as a male preserve. Even when technical and vocational institutions are perceived as offering courses that are mathematics and science-based, some vocations do not require high mastery of mathematics and scientific skills. Such courses include Home Science, Textile Technology, Fashion and Design and Food and Beverage technologies. Consequently, such courses have overtime become the source of categorizing courses in these institutes along gender lines. The conceptual argument of this study was that for women to access highly competitive careers in the labour markets, they need to do that by accessing courses that require higher level mathematical and scientific skills, such as engineering and electronics is important. Table 4.2 below provides a comparative overview of the trends in enrolment in the three institutions.

**Table 4.2 Comparative Gender Analysis of Trends in student Enrolment  
from the Three Technical Institutions 2000-2004**

<b>Institution</b>	<b>Gender</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
<b>Kabete Technical</b>	Male	310	286	371	350	257
	Female	155	204	103	172	139
	<b>Totals</b>	<b>465</b>	<b>490</b>	<b>474</b>	<b>522</b>	<b>396</b>
<b>Nairobi Technical</b>	Male	154	174	249	412	274
	Female	62	133	222	198	214
	<b>Totals</b>	<b>216</b>	<b>307</b>	<b>471</b>	<b>610</b>	<b>488</b>
<b>Kinyanjui Technical</b>	Male	36	32	76	60	90
	Female	10	3	8	19	54
	<b>Totals</b>	<b>46</b>	<b>35</b>	<b>84</b>	<b>79</b>	<b>144</b>

Table 4.2 reflects the gender trends in the three technical institutes in respect to the enrolment of female students within the five-year period. This data were provided by the heads of institutions that were sampled as shown in the table above. First, in none of the institutions did female enrolment go higher those of male students. At Kabete Technical Training institute, which on average enrolled more students compared to the other two throughout the five-year period, female student enrolment averaged 33%, 41%, 21% 32%, and 35% within the respective years. At the Nairobi Technical Training Institute, the averages were slightly higher, but never at par. The percentages within the five-year period were 43, 47, 32, and 43% respectively. At the Kinyanjui Technical Institute, which also had the least volume of students, the percentages for female students were negligible, averaging 8.6%, 9.5%, 24% and 38% over the five years.

The second observation was that in instances where the enrolment of male students went up, reflecting an increase in the total enrolment of the colleges, the

number of female students tended to decrease. For example, in the year 2002, the number of male students at Kabete Technical College increased to 371, from 286 in the previous year, while those of females decreased to 103, from 204 students in the previous year. This trend is again repeated at the Nairobi Technical Institute where the number of male students increased to 412 in 2003, from 249 in 2002, while those of female students decreased to 198 from 222 in 2002. This trend is not consistent but raises curious questions regarding the female composition of the student body in technical institutes, such that even at times when there is an upward surge of students at a national level to join the technical institutions, the number of female students is not significant, and in some instances tends to decrease.

Third, though this study did not explore this issue in detail, there seems to be a correlation between the numbers of female students enrolled in the institutions and the range of courses offered in the institutions. For example, there would be a correlation between the number of female students in the institutions and the range of courses traditionally associated with females offered by the institutions. This would be the case with Kabete and Nairobi technical institutes as they offered courses in secretarial studies, home science, clothing technology, fashion and design and computer studies. This implied that an increase in the total numbers of female students in the institutions does not mean their increased access and participation to science and technology. Rather, female students tend

to get to institutions that offer courses such as secretarial and Home Science that have traditionally been labelled female. This study, therefore, went ahead to explore the actual numbers of female students who were accessing these courses in the three institutions.

Data showing the enrolment of male and female students into the various courses at a national level were not readily available. An examination of the enrolment trends from the three technical institutes sampled for the study was therefore done. Table 4.3 below is a comparative summary of the enrolment trends in the selected course over a period of four years, 2001-2004.

**Table 4.3 Distribution of Female Enrolments in Science and Technology Courses in the sampled institutions**

<b>Institutions</b>	<b>Courses</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>Total %</b>
<b>Kabete</b>	Mech. Eng	0(19)	0(36)	2(28)	0(36)	1.6%
	Motor Vehc. Eng	0(0)	0(59)	0(34)	0(35)	0%
	Elect. Inst	0(46)	1(44)	0(19)	0(36)	0.6%
	Electronics	0(25)	5(55)	3(21)	3(26)	8.6%
	Scie &lab tech	2(22)	0(5)	10(15)	32(37)	55.6%
	Secretarial	175(175)	246(246)	224(224)	313(313)	100%
	Agric. Mech.	-	-	2(24)	2(23)	8.5%
	Carp &joinery	-	3(36)	0(8)	0(7)	5.8%
	Computer Studies	2(30)	1(25)	2(20)	1(14)	6.7%

<b>Nairobi</b>	Med. Lab tech	9(36)	13(26)	7(14)	-	34%
	Pharmacy	26(47)	30(56)	14(41)	15(31)	48.5%
	Analytical chemistry	7(19)	-	15(25)	23(41)	52.9%
	Applied biology	15(31)	-	17(25)	17(30)	56.9%
	Science laboratory	9(17)	15(28)	21(27)	-	62.5%
	Bus. Admin	12(25)	7(12)	19(31)	16(31)	34.3%
	Supplies Mgt	11(26)	7(13)	7(15)	8(12)	50%
	Secretarial	16(16)	4(4)	14(14)	25(25)	100%
	Mech. Eng	13(58)	0(30)	0(25)	0(23)	9.5%
	Auto eng	0(14)	-	0(13)	1(27)	1.8%
	Motor Vehc Mech.	1(27)	-	0(14)	0(31)	1.3%
	Elect eng	1(28)	-	0(10)	0(40)	1.2%
	Electronics	2(42)	1(15)	0(15)	0(32)	2.8%
	Telecommunications	1(7)	-	1(3)	-	20%
	Elect. Inst	0(24)	0(26)	0(12)	-	0%
	Clothing tech	9(9)	5(5)	5(5)	9(9)	100%
	Food and Beverages	21(28)	12(16)	12(16)	21(27)	75.8%
Computer Studies	3(25)	2(20)	1(15)	0(14)	8.1%	

<b>Kinyanjui</b>	Mech. Eng	0(10)	0(26)	2(18)	0(26)	4.5%
	Motor Vehc. Eng	0(0)	0(49)	0(24)	0(35)	0%
	Elect. Inst	0(36)	1(34)	0(9)	0(26)	1.6%
	Electronics	0(15)	5(45)	1(11)	3(16)	12.5%
	Scie. &Lab Tech.	2(12)	0(3)	5(5)	32(27)	83%
	Secretarial	160(175)	(200)246	180(224)	280(313)	86%
	Carp & Joinery	-	3(20)	0(6)	0(5)	9.7%
	Computer Studies	3(25)	2(20)	1(15)	0(14)	8.1%

*The figures in brackets indicate the total student enrolment for the various courses.*

Key: Mech. eng-Mechanical engineering

Motor Vhc eng-Motor vehicle engineering

Elect. Inst-Electrical installation

Scie &lab tech-Science and laboratory technology

Agric. Mech-Agricultural mechanics

Carp & joinery-carpentry and joinery

Med lab tech-Medical laboratory technology

Bus. Admin-Business administration

Supplies Mgt-Supplies Management

Data from table 4.3 above reveal various trends regarding access and participation of female students in the three technical institutes. The table indicated the

distribution of female students in purely science and technology courses over the four years period for which detailed data on the issue were available for all the institutions. For each course, the total number of student enrolment was given in brackets and the percentage average composition of female students was given in percentages in the last column. The table shows that for Kabete Technical Training Institute, enrolment of female students in secretarial courses averaged 100% for the four year period, followed by Science and Laboratory Technology courses where female enrolment averaged 55.6%. The same trend was consistent at Nairobi Technical Institute and Kinyanjui Technical Institute where female enrolment in secretarial and clothing technology courses averaged 100%. Other courses that were popular with female students and where enrolments averaged over 50% within the same period included Supplies Management, Applied Biology, Analytical Chemistry, Food and Beverage technology and Laboratory Sciences.

At the second level were courses from all the three institutions where female enrolments averaged between 30-49% (consistent with national averages). These courses were medical laboratory technology, pharmacy and business administration. The last groups were the pure science and technology courses where female participation averaged below 2% in most cases. These courses were mechanical engineering, motor vehicle engineering, electrical engineering, electronics, agricultural mechanics, carpentry and joinery, automotive engineering

and electrical installation. In some of these courses, not a single female student was enrolled in some years.

Overall in terms of access, this study established that female students constituted a small percentage of student enrolments in the technical training institutions in Kenya. In respect to the three institutions that were picked for this study, female students were not only the minority, but their enrolments in science and technology courses was so small, sometimes 0% of the total enrolments. These trends have negative implications in the development of the female workforce as skills in mathematics and science increasingly determine entry into both formal and informal labour markets. In the case of Kenya, and in regard to the development of middle level workforce, women in Kenya are at a disadvantaged position.

The most worrisome trend was the concentration of female students in secretarial courses- packaged in the traditional setup of a manual typewriter and a shorthand note book as opposed to the increasingly visible personal computers. In all the three institutions covered by the study, this was the basic approach to secretarial studies. Computer word processing was offered as a different course and the number of female students was not as high compared to secretarial studies. For example, at Kinyanjui Technical College, in one academic year, there were 26

students admitted for secretarial studies compared to 3 who were admitted for computer studies (field data).

At Kabete Technical Training Institute, 313 female students were admitted for secretarial while two were admitted for computer studies. Investigation on this issue through observations and interviews with respondents showed two trends that still tended to affect female students in this area. One, as the traditional secretarial courses gets improved through the use of computer technologies, female students still get stuck in the traditional secretarial courses as male students enter the computer technology classes often taking up traditionally feminine roles, and the remunerations therefore improve. Second, any improvement in terms of providing new equipment for technical institutions focuses on courses where female students are rarely enrolled. As the study observed, while female students flocked to secretarial courses with old manual typewriters, other technical courses such as information technology and engineering courses continued to receive new equipment. Personnel were also concentrated on these courses. This meant that courses such as secretarial studies that were considered feminine were also marginalized in terms of materials and resources.

#### 4.2 Performance of Female Students in Mathematics and Science- Oriented Technical Courses

Besides access, the study sought to establish the performance of female students who got admitted to technical courses that required skills in mathematics and sciences. The data on this issue was provided by both the heads of institutions and heads of departments. These were the engineering courses where it has been shown, that enrolment of female students was in small percentages. The issue addressed here was, how was the performance of the few female students who got admitted to these courses compared to that of males?

**Table 4.4: Performance in Diploma Exams (Kinyanjui Technical)**

Year	Total Males		Total Females	
	Enrolled	Pass	Enrolled	Pass
2001	74	15	1	1
2002	47	6	1	1
2003	44	3	1	-
2004	98	18	15	6
<b>Total</b>	<b>263</b>	<b>42</b>	<b>18</b>	<b>8</b>

**Table 4.5: Performance in Diploma Exams (Kabete Technical)**

Year	Total Males		Total Females	
	Enrolled	Pass	Enrolled	Pass
2001	91	20	26	7
2002	142	61	61	24
2003	164	135	108	30
2004	118	38	24	20
<b>Total</b>	<b>515</b>	<b>254</b>	<b>219</b>	<b>81</b>

**Table 4.6: Performance in Diploma Exam (Nairobi Technical)**

Year	Total Males		Total Females	
	Enrolled	Pass	Enrolled	Pass
2001	97	38	68	25
2002	134	43	97	33
2003	216	79	108	52
2004	178	77	140	71
<b>Total</b>	<b>625</b>	<b>237</b>	<b>413</b>	<b>181</b>

Data on the above issue were availed for Nairobi, Kabete and Kinyanjui Technical training institutes. The data showed that the few women who were

admitted to mathematics and science-oriented technical courses did not perform as well as their male counterparts. For example, in the year 2003, only one female student enrolled in agricultural mechanics department failed. In the electrical installation department, five female students were enrolled, 3 were referred while the rest two failed. In the electronics department, 3 female students were enrolled. One was referred, while the other two failed. And in the science laboratory and technology department, of the 49 female students enrolled, 10 passed, 28 failed and 11 were referred. In the year 2002, 20 female students were enrolled in the science laboratory department. Five passed, 6 failed while 9 were referred. In electronics, of the 3 female students enrolled, 2 failed while one was referred. In the year 2001, of the 3 female students enrolled in the carpentry and joinery course, one passed, one failed and one was referred.

The above information establishes an important pattern regarding female participation and performance in courses that require mathematics and science skills. Female students were not only few in the institutions but performance in critical disciplines that would enable them compete in the labour market was dismal. Whereas it may appear from tables 4.4, 4.5 and 4.6 that the few females who were enrolled performed relatively better than their male counterparts, this performance was such a general one without some keen grading. Indeed their real performance shows low achievement at the individual level, that is, most of them

just performed at the average level, even though seen from a frequency perspective, many of them appear to have passed.

Three conclusions can be made from these data and what has already been previously reported. One, while females students constitute the majority of the population in the informal sector in Kenya and therefore in need of the skills provided in technical institutions, they constitute a small percentage of the students admitted to these institutions. Second, the concentration of female students in these institutions tends to be in courses which have been traditionally stereotyped as feminine, with little rewards in the labour markets. Third, when it comes to programme to improve resources for the various courses, those that have a male dominance are usually given preference leaving courses dominated by female students with worn-out or no resources and equipment at all. And lastly, most of the few women who manage to get admitted to courses requiring mathematics and science skills perform so poorly that the percentage passes are sometimes zero. These factors have continued to undermine women's participation in the labour markets.

### **4.3 Factors Influencing Female Students' Access and Participation in VET Institutions**

Opinions were sought from respondents on what factors contributing to the low access of female students to the institutions. The opinions of the students on this issue were sought through an open-ended questionnaire. Administrators from the colleges were also interviewed. Table 4.4 below summarizes students' responses on why female students faced limited access to VET institutions and why those admitted were not placed to pursue careers in areas that required science and mathematics skills.

**Table 4.7 Students' Responses on Factors Contributing to Low Access of Female Students to VET Institutions and Placement in Professional Courses**

<b>Factors</b>	<b>Frequency responses</b>	<b>%</b>
Secondary school grades	78	36.8
Nature of curriculum	55	25.9
Biased selection	46	21.7
Limited advertisement of opportunities	33	15.6
<b>Total</b>	<b>212</b>	<b>100</b>

According to the students' responses as summarized in table 4.7, the majority 78(36.8%) thought that the limited access that women faced to VET institutions was due the grades they scored in secondary schools. They noted that female students performed poorly in science and mathematics subjects at secondary school. However, these are the subjects that one required to enrol in most courses offered in VET institutions. For example, qualitative analysis of data collected from the heads of institutions and departments showed that whereas at least a C+ was required for students to pursue courses in engineering and electronics at a diploma level, most female students scored an average of D+ in most of the science subjects at secondary school. Analysis of 70 responses from female students who indicated their scores for mathematics in the form four examination showed that 55(78.6%) scored D+, 10(14.3%) scored C+, 4(5.7%) scored C-, while one (1.4%) scored C.

These low scores mean that most female students do not qualify to join VET institutions at diploma level for disciplines that require high grades in science and mathematics at secondary school examinations. Instead, and in the few instances where female students were found, they had to start from the certificate courses to improve their grades before they proceeded to diploma level. However, possession of diploma level qualifications increases one's chances of securing employment. This situation presented two scenarios to female students. One is that since most female students enter VET institutions at certificate level, they

take more time to achieve diploma level qualifications to eventually enter the labour market. Second is that VET becomes comparatively more expensive to most female students as they have to start from lower levels, and take time before they eventually attain diploma level qualifications.

The other reason indicating the low participation was the nature of the curriculum offered in VET institutions as indicated 25.9 % of the students. Qualitative interviews showed that most of the female students and their instructors perceived VET institutions to be for male students and therefore, the curriculum in the institutions was tailored more to the interests and career aspirations of male students to the disadvantage of female students. The same sentiments were shared by the heads of institution and heads of departments. In this case, female students would only aspire to join VET institutions that offered courses in home science and secretarial that has traditionally been associated with female professional aspirations. This response closely relates to the first one where poor grades at form four hindered access of female students to VET institutions. This would mean that the curriculum inclinations of female students at secondary schools are largely at variance with the core professional offerings of VET institutions.

The perception that VET institutions are meant for male students is also historical. As noted by Sifuna and Chege (2006:99), the growth of technical training institutes in Kenya was first a reserve for boys, offering a curriculum in building

and basic engineering courses for boys. This went on until 1977, when a few technical secondary schools opened doors for female students. Female students were offered separate curriculum in home science, business studies, tailoring and dressmaking. This made access to technical institutions more favourable to boys than girls, and contributed to the development of a better curriculum for boys than girls. This observation ties with one of the findings of this study already reported by heads of institutions and heads of departments that there seemed to be more improvements in departments dominated by males than those dominated by female students. The improvements were in terms of resources, quality of staff and learning environments.

Unfortunately, the above attitude has continued to influence negative perceptions towards females' participation in VET institutions. There has continued to exist the feeling that VET institutions and the courses offered are for male students and women students can only join if courses that are suitable for them are introduced. Hence the encouragement to take in more women into VET institutions has always been accompanied by the introduction of 'soft courses' for them, instead of introducing them to the purely technical courses that have high remuneration in the labour market. This has also tended to create a 'masculine' culture in the VET institutions where female students are only tolerated to pursue female friendly courses.

The above implies that technical education curriculum is discriminatory and even when few female students are admitted to the disciplines such as engineering and electronics; their failure rate is higher compared to males as discussed in section 4.1.2 above. This finding is consistent with other studies that have shown that the ‘masculine’ culture that prevails in professions and academic disciplines exerts a strongly inhibiting influence on women’s performance (Wattus, 2004). This masculine culture is manifested in the curriculum, learning styles and language that is insensitive to women. For example, during interviews with instructors, the use of phrases like ‘the women who want to take disciplines meant for men are few’, ‘women in mechanical engineering can only understand the theory part, when it comes to lifting engines and other metals, they can not take it’, ‘women are not comfortable climbing walls to fix wires’. These are attitudes that influence even the manner teaching is conducted and contribute to the high failure rates as noted above.

A third factor noted was that of biased selection (21.7%). Some respondents (both students and heads of institutes and heads of departments noted that there occurs discrimination and bias when students are selected to the VET institutions. This according to the respondents occurs in courses that are sponsored by the government, donors and NGOs. The discrimination does not however, occur at the college but from the sponsoring institutions. A female respondent noted that she worked with the government and she had been passed twice before to get

training opportunities. Apart from being selected for further training, it was noted that most women did not get study leave to pursue such courses.

The above findings corroborate those of other studies that have identified trends in the systematic discrimination of women in terms of opportunities for training and need to utilize their skills within organizations. A study of three parastatal organizations showed that organizational demand and utilization of women's skills is different from that of men. Women interviewed said they experienced discrimination in task allocation, career mobility and job-related training. Male bosses admitted they used factors other than capability in deciding job allocation and further training for women. The factors on which such decisions were based included marital status and femininity. From these findings, it would appear that the barriers women face in terms of appropriate technical training go beyond the obvious stated factors of curriculum and academic ability to widespread gender typing, some of which operate unnoticed to deny women chances of pursuing careers in areas that are competitive in the labour market.

Generally, this study established that a set of three factors limited women's access and participation in professional courses in the VET institutions. First were factors associated with the nature of the curriculum the female students pursued at secondary school and the masculine nature and culture of the curriculum in the VET institutions. Second were historical factors related to the fact the VET has

historically been presented as a specialization for boys. Third were issues related to the fact that female students are often discriminated with in terms of study leave of opportunities for sponsorship. All these factors led to three developments. One, women who accessed VET institutions for any courses were usually few, and most entered training at certificate as opposed to diploma level. This eventually made VET more expensive for female students compared to males. Second, women find it difficult to enrol in courses requiring mathematics and scientific skills, and the few who did failed in the examinations. Third, this has had a negative impact in enabling women with the skills to compete with men in the labour market in jobs that require mathematics and scientific skills.

#### **4.4 Career Aspirations of Female students in the institutions.**

Female students in the sample were asked to state what their career aspirations were after finishing training. Table 4.8 below summarizes their responses.

**Table 4.8 Career aspirations of the female students**

<b>Career</b>	<b>Frequency responses</b>	<b>%</b>
Formal employment	81	38
Self employment	67	32
Further training	23	11
N/A	41	19
<b>Total</b>	<b>212</b>	<b>100</b>

Table 4.5 shows that 38% of the female students aspired to join formal employment. This was followed by 32% who indicated they wished to be self-

employed in the informal sector, 11% who wanted to continue with further training and 19% who were undecided. Most of those who indicated they wanted to join formal employment (56%) were those who joined the institutions straight from school and had not been employed before. Those who indicated they wanted self –employment, the majority 72% were those who were already working in the formal or informal sector.

The interesting finding was a response to the question that required respondents to state if the courses they were pursuing in the institutions were related to their career aspirations. Most 145(68%) of the respondents indicated the courses were not. 131(61.7%), indicated they planned to explore more training opportunities before they settled for their preferred careers either in formal or informal employment. Some of the careers they indicated they wished to pursue included baking (30%), operating cyber café (10%), estate agent (23%), selling farm produce (33%), and selling clothes (5%). Generally, the study established that female students' career aspirations were in most cases not in line with the courses they were pursuing at the colleges. The implication of this finding is that VET programmes and especially courses in which female students are placed do not give them the skills that are required in the labour market or the skills that they need to pursue their careers. This is despite the fact that the majority of them indicated they wanted to join formal employment.

#### 4.5 Students and Heads of Institutions and Departments' Responses on Strategies to Improve Female Students' Participation in Mathematics and Science VET Courses

Students, heads of institutions and departments sampled for the study were asked to suggest strategies through which the access of female students to VET institutions would be increased and how they could be enabled to successfully pursue mathematics and science-based courses. Table 4.6 below summarizes responses from the female students. The students were provided with a list of suggestions and asked to rank them in order of preference.

**Table 4.9 Strategies to improve female students' participation in VET Mathematics and Science –based courses.**

<b>Strategies</b>	<b>Frequency responses</b>	<b>%</b>
Enhance participation of girls in science and mathematics at secondary school	71	33.4
Make curriculum sensitive to female students	77	36.3
Admit on quotas to competitive courses	53	25
Affirmative action in admissions and training	63	29.7
Sponsor more females to competitive courses in VET	13	6.13
Separate VETs for women offering mathematics and Science courses.	43	20.2
Introduce remedial courses to enable women to join science and mathematics courses.	37	17.4

*Note: the percentages above add to more than 100% as each respondent had to rank each of the strategies.*

The table above summarizes responses from students on what they thought should be done in terms of increasing access of female students to VET institutions and their placement in mathematics and science-based professional courses. The

majority of the students (36.3%) thought that the problem was with the curriculum of the technical institutions, which was biased against female students. Even the few women students who tried to register in courses like engineering that have traditionally been dominated by male students ended up failing because they were seen as entering into a field they did not belong to. During interviews, students had indicated that even during teaching, engineering and other science and mathematics lecturers assumed that there were no female students in the classes and gave all using male experiences.

This response reflected the widely held perceptions that gender-typing in the disciplines contributes more to the low performance of women in the scientific and engineering disciplines. Gender typing is manifested through the curriculum in terms of the language used and styles of teaching that consequently labels female students as unsuitable to pursue such disciplines. Hence, engineering and other professions that utilize mathematics and scientific skills are labelled as 'masculine' with the assumption that it is only males who have the natural mental capacity to pursue such disciplines. In the classroom situation, it creates teaching and learning styles that are sexist, and other sexualized behaviours that discourage females from venturing into such disciplines. An analysis of students' responses from this study shows that this is the situation that female students face in the VET institutions in Kenya. Hence increasing female participation in VET

mathematics and science courses will have to start from a gender-inclusive curriculum in these courses.

The second response was almost similar to the first one, calling for enhancing of female participation in science and mathematics courses from primary and secondary school. Some (33.4%) of the students thought that the problem started in primary and secondary school where girls did not participate in science and mathematics courses compared to their male counterparts. Studies have for example indicated the consistent under-performance of girls in science and mathematics in both primary and secondary schools, (for example, Twoli 1986, Eshiwani, 1985). This under-performance is sometimes due to the unavailability of learning resources for girls. Many girls' schools lack basic learning resources in science and mathematics. This is consistent with one of the findings of the present study as collected from the heads of institutions and departments that even in VET institutions, there were noticeable efforts to provide more and better resources in disciplines that male students dominated while those where females were the majority were ignored. Enhancing girl's performance in science and mathematics will therefore require an increase in the learning resources provided towards girls' education in Science and Mathematics. The resources should include both material and personnel (teachers with positive attitudes towards girl's participation in science and mathematics).

Three sets of responses, that is, the students', heads of departments' and heads of institutions' responses seemed to centre on a policy of giving favourable admissions criteria for girls to VET institutions. Some (29.7%) of the respondents supported affirmative action to be used for female students to VET institutions and in terms of placing them in science and mathematics-based disciplines while 25% of the respondents felt the issue should be addressed through use of admission quotas, which may be related to the first one. And 20.2% felt that separate VET institutions for female students should be started in the country to give female students a more female –friendly learning environment.

All the above suggestions are related in kind as they argue for a system of giving female students a slight advantage to pursue science and mathematics-based disciplines in VET institutions. It should also be noted that government policy is currently exploring alternatives towards these directions. For example in the current year, (2007) a programme under the Directorate of Industrial Training (DIT), has sponsored 30 female students to pursue engineering-based courses in any of the four polytechnics in the country. Though the number of girls which has benefited from the first phase is relatively small, it marks a positive beginning. The programme may also be limited that it targets girls that have already performed best in science and mathematics subjects from secondary schools. It does not have any mechanisms to address the causes of poor performance of girls in these subjects. There has also been set a trend of establishing women's only

higher education institutions in the country such as Kiriri Women's University of Science and Technology. Suggestions that this trend be replicated at the level of VET institutions seem to be in line with this trend.

Overall, suggestions on how to improve women's access to VET institutions and placement centred on three issues. One was through some form of affirmative measures, and the on-going government policy of giving full scholarships to girls pursuing engineering and related courses in the polytechnics is a step towards this direction. The second was the suggestion that the curriculum of primary and secondary schools and that of VET institutions needs to be made gender inclusive and especially to reflect the concerns and aspirations of women. Lastly was the suggestion that there needs to be separate VET institutions for women, which should be provided with adequate resources in science and technology areas.

#### **4.6 Summary**

This chapter analyzed trends in the access and participation of female students in science and mathematics based professional disciplines in VET institutions in Kenya. The findings as presented in the preceding sections of this chapter were based on data collected from three VET institutions, namely Kinyanjui Technical Institute, Nairobi Technical Training Institute and Kabete Technical Training Institute. Data gathered showed that access of female students to VET institutions is still too low and their enrolment in professional disciplines such as engineering

still too negligible. At a national level, only about 30% of the students in VET institutions are women, with the majority enrolled in certificate level, traditionally female disciplines. Data from the three institutions above indicated that female students were rarely admitted to disciplines such as engineering and information technology. The majority were in secretarial and other low-rewarding areas traditionally seen as feminine. Consequently, since most women were enrolled at the certificate level, VET training becomes more expensive for them as they have to enrol for diploma courses to enhance their chances of employing.

Data gathered also indicated that VET training in Kenya is biased against female students. For example, in instances where training is sponsored, male candidates got first priority compared to female ones. Within the institutions, improvements in terms of resources benefited disciplines that were dominated by male students. This reflected a trend from secondary schooling where girls have always lacked adequate resources in science and mathematics thus contributing to their poor performance in these areas.

Given the above situation, respondents felt that certain policy decisions need to be implemented to increase participation of female students in science and mathematics disciplines in VET institutions. Some of the suggestions include enhancing the participation of girls in mathematics and science from secondary

schools, implementing affirmative action for female students to VET institutions and starting female only VET institutions in Kenya.

The above findings have implications to the participation of females in the labour market especially in areas requiring scientific skills. Since their participation in VET institutions in critical areas is low, their entry into better remunerated formal and informal labour markets is also low. This trend impacts negatively on women's economic power.

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.0. Introduction**

The concern of this study was to investigate the factors influencing women's access to and participation in science-oriented VET programmes in technical institutes in Nairobi. This chapter presents the study findings summarized on the basis of the major areas reflected in the five research questions presented in chapter one.

#### **5.1 Conclusion**

Several conclusions have been reached in regard to the findings of the study. These conclusions are discussed under three themes, namely: enrolment trends, factors influencing females' choice and enrolment in VET programmes, and policy interventions.

##### **5.1.1 Enrolment Trends**

The findings of this survey concerning enrolment trends and career aspirations revealed a number of things which included the following:

- i) Access of female students to VET institutions is still too low and their
- ii) Enrolment in professional disciplines such as engineering still too negligible.

- iii) At a national level, only about 30% of the students in VET institutions are women, with the majority enrolled in certificate level, traditionally female disciplines.
- iv) Female students were rarely admitted to disciplines such as engineering and information technology.
- v) The majority were in secretarial and other low-rewarding areas traditionally seen as feminine.
- vi) Most women were enrolled at the certificate level, VET training becomes more expensive for them as they have to enrol for diploma courses to enhance their chances of employing.
- vii) VET training in Kenya is biased against female students. For example, in instances where training is sponsored, male candidates got first priority compared to female ones.
- viii) Within the institutions, improvements in terms of resources benefited disciplines that were dominated by male students and this reflected a trend from secondary schooling where girls have always lacked adequate resources in science and mathematics thus contributing to their poor performance in these areas.

### **5.1.2 Factors Influencing Females' Choice and Enrolment in VET Programmes**

The findings of this survey point to specific factors that influence female participation in Vocational Technical Education in Kenya. The factors could be grouped into three categories on the basis of what appeared to be their root causes. The two categories were:

#### ***Socio-Cultural Factors***

- ❖ Cultural beliefs and practices: for example, early marriage.
- ❖ Gender stereotypes: frequently, females are depicted as weak, delicate, submissive, etc.
- ❖ Gender roles: women are expected to perform multiple roles, leaving them with little time to participate fully in education and wage employment.
- ❖ Girls' attitude to science and technology: girls have been socialized to see science and technology as fields that are suited to male brains only. There is a need to actively de-socialize boys and girls right from their early ages.
- ❖ Family pressures and attitudes both economic and social.

#### ***Institutional Factors***

- ❖ Admission criteria which favour boys
- ❖ The legacy of poor support for girls education, especially in science and technology

- ❖ Lack of appropriate role models at home, in school and in the world of work
- ❖ Peer pressure; everyone wants to conform to societal and group norms.
- ❖ Negative attitude of industrial managers towards trainees and qualified females in practical attachments and job recruitment
- ❖ Lack of effective school and college career guidance and counseling programmes.

### *National Economic Factors*

- ❖ Lack of sufficient job opportunities for qualified youth
- ❖ Current economic difficulties: parents are unable to meet all their economic obligations, including the education of their children. Often the education of the girl child is sacrificed.
- ❖ Lack of industries in rural areas: the majority of female graduates are expected to live in the rural areas - with or near their parents. Employment prospects are slim. The purchasing power of the locals is very low. Female graduates are unable to establish viable businesses within those local areas.

### **5.1.3 Policy Interventions**

The study noted that a major obstacle to females' access to science-oriented courses in the VET institutes is their negative attitude towards sciences. This underscores the need for creation of awareness among girls on the significance of science and technology in national development. Secondly, the study noted a lack

of gendered approach to education policy that would support the values and objectives of women in development. Thirdly, the study noted that prospective employers tend to discriminate against women, which underpins the need to establish employment policies that are gender- responsive.

## **5.2 Recommendations**

Several recommendations were suggested to alleviate this situation. The major recommendations being, changing the attitude of females towards science, guidance and counselling girls on the importance of sciences, organizing seminars to educate the females on the benefits of science based careers, female role models, offering equal job opportunities, encouraging entrepreneurs to employ more women and to establish special institutions for female students.

### **5.2.1 Policy Recommendations**

On the basis of the findings of this study, the following are the policy recommendations:

- 1) One important finding that emerged from this study is that one of the main hindrances to female's access to science-oriented courses in the VET institutes is their attitude towards sciences. There is, therefore, need through guidance and counselling, more seminars and workshops by stakeholders in education to sensitize and create awareness among girls on the significance of science and technology in development.

- 2) A gendered approach to education policy that supports the values and objectives of women in development should be adopted.
- 3) One of the findings of this study is that prospective employers tend to discriminate against women, there is therefore need for key players in the labour market to be sensitised to change their attitudes towards their prospective employees, and employment policies should become gender- responsive, not discriminatory.
- 4) Attitudes and values of girls need to be changed, preferably, by way of socialisation, to accommodate new thinking and/or technology thus, there is need to re-socialise girls into the world of technology
- 6) There is need to sensitize the market by way lobbying through the media, brochures, civil society and all the other stakeholders in education to accept girls as a human resource in the area of technology.

### **5.2.2 Suggestions and Recommendations for Further Research**

This study has only examined the factors influencing women's access to and participation in science-oriented VET programmes in technical institutes in Nairobi. Although the researcher gave her own reasons for selecting Nairobi, other institutes in Kenya are characterized by low female enrolment in science-oriented courses. In this regard, it would be important if some studies could be carried out in the following areas:

- i) Researchers to examine the factors influencing women's access to and participation in science-oriented vocational education and training

programmes in Kenya from a variety of perspectives such as human resource and cultural other than the sociological one adopted in the present study.

- ii) Investigate the ultimate factors that influence and determine the acceptability of women as technicians in the labour market.
- iii) Investigate the possible strategies of making VET courses interesting and attractive to girls/women.

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**APPENDIX A: STUDENTS QUESTIONNAIRE**

- 1. Age 01 18-21 years ( ) 02 22-25 years ( ) 03 -26 Years and above ( )
- 2. Sex 01 Male ( ) 02 Female ( )
- 3 District of origin.....
- 4. Year of study 01 1st ( ) 02 2nd ( ) 3rd ( )
- 5. Name of institution 01 Nairobi ( ) 02 Kinyanjui ( ) 03 Kabete ( )
- 6. Department.....
- 7. Course of study (e.g. mechanics, secretarial).....

**Socio-economic Background**

- (a) Your father 01 Non-literate ( ) 02 Primary ( ) 03 Secondary ( )  
04 College ( ) 05 University ( )
- (b) Your mother 01 Non-literate ( ) 02 Primary ( ) 03 Secondary ( )  
04 College ( ) 05 University ( )

8. Indicate your parents' occupation/career:

- (a) Father.....
- (b) Mother.....

9. How many siblings (brothers and sisters) have you in the family.....?

10. What is your position of birth in the family (1st born, 2<sup>nd</sup> born).....?

11. Indicate the level of education attained by :

- (a) Brothers (i)..... (ii).....
- (iii).....(iv).....
- (v).....(vi).....

- (b) Sisters (i).....(ii).....
- (iii).....(iv).....
- (v).....(vi).....

**Participation and Access to VET Programmes**

12. What is your occupational aspiration?.....

13 Female enrolments in technical institutions is generally low compared to male enrolment. In your opinion, what are the major factors which contribute to low enrolment of females?

- (i).....
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- (ii).....
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- (iii).....
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- (iv).....
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- (v).....
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14. It has been observed that very few women enrol in science and technology-oriented courses. What are the causes of this situation?

- (i).....
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(ii).....

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(iii).....

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(iv).....

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(v).....

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15. Some studies show that at all levels of education, overall performance of women is lower than that of men. In your view, what are the contributing factors to low performance by females in technical colleges?

(i).....

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(ii).....

(iii).....

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(iv).....

(v).....

16. In your view, what influences women's choice of programmes in technical institutes ?

(i).....

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(ii).....

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(iii).....

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(iv).....

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(v).....

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17. What recommendations would you make to improve:

(i) Enrolment of women in technical institutes?

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(ii) Enrolment of women in science and technology oriented courses

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(iii) Overall performance by women in technical institutions



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5. In your opinion, why is the enrolment of females low in science and technology-oriented causes?

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6. What factors do you think influence performance by females in technical institutes?

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7. In your view, what do you think are the main factors which explain/influence disparities in access and participation by men and women in VET programmes?

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8. What recommendations would you make which can improve: General enrolment by females in VET programmes?

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(b) Enrolment by females in science and technology oriented courses?

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(c) Overall performance by females in technical institutes?

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(d) Factors which influence gender disparities in access and participation in VET programmes

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7. In your opinion why is the enrolment of females low in science and technology-oriented courses?

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8. What factors do you think influence performance by females in technical institutes?

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9. In your view, what do you think are the main factors which explain/influence disparities in access and participation by men and women in VET programmes?

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10. What recommendations would you make which can improve?

(a) General enrolment by females in VET programmes

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(b) Enrolment by females in science and technology-oriented courses

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( c ) Overall performance by females in technical institutes

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(d) Factors which influence gender disparities in access and participation in VET programmes

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