

**FACTORS INFLUENCING LOW FEMALE STUDENTS
ENROLMENT IN SCIENCE BASED COURSES IN TERTIARY
INSTITUTIONS IN WESTERN PROVINCE, KENYA**

BY

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DECLARATION

This research project is my own original work and has never been submitted for a degree award in any other university.

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This research project has been submitted for examination with my approval as the University supervisor.

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DEDICATION

I dedicate my work to my husband Erick and children Ruthlily, Grace, Joe, Joy, Hattie, Becky and Paul, for their moral and financial support.

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ABSTRACT

Despite the high number of career opportunities available in science and technology, the enrolment of female students in science based courses is still low. This study was conducted in tertiary institutions of western province, Kenya and its purpose was to investigate factors influencing the low enrolment among female students in science based courses at the tertiary institutions in Western Province, Kenya. The objectives covered by this study were: To find out the performance in science subjects at Kenya certificate of secondary education for the female students enrolled in Science-based courses in tertiary institutions in Western province, Kenya to identify institutional factors influencing female students enrolment in Science-based courses in tertiary institutions in Western Province, Kenya; to find out the social-economic background of the female students enrolled in Science-based courses in tertiary institutions in Western Province, Kenya; to investigate how students factors influence their enrolment in Science-based courses in tertiary institutions in Western province, Kenya. This study used a descriptive research design. Systematic random sampling technique was employed to select the sample. The study population constituted of 271 female students enrolled in Science courses at the 10 tertiary institutions in Western Province and all the principals of tertiary institutions within the study area. The sample was comprised of 161 female students enrolled in the Science subjects at the tertiary institutions in Western Province and the 10 principals of these institutions. The instruments of data collection were questionnaire, interview schedule and checklist. Data was analyzed by using descriptive statistics. The study revealed that curriculum demand was suitable in tertiary colleges, yet students did not seem to have covered the past performances adequately, most of them having dealt with much theoretical aspects of the courses, which affected the competence of the local tertiary level college trained graduates. Secondly, the socio-economic factors such as fathers' levels of income, number of siblings and income of the parents were the main socio-economic factors affecting the enrolment in Science based courses among the female students. The perception of the female towards Science based courses was generally positive and many opted for the course because they had confidence in it. Finally there were institutional challenges that affected the local tertiary institutions, these were; poor management, lack of basic facilities and a generally poor working environment. From the findings the recommendations were made; that the government of Kenya should establish a clear outline aimed at regulating the learning resources for Science based courses at the tertiary institutions. The government should also set aside a certain percentage of the funds to each tertiary level college through the Ministry of Higher Education to facilitate the implementation of the practical training programme. Finally, the government should provide resources to eliminate the various problems constraining the effective implementation of the practical programmes in the tertiary institutions by strengthening the overall capacity of these institutions to train students in Science based Course programmes.

TABLE OF CONTENTS

PAGE

DECLARATION.....ii

DEDICATION....."i

ACKNOWLEDGEMENT.....iv

ABSTRACT.....v

LIST OF TABLES.....ix

LIST OF FIGURES.....x

LIST OF APPENDICES.....xi

LIST OF ACRONYM.....xii

CHAPTER ONE: INTRODUCTION.....1

 1.1 Background of the study.....1

 1.2 Statement of the problem.....2

 1.3 Purpose of the study.....3

 1.4 Objectives of the Study.....3

 1.5 Research Questions3

 1.6 Significance of the Study.....4

 1.7 Delimitation of the study.....4

 1.8 Limitation of the study.....4

 1.9 Assumptions of the study.....5

 1.10 Organization of the study.....5

 1.11 Definitions of significant terms.....6

CHAPTER TWO: LITERATURE REVIEW.....7

 2.1 Introduction.....7

 2.2 Review of Literature.....7

 2.3 Empirical literature.....9

 2.3.1 Influence of secondary school performance on female enrolment at higher learning institutions.....9

 2.3.2 Institutional factors and students enrolments at higher learning institutions 10

 2.3.3 Influence of socio-economic background and students enrolment.....13

 2.3.4 Students factors and female enrolments.....16

 2.4 Theoretical framework for gender differences in education.....21

 2.5 Conceptual framework.....23

 2.6 Knowledge gap.....25

2.7 Summary of literature re view.....	26
CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY.....	27
3.1 Introduction.....	27
3.2 Research design.....	27
3.3 Target Population.....	27
3.4 Sample size and sampling procedure.....	28
3.5 Data Collection Instruments.....	30
3.5.1 Questionnaires for female students.....	29
3.5.2 Interview scheduled for principals.....	29
3.6 Data Collection procedure.....	30
3.7 Validity of Research Instrument.....	30
3.8 Reliability of the instruments.....	30
3.10 Data analysis.....	32
3.11 Ethical consideration of the study.....	33
CHAPTER FOUR: DATA ANALYSIS,PRESENTATION AND	
INTERPRETATION.....1.....	34
4.0 Introduction.....	34
4.1 Questionnaire return rate.....1.....	34
4.2 Influence of performance of female students in Science subjects at Kenya Certificate of Secondary Education (KCSE) on their enrolment in Science-based courses in tertiary institutions in Western Kenya.....	34
4.3 How institutional factors influence female students enrolment in Science-based courses in tertiary institutions in Western Kenya.....	38
4.4 Socio-economic background of the female students influencing their enrolment in Science-based courses in tertiary institutions in Western Kenya.....	41
4.5 To find out the students factors influencing their enrolment in Science-based courses in tertiary institutions in Western Kenya.....,	45
CHAPTER FIVE.....	47
SUMMARY OF FINDINGS, DISCUSSIONS AND CONCLUSIONS.....	48
5.1 Introduction.....	48
5.2. Summary of findings.....	48
5.3 Discussion.....	49
5.3.1. Performance in the past exams.....	49

5.3.2 Extent to which social-economic background influences enrollment of female students in science based courses in tertiary institutions in western Kenya	50
5.3.3 How students factors influence enrolment of female student in science based courses in tertiary institutions.....	54
5.3.4 How institutional factors influence the enrolment of female students in Science based course at the tertiay colleges.....	56
5.4 Conclusions.....	58
5.5. Recommendations for policy decision.....	59
5.6 Recommendations for further research.....	60
REFERENCES.....	61
APPENDICES.....	65

LIST OF TABLES

Table 3.1: Population of the study in tertiary colleges in Western Province.....	27
Table 3.2. Sample of the study.....	28
Table 3.3: Operationalization of the research table.....	31
Table 3.4: Summary of Data Analysis.....	32
Table 4.1: Performance of female students in the past Science subjects in KCSE relative to their expected performance.....	36
Table 4.2: Students' levels of satisfaction in their performance in Science subjects....	36
Table 4.3: Most preferred Science subjects by the students.....	36
Table 4.4: Grades resulted in the current Science based course at the institution.....	37
Table 4.5: Adequacy of the units in the current Science course.....	37
Table 4.6: Performance rating of the students based on the past examination scores..	37
Table 4.7: Actions by schools for poor performing students.....	38
Table 4.8: Effects of the school-based factors on enrolment in Science based courses among female Science based courses students.....	40
Table 4.9: Effects of the age of the student on enrolment in Science based courses rates among female Science based courses students.....	41
Table 4.10: Effects of the father's levels of education on enrolment in Science based courses among female students in the tertiary institutions.....	42
Table 4.11: Effects of the female students' marital status on the probability to complete education among female Science based courses students.....	42
Table 4.12: Effects of the number of siblings on the probability to complete education among female Science based courses students.....	43
Table 4.13: Effects of parents income on the probability to complete education among female Science based courses students.....	44
Table 4.14: Preference of the father in payment of school fees to the siblings.....	44
Table 4.15: Statements concerning female students' perception towards enrolment in Science based courses of Science based courses due to the socio-economic factors...	45
Table 4.16: Statements concerning female students ' perception of the Science based courses course and the overall rank scores.....	46
Table 4.17: Overall attitudes of the female students towards Science based Course...	47

LIST OF FIGURES

	24
Figure 1: Conceptual framework for the study.....	24

LIST OF APPENDICES

Appendix 1: Introduction letter.....	66
Appendix 2: Research permit from the Ministry of Education, Science and Technology	67
Appendix 3: Questions for students.....	68

1 :



LIST OF ACRONYM

ANOVA	Analysis of Variance
CHE	Commission for Higher Education
DANIDA	Danish Development Agency
GoK	Government of Kenya
KCSE	Kenya Certificate of Secondary Education
KNBS	Kenya National Bureau of Statistics
MDG	Millennium Development Goals
MoE	Ministry of Education

CHAPTER ONE: INTRODUCTION

1.1 Background of the study

Globally, the importance of education cannot be overemphasized as it is required to enhance the intellectual development of man (Hadley, 2010). The most ambitious education-related Millennium Development Goal is the attainment of basic education for all by 2015 (Bennell and Akyeampong, 2007). This goal has essentially created an enormous opportunity for many people to seek formal education. In the recent past many developing countries, have realized the importance of technological and Science oriented development in the achievement of growth for their economies (B6nabou and Tirole, 2011),as a consequence their focus has continued to move towards teaching Science oriented subjected in place of art based subjects. Moreover, the Science based courses continue to play an important role in providing knowledge for current and future research in various disciplines including medicine, agriculture, finance, security, disaster management, environmental conservation and information technology.

The Kenya education system (8-4-4; denoting 8 years in primary, 4 years in secondary and 4 years in the university) currently advocates strongly for Science oriented post secondary school education (Nzomo *et al.*, 2011). This is because Science oriented courses have continued to play a significant role in imparting Science-based knowledge to many post-secondary school students (Shiundu and Omulando, 1992; Birdsall *et al.*, 2005; Barnab6 and Burns, 2008). As a direct result of this knowledge-based economy, the absolute numbers and types of rewarding careers in science and technology have expanded beyond most people's expectations (Littleton and Barnnert, 2009). Ideally, the Science oriented courses must be accessed by students of both gender and in equal measures to foster equal opportunities.

The importance of females accessing the same education as males is more important due to the implicit recognition of women as the greatest engine of economic growth if they are given opportunities as their male counterparts (Kinyanjui, 1999). Kenya recognizes women as fully participating members of society by law and as such each female is entitled to all the rights, responsibilities, and privileges in all sphere of life. In Kenya, women have been granted equal chances in enrolling in any course and can therefore gain access to any career of their choice (Kane, 2004; Hadley, 2010). In spite of guaranteeing equality in the constitution and

removing legal barriers to equal participation of men and women, available statistics show that women have failed to participate equally with men in the Science oriented courses both at the secondary and post secondary education (Nafukho, 1999; Okwako, 2006).

In the post-independence Kenya, information available have indicated a consistent differences among students in sciences and Science based courses between the males and females in Kenya in many tertiary institutions (Bogonko, 1992; Eshiwani, 1993; Oketch and Oloo, 1995; McGrath. and King, 1999; Kaino and Mazibuko, 2001; Kyalo *et al.*, 2006; Littleton and Barnnert, 2009; Cummings *et al.*, 2009). Although the administrators, teachers, students, and tertiary colleges -based researchers alike have stressed the importance of science and technology for the educational and vocational futures of all students, neither the number of female students enrolling in Science based subjects, nor the number of women who go on to work in them, has noticeably increased (Kyalo *et al.*, 2006).

i •

For a number of years, efforts at sector planning to enhance more participation of females have been underway (McGrath and King, 1999), but the national policy on tertiary colleges' practical and technical training has not yet emerged to enhance female enrolment. What remains unclear is why low female participation in these areas continues. Although studies have investigated males' and females' participation rates in science and mathematics education (Gaskell *et al.*, 2007; Greenfield *et al.*, 2002), achievement (Cowley and Easton, 1999; Lawton, 1997), and psychological sex differences (Kolaric, 1999), little information is available in Kenyan tertiary level institutions that have investigated the factors that account for the low enrolment of female students in Science based courses.

1.2 Statement of the problem

Statistics in Kenya show that the large majority of females do not enrol in Science oriented courses at the tertiary levels of education (DANIDA, 1998). Between the year 2007 and 2011, approximately 207,000 female students joined tertiary institutions in Kenya commission of Higher Education [CHE 2011]. Statistics show that between the aforementioned years 67% of the female students in the tertiary level institutions

enrolled in Arts, languages, social sciences and humanity courses leaving out science oriented courses to only 33% of the female students (CHE, 2011). In Western Province, statistics indicate that 38% of the females are enrolled in the Science oriented course. It has also been realized that the few females students who join Science based courses usually changed their courses from Science based to Arts and language based courses once they report to the tertiary institutions, making the enrolment of females in the Science oriented courses even much smaller (Kerre, 2009). The problem of this study therefore was to investigate the factors influencing the low enrolment of female students in science -based courses in tertiary institutions in western province, Kenya.

1.3 Purpose of the study

The purpose of this study was to investigate the factors influencing the low female student's enrolment in science based courses in the tertiary institutions of Western Province, Kenya.

1.4 Objectives of the Study

1. To find out the performance in science subjects at Kenya certificate of secondary education, for the female students enrolled in science based courses in tertiary institutions in western province Kenya
2. To identify institutional factors influencing female students enrolment in Science-based courses in tertiary institutions in Western province Kenya
3. To find out the social-economic background of the female students enrolled in Science-based courses in tertiary institutions in Western province Kenya.
4. To investigate how students factors influence their enrolment in Science-based courses in tertiary institutions in Western province Kenya

1.5 Research Questions

1. What is the performance in science subjects at Kenya certificate of secondary education (KCSE) for the female students enrolled in science based courses in tertiary institutions in western province in Kenya?
2. What institutional factors influence the enrolment of female students in science -based courses in tertiary institutions in western province?

3. What is the social economic background of female students enrolled in science-based courses in tertiary institutions in western province?
4. What female students' factors influence their enrolment in science-based courses in tertiary institutions in western province?

1.6 Significance of the Study

The significance of this study was both practical and scholarly. Educators' recommendations on how to best reduce low female enrolment are useful to other educational leaders and beneficial to students and society. Through this investigation, the main cause of low female enrolment in science based course was determined and can be solved to enhance improved female enrolment in Sciences at the tertiary institutions.

Identifying the factors that influence enrolment not only allows governments and institutions to forecast enrolment more effectively but also permits them to make adjustments to meet current or future labour needs. Planning for skills shortages is critically important for governments and decision-makers who have the responsibility of ensuring the maintenance of a skilled and productive workforce. Having the capacity to predict changes in enrolment numbers allows decision-makers to take into account such changes in their plans.

Gender sensitive strategies to attract female students were recommended for implementation, as was gender audits, but there were no mention of gender bias as a problem that required resolve and there is the very important issue regarding what is truly happening to female students today, socially, within the education system, in regard to the Science based courses.

1.7 Delimitation of the study

The scope of the study was limited geographically to tertiary institutions in Western Province. The content of this study was limited to female enrolment in Science-based courses in Kenyan tertiary institutions in Western Province. The study was conducted within a period of six months from January 2012 to June 2012.

1.8 Limitation of the study

The encountered the following imitations limitations: First, The study was limited to the tertiary institutions in Western Province, however the respondents were randomly selected, therefore the findings of the study could to a great extend be generalized to all tertiary institutions in Kenya, as ideally expected. Secondly, this study was limited by time considerations, as very little time was allocated to the entire research study time. The study was limited by inadequate resources and finances. The study could only go as far as observing, investigating and analyzing data given by the sources. Some of the respondents gave inaccurate information and this was corrected by cross checking the information provided from official institutional documents and other respondents and also use of two instruments a questionnaire and an interview to get more information. Lastly confinement of the current study to female students already enrolled in Science Oriented courses did not allow for the views of other students not enrolled to be sought and these also excluded students who are still in secondary schools or have just completed their secondary education.

1.9 Assumptions of the study

The study was based on the following assumptions:

1. The participants would be cooperative and were to give the required information without any reservations
2. Responses that were given by the respondents were true.
3. All the sampled tertiary institutions in western province had up to date and accurate students records.

1.10 Organization of the study

The study was organized as follows: Chapter one was the introduction, which contains background of the study, statement of the problems, purpose of the study, research objectives and questions, significance of the study, delimitation of the study, justification of the study, assumptions and definitions of significant terms. Chapter two consists of literature review based on the four research objectives, theoretical framework, knowledge gap and conceptual framework and summary of the literature review. Chapter three comprises of introduction, research design, target population, sample size, sampling procedure, research instruments, reliability of the instruments validity of the instruments, data collection procedure, ethical considerations of the study.

Chapter four included data analysis, presentation and interpretation. Chapter five included summary of findings, discussions, conclusions, recommendations for policy decisions and for further research references and appendices

1.11 Definitions of significant terms

The following terms were used in this study to mean:

Academic performance Scores obtained by the students in the Kenya certificate of secondary education and in exams at the colleges. In this study, high academic performance is taken to be grades A and B in the Kenya certificate of secondary school examination. Grades C was average and Grade D and E was below average.

Attitude Is a persistent tendency by a student to feel and behave in way towards some object or person. In this study attitudes are categorized into positive, neutral and negative. The students' feelings or perceptions towards their teachers were taken as attitudes they had towards them.

Curriculum The content of subjects offered at the tertiary institutions.

Socio-economic background refers to the income, number of siblings and education level of parents of the students.

Enrolment The number of students who register as students in the college.

Gender disparity refers to situation where either male or females are participating in a minority.

Science Based Courses These are courses whose content is delivered through experiments or observations and measurements.

Tertiary institutions Post secondary school learning institutions including colleges that offer vocational training

Institutional factors These are learning facilities, rules, staff and learning resources

Student factors Refer to students' attitudes and perceptions and motivation of students in the science based courses

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter contains the review of literature and provides readers with a brief review of the theoretical literature together with empirical literature associated with the main objectives of the study. The sources included books, journals, periodicals, Magazines and Internet.

2.2 Review of Literature

Gender disparity has persisted in education, post-secondary education, and careers (Clariana and Schultz, 1993; Bunderson and Christensen, 1995; Bryson *et al.*, 1996; Beckam *et al.*, 1999; Broos, 2005). Although education and careers in Science, Technology and Science based (Simpson, 1996) are open to females and males and, more specifically, that females are as capable as males in these education and career areas (Penny and Kelly, 1990; Wilson, 1999; Cowley and Easton, 1999), low female participation persists (Fullan 1990; Gaskell, Eyre, Oberg and McLaren, 2007; Scheibinger, 2007; Wilson, 2007; Acker, 2009; Gattiker, 2009; Shakeshaft, 2009; UNS, 2009). Chen [1985] observes that although legislation and social change have been demonstrated equality is yet to be completely established. These persistence of these have been attributed to different factors.

For example in North America, the persistence of female gender disparity has been described as being connected to historical roots in regard to beliefs and gender stereotypes and bias. These beliefs have been used as justification for different education and career paths for males and females (Phillips, 2008). The historical record in Kenya shows females are counselled away from non-traditional educational programs (Odipo, 2005), concentrated in educational fields leading to low-paid jobs (Heitlinger, 2007, Probert and Wilson, 2007), and given different curricula than males (Acker, 2009). Women have also had unequal opportunities to participate in science (Hanson, 1996). Most of these practices were documented in the late eighties and early nineties. Over two decade have passed since many of these more recent issues were documented, and yet female gender disparity persists. According to Scott (2008), similar questions need to be asked, such as "Why are young women staying away from these fields when high-tech and knowledge-based industries have a huge demand for people educated in these disciplines"? According to Shashaani (1994a), there should be serious concern for low female participation in some field. He argues that without

women in these fields, we lose 50% of the available brain power when we need all the brains we can get.

Academics are not alone in the quest to answer such questions. Females were once blocked entry into even the management of technology (United Nations Publication, 1995, p. 84). Recent research has been performed and articles written on female gender disparity across multiple disciplines in areas such as: sociology (Hacker, 1990; Hall and Cooper, 1991; Fraser, 1996; Kearlsey and Lynch, 2004; Faludi, 2009), business (Kanter and Nichols, 1994), history, anthropology, and women in science (Ogilvie and Meek, 1996), education (Gaskell *et al.*, 2007; Lawton, 2007), enrolment (Gaskell *et al.*, 2007, Franklin, 2001), and women's studies (Barad, 2004). Although it is now acknowledged that gender disparity persists, there is a gap in the literature as to why persistence continues.

Gender disparity has also been investigated in relation to various issues and topics including technology and employment (Sandhfi and Sandler, 1986). Analysis has been directed towards changes in the role of women in relation to the traditional role of women (Heitlinger, 2007), and changes in socially constructed norms of behaviour of women and law. Organizations have formed to support women in non-traditional occupations. Established organizations have integrated women into non-traditional occupations such as the military (Hess and Miura, 2007). The fore mentioned scholarly inquiries are highly relevant in regard to the education of females because the role of women in society, and the social struggle for equality, changed many adults' perception of what female students' education should consist of.

The separation of male and female students in regard to career choice appears to be an artificial boundary and yet breaking this boundary is important in order to address gender disparity as it is in relation to the education of female students, and the experiences of female students in secondary education science and mathematics. This thin veneer separating female in relation to male is moot in terms of gender but not so in terms of hierarchy of responsibility. In regard to why any males would collude against a female, as depicted by Lee (2003), raises the issue that some males deem

gender a grouping sufficiently defined so that they may draw lines in the sand and discriminate against women in positions of authority, for their own self interest.

The findings of discrimination against females are serious. Academic research has already been focused on removing barriers to women's equal participation (Newman, 1995). Academics have analyzed economic and social barriers (Benston, 1998). The removal of barriers to education and careers, it remains unclear why female gender disparity persists in schools and post-secondary education, in the physical science and mathematics subjects and technology (including ICT), which lead to careers in these fields. Whereas education precedes most careers and vocations (Heitlinger, 2007), and female gender disparity persists in physical science and mathematics, and female gender disparity has been observed concurrently in education and careers, a gap in the literature in relation to why female gender disparity persists in enrolment education, knowledge and access need to be identified.

The researcher has considered this area to be a location to begin the inquiry because it is reasonable to consider that the future prospects regarding the careers of females begin, as they do for all students, during their education years. Although one may state that education is for all students equally, given the persistence of female gender disparity in science and technology, it has not been clear how female gender disparity is being manifested, and whether it is political, social, or a combination of both. Although this were not clear, it is clear that female gender disparity is an educational leadership issue that should be a priority for resolution.

2.3 Empirical literature

2.3.1 Influence of secondary school performance on female enrolment at higher learning institutions

In order to perform well in a course of action, the learner needs to be interested and understand the concepts that they are dealing with (Kroft *et al.*, 2006). It is imperative to note that indeed the students in Science courses should be satisfied with their performance in the subject at low levels of education. As a result of the better achievements in secondary schools, students are often expected to enrol more in the course at higher levels of institutions (Kinuthia, 2009; Achote, 2010). As yet, more female students don't appear to be performing well in the Science subjects (KNEC, 2005-2009) leading to low enrolment in the subject. However, despite lower

performance in Sciences than male counterparts, there are still more than adequate number of females who can make up substantial proportion of the students enrolment in Science oriented fields at the tertiary institutions, yet this is not the case and the reasons remains largely speculative.

The problem arising from negative perception of the Science based courses among female stems from the perception that past performance covered in the colleges appears to be complex for the female to comprehend (Morris, 2004). Moreover, Ashcroft (2001) contents that employment of large number of male tutors' in Science oriented courses at the tertiary institutions may suggest that females may not be performing well in the course and therefore the female students shy away from enrolling in these courses. There are also reports that some of the teachers did not meet the minimum qualifications to teach technical courses to those who are academically weak in the subjects (Brodkin *et al.*, 2001).

Zhang (2006, p.312) categorised as instrumental factors such as interest in the subject, ability to do the subject which also contribute to performance as a major factor that influence enrolment in the subject (Galotti, Giacomino, Akers, Gist, Goedde and Ward; Simpson; Wikoff and Kafka as cited in Pritchard *et al*2004, p.152), quantitative skills and intellectually challenging and not boring (Cohen and Hanno as cited in Pritchard *et al.*, 2004, p.153 and as cited in Zhang, 2006, p.312) were examined. Many research revealed that student's interest in the subject is one of the significant factors identified that influences their choice of subjects at the next tertiary level (Adams, Pryor and Adams; Cohen and Hanno; Malgwi *et al.* as cited in Zhang, 2007, p.312). Research findings indicated that students with better Mathematical skills tended to choose Science, Mathematics or Science based Course related (Pritchard *et al*, 2004, p. 154). This research investigates if the performance of female students in Science in Secondary level of education interest *in* the Science subject, and ability to do the subject, have significant influence on tertiary levels Science students in choosing their career in Science oriented field.

2.3.2 Institutional factors and students enrolments at higher learning institutions

There are several administration challenges that the training institutions undergo in

ilieur course of operations. In Kenya, there is a longstanding awareness that employment needs to be conceived in terms of more than formal jobs (IFC, 2006). There are a large number of public and private training institutions in Kenya that provide technical training to students, including: over 600 Youth Polytechnics, 20 Technical Training Instiftites, 17 Institutes ofTechnology and 4 National Polytechnics; furthermore the National Youth Service operates training centres, and there are Industrial Training Centres, YMCA Vocational Training Centres and Christian Industrial Training Centres (NMSE, 1999). In addition, there are tertiary institutions and a large number of private-for-profit training institutes, many of which have come up in recent years and concentrate on courses that provide technical skills. The Youth Polytechnics account for almost one third of all the trainees enrolled in these training institutions (Oketch and Oloo, 1995). Poor staffing and teaching of subjects described as "theoretical" is the major factor that have limited the success of these institutions in provision of quality informal training to the students.

In addition to the factors that operate at an individual level, researchers have found a variety of institutional factors, or factors pertaining to educational and vocational alternatives, that affect college enrolment levels. Manski and Wise (1983) include among these factors tuition level, "quality of school" (as measured by the average combined SAT score of incoming freshmen), and the availability of government and institutional financial aid. Rouse (1994) examines the factor of proximity by estimating changes in enrolment s that would result from decreasing the average distance to the nearest 2-year college. She also considers the effects of tuition levels and financial aid availability, as well unemployment rates, which serve as a measure of competing opportunities available to high school seniors.

Tuition levels are another institutional factor with a significant effect on college enrolment. Leslie and Brinkman (1987) review 25 studies on this subject, and found that a, \$100 increase in tuition fees nationwide, in 1982-1983 academic year dollars, would result in a 6 percent decline in the college participation rate for the 18- to 24-year-old group. Savoca (1990) makes the point that high tuition levels may lessen postsecondary enrolment s in the aggregate by discouraging some students from ever applying to college. The effects of tuition levels are moderated in many cases by the

effects of financial aid. McPherson and Schapiro (1991) state that the variable of interest should be net cost, or tuition less financial aid. At the initial stages of the enrolment decision, however, students often lack information on their eligibility for financial aid and the amount of aid they would be likely to receive.

Researchers have differing views regarding the effects of financial aid on enrolment at different types of institutions. Reyes (1994) observes that increases in financial aid positively affect both 2-year and 4-year college enrolment rates, based on information from the NLSY and HSB. Manski and Wise (1983), concluded that financial aid affects students' decisions to attend 2-year institutions, as opposed to not going to college at all. However, this study finds that enrolments at 4-year schools have little sensitivity to the availability of financial aid. Manski and Wise do not consider the effect of financial aid on the student's choice between a 2-year and a 4-year institution.

Other researchers have compared the effects of decreasing tuition with the effects of increasing financial aid. Manski and Wise (1983) find that for those attending 2-year schools, an additional dollar of financial aid would be worth more than a one dollar reduction in tuition. St. John (1990:172) noted that that "college applicants...[are] more responsive to changes in student aid than to changes in tuition," except for those in the upper income group. Kane (1995), however, argues that while financial aid increases may be more equitable because they are means tested, they are not as effective as decreases in tuition. This is a consequence of the complexity of the financial aid application process and the unwillingness of low income families to borrow to finance a college education.

When studying the effect of tuition and financial aid on post secondary school enrolment, the group to be especially concerned about is low income students. Leslie and Brinkman (1987) and Savoca (1990) find that tuition levels affect enrolment decisions for low income students much more than for middle and upper income groups. By the same token, the availability of financial aid is a much more crucial factor for those at lower income levels. Orfield (1992) notes that the maximum Pell grant is less than one-fifth of the tuition at an elite university. Such a gap between aid and costs, he contends, may steer many low income students toward lower cost

schools. Hearn's 1991 study supports this hypothesis. He finds that when academic ability, achievement, and other factors are controlled for, lower income students are especially likely to choose institutions of lower selectivity.

Schwartz (1985) found that low income students are affected differently by publicly provided financial aid and aid supplied by institutions. He states that public grants tend to promote greater equity among income groups in college enrolment. Private grants, however, are often awarded on the basis of academic ability, and they tend to favor students who could afford to go to college without them. Clotfelter (1991) expresses the same concern about the effects of institutional aid. Manski and Wise (1983) note that even public aid is not always awarded where the need is greatest. They state that in 1979, 59 percent of Basic Educational Opportunity Grants were awarded to students who would probably have gone to college in the absence of such aid.

2.33 Influence of socio-economic background and students enrolment

Several studies have focused on income and enrolment. Most of these studies are undertaken at a macro-level. A UN taskforce report on education and equality on low and middle income countries shows that enrolments are lowest for students from poor households and less than half of the poorest students complete even the first year of school (Birdsall et al, 2005). At a micro-level, family income is directly linked to the affordability of education and as such has a direct impact on whether students attend schools and enrol in their career choices (Hadley, 2010). If students do attend education, changes in the financial situation of parents, as reflected by the volatility of family income, may push some students out of education or may force the students to enrol for some cheaper career subjects (Kane, 2004; Hadley, 2010).

Another important factor that is often related to low enrolment is parental education level (Chowdhury et al, 2002; Nath et al, 2008). Parents with low levels of education are more likely to have students who do not attend school and may also jeopardize some of their children from taking up career choices. If they do, they tend to drop out in greater numbers (Blick and Sahn, 2000; Brown and Park, 2002) and engage in more income generating activities than students of parents with high levels of education (Duryea, 2003; Ersado, 2005). A recent case study of a rural village in Ghana showed

parental illiteracy was associated with low household income as two important factors likely to cause children not to take up their career choices (Pryor and Ampiah, 2003). Interestingly, more female were affected than males. Furthermore, there may be some dimensions to the links between parental education and enrolment in various subjects at higher levels of education with differential effects for male students and female students (Connelly and Zheng, 2003). For female students, the risk of becoming pregnant, and hence potentially not taking up a Science career, declines significantly as the educational attainment of the household head increases (Grant and Hallman, 2006).

Although official expenditure on education in Kenya has been decreasing in the last five years, public recurrent expenditure per school-child has been rising in recent fiscal years: Kshs. 1,486 in 2000/03, Kshs. 2,430 in 2004/05, and Kshs. 2,772 in 2005/06. But the cost-sharing policy, which the Ministry of Education introduced in 1988, has shifted the burden of financing some aspects of education to parents. This move has made it difficult for parents and communities who are very poor to support education adequately, mainly some of the high cost courses such as in Science, Medicine and Science based Course; consequently, education in Science oriented courses is now beyond the reach of many poor households (Abagi, 1997b, World Bank/MoE Studies, 2005). This is mainly due to poverty levels, which have been rising in the country. The increased level of poverty makes parents unable to pay for the high cost of education in the Science oriented fields especially for the female students. Faced with limited resources, and reduced returns from education, parents are not only unable but also unmotivated to educate their students. In the end, these factors have negative effects on student's enrolment in some of the courses in Science. According to the cost-sharing policy, the burden of paying teachers lies with the government, while erecting physical structures and purchasing instructional related materials and Science equipment are the responsibility of the institutions, who levy fees on the parents (MoEST, 1999). Most parents are not in a position to meet these costs especially, for Science facilities. As a result, many institutions of higher learning prefer to teach non-Science oriented courses and limit the Science oriented courses to few students that normally favour the male students.

The rise in the level of poverty in Kenya (KNBS, 2010) indicates that 46.8% of Kenyans live below the poverty line) is one of the major factors, which discourage parents from investing in their student's education; more specifically the female students. Parents, and by extension, many communities, are not in a position to meet the ever-increasing cost of schooling adequately. Since the level of poverty has also gone up in the country and the costs of education and training at all levels have continued to rise, many Kenyans are unable to meet the cost of education and can no longer have access to education (Abagi, 1998; MoE, 1996). It is widely believed that such state of affair can really hamper the development of schools and the learning process of the female students and hence negatively affect their enrolments.

Social-cultural factors, such as initiation ceremonies and socialization, are additional factors responsible for female students' enrolments and their inability to compete effectively in schools with male students (Littleton and Barnert, 1999). In areas where traditional female circumcision is still practiced, students are pulled out of school or once they complete secondary schools to participate in initiation ceremonies. Once initiated, some develop negative attitudes towards education especially after being taught that Science is for the male students during initiation (Oduor, 2001), which might affect how they enrol in schools.

Raju (1973; 49) argues that the difficulty of finding money to pay for the education of daughters in the main cause of low female enrolment across all fields without special emphasis to the Science oriented subjects.. Enrolment rates primarily for financial reasons are said to be much higher for students of poor families and for girl child from the said families (Graham, 1998). In Zimbabwe, the enrolment figures for female students in post secondary school continue to decline in relation to those of male students. In 1987 in the Matabeleland South, female students made up of 31.2% of enrolment in first year in the tertiary institutions (nationally 43.6%). Comparatively, only 8.4% of the students in Science oriented courses were females.

Rono (1990) identified difference levels of aspiration, attitude, and parental level of education, school type category and quality as some of the most important variables affecting enrolment of females in tertiary institutions in Nandi County. Meme (1987)

carried out a study to investigate the socio-economic factors contributing to low enrolment of female students in tertiary institutions in Itliima location in Meru County and concluded that low enrolment among females vary greatly even within the same locality due to a number of economic, social, physical and cultural and socio-economic based factors. Therefore the factors affecting enrolment are not general but specific to students across the country.

2.3.4 Students factors and female enrolments

There are a number of students' factors including their attitudes that may affect their enrolments. Attitudes are the learned predisposition to respond positively or negatively to certain objects, situations, institutions or persons. As such, Attitudes constitute the cognitive, affective and performance components. The attitude of teachers toward a programme affects the way the programme is implemented. Cage (1995) pointed out that attitude also affect students fitness for various curricula activities and that unless a pupil has a favourable attitude towards a set of instructional objectives and sets them over as desirable goals for himself, the additional process was relatively ineffective. According to Kadjevich (2000), attitude influences ones performance either negatively or positively. They go further to define attitude as a feeling towards something or somebody and that attitude of the pupil depend on the role of the teacher. Jones and Smart (1993) underscores the need to change people's attitude to favourable implementation of any particular innovation. In addition (Goyal, 2001) emphasized the needs for the staff to be willing to expand their time and effort required for this implementation and this condition must be operative. Initiating a curriculum change encompasses a strategy of modifying attitude and feeling, which often is a task of producing competence for curriculum development.

Historical findings, according to Gredler (1997), have indicated that females have different attitudes, but their findings have shown no difference in aptitudes for conceptual ability, Science-based application, languages ability, Science-based ability, and reading comprehension. Furthermore, an individual preconception of pre-existing innate Science-based ability has been implicated in whether or not a female practices or does not practice technology. Although female students may be better organized in

some schools, there does not appear to be any evidence that organization and work ethic are innate.

The issue of the gender gap in Sciences has caught the attention of many researchers and as a result, numerous studies have been conducted to study the extent of this gap (Margolis and Fisher, 2002). As early as the 1980s, studies had reported that females exhibited more negative views and attitudes towards Sciences than males (Dambrot, Watkins-Malek, Silling, Marshall & Garver, 1985; Koochang, 1987). Studies reported in the literature over 20 years ago suggested that gender has had a mediating effect on attitudes toward Science (Mitra, Lenzmeier, Steffenmeier, Avon, Qu and Hazen, 2000).

The integration of Science into much education system has greatly influenced the mindset towards it. Hence, although the literature shows that extensive research related to gender and attitudes towards Science have been carried out over the years; such findings may be irrelevant today because of the ever expanding nature of Science orientation. The debate over the gender gap that started since the 1980s still persists in the new millennium. Many researchers have revisited this issue and many are continuing to do so. For example, the study by Houtz and Gupta (2001) found significant gender differences in the way females and males rated themselves in their ability to master Science and technology skills. Even though both genders were positive about their technological ability, males rated themselves higher than females. In another study, Shashaani and Khalili (2001) reported that female undergraduate students had significantly lower confidence than males when it came to their ability to perform tasks in Science oriented courses. Females also reported feeling helpless, nervous and uncomfortable during Science oriented examinations. Consistent with earlier studies (Houtz & Gupta, 2001; Shashaani & Khalili, 2001; Margolis & Fisher, 2002), a recent study by Broos (2005) also found significant gender differences - favouring males in terms of attitudes toward new Science technology, the extent of enrolment use and self-perceived enrolment experience.

Although they may not provide conclusive evidence of specific gender disparity, all the above mentioned studies, which were carried out among high school or

uhvloiggraduate students except for Brcos (2005), indicated that gender disparity in the Science existed to a certain extent. This is definitely a cause for concern as Science is the core course cnicial tool for effective teaching and learning in most curricula. The debate on gender disparity in Science has also been documented by several researchers who recognized the importance of other variables, such as students' enrolment experiences, socioeconomic status and age, in explaining gender differences. Most of the early stfidies revealed that enrolment experience played a role in narrowing the gender gap while other stadies indicated that such experience might be gender-based.

The study by Gaskell *et al.* (2007) endeavoured to bring together many different perspectives of female students, so that the views of female students would be understood. Although the name of the smdy indicates "gender issues in student choices in Science based courses," there was a purpose of illuminating "factors which contribute to patterns of high and low participation by students, particularly female students, in Science-based knowledge courses in the province. This was a part of the secondaïy purpose of the study; the primaiy purpose of the study was to "describe the patterns of participation in the tertiary colleges.

According to Gaskell *et al.* (1993), female students interviewed expressed desires to study and have careers in some of the traditional fields, such as nursing, but female students also expressed desires to study and have careers in "Science based architecture, law, medicine, aviation, commerce, and business." Outcomes stated that "students should have equal access to knowledge" but those physical sciences teachers should practice "gender sensitive teaching strategies".

There has been a problem with knowing what is happening in Kenya, within science and Science-based courses, as there is an absence of current empirical studies on the expenences of female students in education; therefore, the literature reviewed on the experiences of female students has been primarily from literature on the phenomenon from outside of Kenya. The recent literature on what female students are experiencing within their education, within science and Science-based courses, suggests that, for many female students , their educational needs in science and Science-based were not being met. Even the most argumentative studies that argue male students were being

shoit changed in schools acknowledge thai female students are being "shoii changed" in and Science-based courses (Fraser, 1986). It has been documented that female students are subject to harassment by male students (and not necessarily sexual harassment), and it has been documented that teachers, even with full knowledge of the harassment of female students , will often side and favour male students while passing over female students (Fey, 2001). Interaction studies still indicate that in-class attention is still primarily going to male students in elementary school, with male students receiving more attention for "childish" behaviour (Fennema and Herma, 1978).

An individual's perceived ability to do well in a subject is one variable that has received considerable attention in educational literature from time memorial. Within an African context, Lee (2007) conducted a study of 1,012 students enrolled in single-sex and mixed-sex secondary schools from ten Southern states in Nigeria. The authors found that perceived ability positively related to higher performance in Agricultural Science based. Similarly, in a study of secondary and college students selected from seven state secondary schools and one federal college in Nigeria, Aghenta (1989) found that "perceived difficulties of science occupations" was a significant factor in preventing females from entering Science oriented fields.

Historical findings, according to Gredler (1997), have indicated that females have different aptitudes, but their findings have shown no difference in aptitudes for conceptual ability, Science-based application, languages ability, Science-based ability, and reading comprehension. Furthermore, an individual preconception of pre-existing innate Science-based ability has been implicated in whether or not a female practices or does not practice technology. Although female students may be better organized in some schools, there does not appear to be any evidence that organization and work ethic are innate.

Attitudes of how an individual sees themselves, as within a group and self gender stereotyping, may have something to do with different successful test and grade score strategies observed. The claim that ability differs between the genders has not been substantiated; however, there have been studies that indicate differences in self

perception of abilities between males and females. According to Muthelo (2003), girl students perceived themselves as performing poorer than their male counterparts in Agricultural Science based, even though they had the same grades. Also, other studies have claimed that environmental factors have given males an advantage over females, in spite of females' valid better grades (Mohammad, 1998). Disparities have been noted both within and between other countries, such as France and England (Lee, 2003).

Although a deeper understanding was sought, questioning why female gender disparities persisted was not within the purview of their study. Furthermore, their study specifically recruited the participation of female students and female teachers (Gaskell *et al.*, 2007). Without the Gaskell *et al.* study, the foundation for asking why female gender disparity persists may not be as relevant as it is now, given the years that have passed since the study was conducted. Asking why female gender disparity persists is very different from describing and illuminating gender issues and factors within a system, at a point in time. Interestingly enough, the results from the primary purpose of the study highlighted the lack of homogeneity between provinces, with varying degrees of gender disparity in British Columbia, Alberta, Saskatchewan, Ontario, and New Brunswick. New Brunswick demonstrated the least measurable gender disparity amongst all the provinces. The province with the greatest gender disparity was described as British Columbia.

Sax (1994) examines students' initial interest in scientific careers, factors influencing career choice during college, and how these factors differ between men and women. Men who abandon career aspirations appear to be driven by financial concerns, whereas women who decide not to pursue scientific career appear more concerned with the social good of their career choice. Ferry (2006) asserts that adolescent occupational choice is influenced by many factors, including life context, personal aptitudes, and educational attainment. He contends further that whether college-bound or work-bound, meeting the challenge of this developmental milestone is critical in adolescents' lives.

According to Gaskell *et al.* (1993), female students interviewed expressed desires to study and have careers in some of the traditional fields, such as nursing, but female students also expressed desires to study and have careers in "Science based architecture, law, medicine, aviation, commerce, and business." Female students communicated the desire to have careers, independence, and perhaps a family background (p. 133). Outcomes stated that "students should have equal access to knowledge" (p. 141) but those physical sciences teachers should practice "gender sensitive teaching strategies" (p. 160). There has been a problem with knowing what is happening in Kenya, within Science-based courses, as there is an absence of current empirical studies on the experiences of female students in education; therefore, the literature reviewed on the experiences of female students has been primarily from literature on the phenomenon from outside of Kenya. The recent literature on what female students are experiencing within their education, within science and Science-based courses, suggests that, for many female students, their educational needs in science and Science-based are not being met. Even the most argumentative studies that argue male students are being short changed' in schools acknowledge that female students are being "short changed" in science and Science-based (Fraser, 1986). However, despite the fact that much has been written about the individual variables affecting career aspirations and of the relationships among them, a survey of the literature, however, revealed that very little empirical studies on this subject exist. This study, therefore, serves to fill the missing gap in this aspect of the literature.

2.4 Theoretical framework for gender differences in education

Historically, social and political triggers of change have been connected to events. These historically significant events have had a dramatic influence on what education females have been permitted to access (Tayler and Mounfield, 2009). The representation of the cascade of events in this section has been delimited to the last four centuries, to provide an historical synopsis to the reader. There has been speculation, that the participation of males and females together as thinkers is mired in historical context (Telecki, 2005). Although there are many vocations where female gender disparity can be historically illuminated, an historical analysis of female and Scienc/Technologies has shown that, although women have always used technologies during the last four hundred years most of the technologies have been dominated by

males (Scheibinger, 2007). Not every historian supports the historical record that women have not been involved in non-traditional occupations, including science. According to Stabiner (2003), there have been few jobs "historically non-traditional for women including: welding, carpentry, electronics and industry as vocations that have historically excluded the participation of women. Smith (2009) currently stated that, prior to the colonial era; women could perform only family background based occupations.

Many disciplines have studied the issue of enrolment and made useful contributions towards understanding its theoretical backgrounds of gender differences in education (United Nations Publication., 1994; Simpson, 1996; Rainere/a/., 2003; Smith, 2009). A number of theories have been used to describe differences in enrolment (Cudd, 2002). Much of the research on college enrolment patterns is founded upon the "human capital" model Gary Becker advanced. According to this theory, one decides to enrol in college as an investment in future earning power (Chapman, 1981; Becker, 2001). Individuals calculate the value of attending college by comparing costs (direct and indirect) with expected income gains, and they make the decision that will maximize their utility over the long term. To understand enrolment behavior according to this model, it is necessary to look at such factors as tuition levels, student financial aid, average wages for high school graduates, and the difference in lifetime earnings between the colleges (Mazzarol, 1998) school and Economists and others agree, however, that non-monetary factors also play a major part in the college enrolment decision.

Sociologists' models of status attainment have suggested a number of background variables that join with economic factors to influence college plans. These include both personal traits (e.g., academic ability) and interpersonal factors, such as the level of encouragement a student receives from parents and teachers (Lin, 1997; Luke, 2003). Hossler and Gallagher (1987) suggest that individual decisions on enrolment can be broken down into three stages: predisposition, search, and choice. Within the econometric and sociological models outlined above, the factors affecting enrolment in college can be divided into two general types: those specific to individual students, such as academic achievement and parental education levels, and those specific to

educational or vocational alternatives, such as college tuition, financial aid, and unemployment levels (Hossler, 1997). Students' enrolment decisions can be viewed as jointly determined by their individual characteristics and the institutional or societal conditions that prevail.

Analytic feminists have chosen to incorporate gender equality along with traditional analytic methods to explain enrolment. Although it may appear that differences in enrolment between the male and female should have been addressed through women's studies, and that therefore a theoretical framework from women's studies would be sufficient, the researcher felt this tactic was also insufficient to address the magnitude of the problem in education. The discipline of Science-based access in women's studies is still new, and there remains debate as to whether this discipline is a discipline in and of itself, or whether it is an interdisciplinary discipline. Also, the scope of the audience in women's studies tends to be limited, although not entirely, but primarily to women (FAWE News, 2000; Hunt, 2008; Hadley, 2010) and that the nature of the problem crosses traditional boundaries of disciplines, the same as education crosses the traditional boundaries of disciplines. The researcher decided to use concepts that were strategically unifying and inter-disciplinary. The Framework, therefore, is one that has evolved through the process of identifying the problem with the incorporation of definitions and principles of equality.

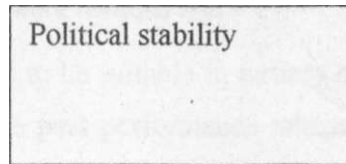
2.5 Conceptual framework

The conceptual framework for this study was researcher based framework depicted in Figure 1. In the framework the researcher determined how performance in Science subject at the KCSE, institution factors, socio-economic backgrounds and students' factors, influence the enrolment rates of female students in science based courses in tertiary institutions. The independent variables are the performance in KCSE, institutional factors, students' factors and socio-economic backgrounds of the female students. The factors were investigated if they influence the enrolment of the female students, hereby termed the dependant variable in the tertiary institutions.

independent variables

Intervening variables

Dependent variable



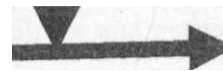
Government policy

Performance in KCSE

Number of Science subjects taken in secondary schools
Performance in the Science subjects in KCSE

Institutional factors

Learning facilities
Rules at the college
Presence of staff to handle the courses



Enrolment of the female students in Science based courses in tertiary institutions

- Number of students

Student factors

Attitude of students towards the course
Motivation for the course
Peer perception of the course marketability
Peer perception of the course prestige

Socio-economic background of the female students

Parent's average monthly income
Family social background
Family levels of education
Number of sibling going to school

Figure 1: Conceptual framework for the study

The variables from conceptual frame work revealed that:

The curriculum demand was found to be suitable in tertiary colleges, yet students did not seem to have covered the past performance adequately, most of them having dealt with much theoretical aspects of the courses. This seemed to affect the competence of the local tertiary level colleges trained graduates in the local industrial market.

The socio-economic factors such as father's levels of income, number of siblings and income of the parents were the main socio-economic factors affecting the enrolment in Science based courses among the female students.

The perception of the female towards Science based courses was generally positive and many opted for the course because they had confidence in it.

There were institutional challenges that affected the local tertiary institutions including poor management, lack of basic facilities and generally poor working environment

i «

2.6 Knowledge gap

The above review of literature was initiated to determine the information available and the existing gap in knowledge. It was clearly evident that female students had low preference for the Science subject not just at higher institution levels but also at secondary schools levels leading to dislike for the science oriented courses at the higher learning institutions. The review clearly identified academic achievements of female students in Science oriented courses was low and could be one of the factors leading to low career choices in Science subjects. As yet, this has not been conducted in Kenyan higher learning institutions. The enrolment in many career choices among students is usually related to the institutional factors such as facilities available, rules at the college; the linkage between these institutional factors and career choices among the students in higher learning institution in Kenya has rarely been conducted. Student factors such as attitude of students, motivation, peer perception of the course marketability and peer perception of the course prestige have been highlighted as likely factors that influence the students enrolment attitudes towards a subject, yet there is very little available information on how they influence the career choices of students in Science oriented courses at the higher learning institutions. Finally, socio-economic

background of the female students usually include aspects such as ability of parent to pay fees, parents monthly income, family social background, family levels of education and number of sibling attending schools. There are few reports that have explored these factors on the students, yet, none of the studies available have determined how they influence career choices in Science among the female students in the higher learning institutions.

2.7 Summary of literature review

The literature review in this section is geared towards the understanding of the low enrolment of the female students in tertiary institution as far as Science oriented courses were concerned. The review has captured the views of various authors and from the review, it is clear that female enrolment in Science oriented courses were lower than male counterparts and would be due to various factors. The literature review revealed that a number of factors would cause low female reenrolment and need to be investigated. This is the gap that this study filled

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Methodology refers to the system of methods or procedures used in sampling and collecting data required for a particular research. This section describes research design, target population, sampling design and sample size, data collection methods, validity and reliability of research instruments and data analysis technique.

3.2 Research design

The study adopted a descriptive survey research design because such issues are best investigated through survey research design (Kerlinger, 1986) and hence the choice. The study was concerned with ascertaining factors that influence the enrolment of the female Science-based students in the tertiary level colleges in Western Province.

3.3 Target Population

The target population constituted of all the female students enrolled in science based courses in and the of tertiary institutions in Western Province principals of these tertiary institutions. Details are presented in table 3.1

Table 3.1: The study Population of tertiary institutions in Western Province

College		Number of students	no principals
Sigalagala	*	31	1
Sangalo		28	1
Bumbe		32	1
Kisiwa		26	1
Matili		29	
Mabanga FTC		24	
Shamberere		18	
Bukura		21	
Friends College Kaimosi		29	
Sacred Africa		33	
TOTAL		271	10

Source: Provincial Education Office, Western Province (2011)

3.4 Sample size and sampling procedure

To determine the sample size, the Yamane (1967) formula was used thus:

$$n = \frac{N}{1 + Ne^2}$$

3.4.1 Sample size

$$n = \frac{N}{1 + Ne^2}$$

Where n = sample size

N = population

e² = error limit

N=271

e= 0.05

i) Sample size of students

: Sample size (n) = $\frac{271}{1 + 271 * 0.05} = 161$ Therefore the sample size of the students

was 161. The same formula will also be applied to determine the sample size for the institutions.

ii) Thus the sample size of the institutions and principals was:

N= 10

e= 0.05

$$\text{Sample size (n)} = \frac{N}{1 + (N * e^2)} = \frac{10}{1 + (10 * 0.05^2)} = 9.7 \approx 10$$

All the tertiary institutions in the province constituted the sample. Details are presented in table 3.2.

Therefore from the calculation above, all die ten institutions and their principals constituted the sample

Table 3.2. Sample of the study

College	Number of students	No. of principals
Sigalagala	18	
Sangalo	17	
Bumbe	19	
Kisiwa	15	
Matili	17	
Mabanga FTC	14	
Shamberere	11	
Bukura	12	
Friends College Kaimosi	17	
Sacred Africa	20	
TOTAL	161	10

3.4.2 Sampling procedure

This is the description of the strategy, which the researcher used to select the institutions and students. Simple random sampling was used to select ten institutions and systematic random sampling technique was used to get a sample of 161 students, from the sampling frame of students in each institution. Purposive sampling was used to select the 10 principals of the sampled institutions. Western Province was selected purposively based on research knowledge of the existing problem in the region. From a sample of 10 tertiary institutions, 161 students were selected using the systematic random sampling technique. In the systematic sampling, every k^{th} student was selected. Where k was obtained by:

$$k = \frac{\text{Total number of students in the institution taking Science based course}}{\text{Sample size}}$$

$$k = \frac{271}{161} = 1.6 \quad \text{Therefore } k = 1.6$$

3.5 Data Collection Instruments

The main instrument for data collection was student's questionnaires, scheduled interviews for principals and HOD science, document analysis and checklists.

3.5.1 Questionnaires for female students

The questionnaire is a convenient tool since a large numbers of students was handled. It will facilitate easy and quick derivation of information within a short time from the students. The student questionnaire was used to gather information on three items thus: performance of the students, student socioeconomic status and attitudes of the students.

3.5.2 Interview scheduled for principals

Scheduled interview was used to gather information from the head of the tertiary institutions or from the head of department on institutional factors likely to cause low enrolment among female students in Science based courses.

3.5.3 Document analysis

The document analysis involved reviewing the contents of target documents i.e. class registers, inventory, and fees registers and parent's registers in the tertiary institutions with the aim of adducing some relevant secondary data of the female students' enrolment rates (Oso and Onen, 2005).

3.6 Data Collection procedure

First the researcher sought research authorization from the School Graduate Studies of the University of Nairobi to do the research. The researcher applied for permit from National Council of Science and Technology. Data was collected from female students pursuing Science-based courses. The data was collected by the researcher with the help of one research assistant so as to get first hand experience in conducting a study. The researcher sought pennission from the Ministry of Higher Education. The researcher sought the consent of the participants and booking of appointments with the institutions. Data collection involved obtaining actual data for analysis.

3.7 Validity of Research Instrument

Validity is the degree to which results obtained from analysis of the data actually represent the phenomenon under study (Best and Khan, 1993). Validity refers to the agreement between the value of a measurement and its true value. According to Mugenda and Mugenda (1999) the validity of research is concerned with the extent to which that data measures what it is supposed to measure. To establish the validity of the research instruments, the researcher consulted the supervisors and experts content validity. The instruments were pretested using respondents who were not involved in the actual study; from the responses obtained, some of the items were modified to eliminate ambiguity

3.8 Reliability of the instruments

Reliability of measuring instruments refers to the instrument's ability to yield consistent results each time it is applied. It can also be seen as a measure of the degree to which a research instrument yields consistent data after repeated trials, Mugenda and Mugenda, (2003). The reliability coefficient varies between values of 0.0 and 1.00. A coefficient of 1.00 indicates perfect reliability, while a rating of 0.0 indicates no reliability. In order then to establish the reliability of the instruments, the split - half approach was employed. To determine the reliability of the student questionnaire, the questionnaire was administered to 16 female students enrolled in science based courses in six tertiary institutions in the province. These students were eventually excluded from the main study. After analysing the responses of this instrument, the cronbach-Alpha reliability coefficient was found to be 0.7.

3.9 Operational definition of variables

There are two variables that were considered in this study, namely, independent and dependent variables. The independent variable will be: performance of the students in the KCSE, institutional factors, and socio-economic status of female students' parents and the attitudes of female students towards Sciences. The dependent variable was enrolment of the female students in Science based courses at the tertiary institutions.

Table 3.3: Operationalization of the research table

Research objective	Indicators	Measures	Data collection method	Scale of measurements
To find out the performance in science subjects at Kenya certificate of secondary education, for the female students enrolled in science based courses in tertiary institutions in western province Kenya	Number of subjects taken secondary schools Performance in Science subjects	Frequency of choice of the subject Number of students passing the course	Questionnaires	Nominal/ordinal
To identify institutional factors influencing female students enrolment in Science-based courses in tertiary institutions in Western province Kenya	Learning facilities Rules at the college Staff to handle courses ⁴	Availability of long facilities Availability of staff	Questionnaires	Ordinal
To find out the social-economic background of the female students enrolled in Science-based courses in tertiary institutions in Western province Kenya.	Ability of the parents to pay school fees Economic status of the family Family background Family level of education Number of siblings going to school	Number of parents paying fees Number of educational families	Questionnaires	Ordinal
To investigate how students factors influence their enrolment in Science-based courses in tertiary institutions in <u>Western province Kenya</u>	Attitudes towards course Motivation Peer perception of the courses	Number of female students who chose the subject	Questionnaires	Ordinal

3.10 Data analysis

Data was analyzed descriptively. Descriptive methods were employed in analyzing qualitative data where frequencies and proportions which were used in interpreting the respondent's perception of issues raised in the questionnaires so as to answer the research questions. To summarize the performance of the students, means was used while frequency distributions were used to summarize, the institutional, socio-economic factors and attitudes of the students. The relationships between performance in KCSE and enrolment in Science subject was analyzed by frequencies and percentage. Relationships between institutional factors, socio-economic factors and attitudes of the students and enrolment of the students in Science based courses were analyzed. All data was analyzed at a level of 95% or $\alpha = 0.05$.

Table 3.4: Summary of Data Analysis

Independent Variable	Dependent Variable	Statistical Technique
1. Performance of female students in Mathematics, Physics, Chemistry and Biology at KCSE.	Enrolment in Science-based courses in tertiary institutions	• Frequencies • Percentage
2. Institutional factors	Enrolment in Science-based courses in tertiary institutions	• Frequencies • Percentages
3. To find out the socio-economic background of the female students	Enrolment in Science-based courses in tertiary institutions	• Frequencies • Percentages
4. Students factors	Enrolment in Science-based courses in tertiary institutions	• Frequencies • percentages

3.11 Ethical consideration of the study

The researcher ensured that she got informed consent from the respondents and permission from the relevant authorities before conducting the research. The researcher informed the respondents of the purpose of the study. The researcher kept the information provided by the respondents confidential.

INTERPRETATION

4.0 Introduction

This chapter presents an analysis of the data gathered using the tools discussed in the previous chapter. This section is divided into five main sub-sections. The first part provides information concerning questionnaire response rate. Section 4.2 presents information on the Influence of performance of female students in Science subjects at Kenya Certificate of Secondary Education (KCSE) on their enrolment in Science-based courses in tertiary institutions in Western Province, Kenya. Section 4.3 presents information on how institutional factors influence female students' enrolment in Science-based courses in tertiary institutions in Western Province, Kenya. Section 4.4 provides the information on the socio-economic background of the female students influencing their enrolment in Science-based courses in tertiary institutions in Western Province, Kenya. Finally section 4.5 determined the students' factors influence their enrolment in Science-based courses in tertiary institutions in Western Province, Kenya.

Tables and figures have been used to summarize and illustrate the findings of the study.

4.1 Questionnaire return rate

The researcher used questionnaires as a tool for data collection. The researcher had sample of 161 female students taking the Science based courses as the sample size. Each of the respondents was given the appropriate questionnaire. For this research 143 respondents returned the questionnaires. Thus the initial response rate was therefore 88.8%. However, during data coding, five questionnaires were adjudged to be wrongly filled and were excluded from the analysis. Therefore, only 138 questionnaires were considered and this finally represented 85.7%, which was considered very good response rate according to Kothari (2004).

4.2 Influence of performance of female students in Science subjects at Kenya Certificate of Secondary Education (KCSE) on their enrolment in Science-based courses in tertiary institutions in Western Province, Kenya

The first objective of the study was to find out the performance in science subjects at K.C.S.E for the female students enrolled in science based courses in tertiary institution in Western Province, Kenya. This was formulated into a research question stating *"what is the performance in science subject at (Kenya certificate of secondary education) K.C.S.E for the female students enrolled in Science based courses in tertiary institutions in Western province, KenyaV.*

The overall performance of female students in Science subjects in relation to the expected performance in the subject in at Kenya certificate of secondary education (KCSE) is shown in the Table 4.1. The figure indicate that most of the students score C in Chemistry (68%) and Biology (63%) and grade D in Physics (50%) whole equal number of students scored grade C and D (40%) in Mathematics. On the other hand majority of the students expected to score grades B in Chemistry (50%), Biology (40%) and Physics (37%) while most of the students expected a score of C in Mathematics. When the differences in the score of students in Science subjects was subjected to statistical chi-square test, there were significant differences in the actual scores from the expected scores ($\chi^2 = 19.874$, $df = 3$, $p = 0.0001$). The overall trend was that most students scored lower grades in Science subjects than expected.

Table 4.1: Performance of female students in the past Science subjects in KCSE relative to their expected performance

	Chemistry		Biology		Physics		Mathematics	
	Actual	Expected	Actual	Expected	Actual	Expected	Actual	Expected
A	0.0	22.5	0.0	13.8	0.0	10.9	0.0	8.0
B	1.4	49.3	1.4	39.1	2.9	39.1	1.4	17.4
C	70.3	15.2	64.5	31.9	37.0	28.3	39.1	58.0
D	23.2	13.0	31.9	15.2	47.8	21.0	39.1	16.7
E	5.1	0.0	2.2	0.0	12.3	0.7	20.3	0.0

The students' levels of satisfaction in their performance in Science subjects were also rated and determined (Table 4.2). Students' level of satisfaction was highest for Chemistry (48%) followed by Biology (40%) and least for Physics (35%).

Table 4.2: Students' levels of satisfaction in their performance in Science subjects

	% rating
Chemistry	48.5
Biology	39.4
Physics	32.2
Mathematics	35.1

The students were further asked to rate their most preferred Science subjects (Table 4.3). Based on the figure, Biology was the most preferred subject by 45% of the students followed by Chemistry by 36% of the students and Mathematics and Physics were the least preferred at 11% and 8% respectively,

Table 4.3: Most preferred Science subjects by the students

	% rating
Chemistry	36.1
Biology	45.4
Physics	7.9
Mathematics	10.6

The students were also asked if their grade in any of the science subjects resulted in their current enrolment in Science based course at the institution. Based on the table 4.4, 65% of the students attested that their current grades in Biology resulted in their current enrolment in Biology based subjects. On the contrary only 30% of the students indicated that their enrolment in Physics was related to their performance in the subject.

Table 4.4: Grades resulted in the current Science based course at the institution

	% rating
Chemistry	54.9
Biology	64.3
Physics	29.8
Mathematics	50.5

Finally the adequacy of the units in the current Science course was also determined (Table 4.5). Based on the responses of the students, majority of the student felt that their performance in Science subjects was inadequate the most being for Biology (63%) followed by Chemistry (52%) and least in Physics (25%).

Table 4.5: Adequacy of the units in the current Science course

	Adequate	Not adequate
Chemistry	54.9	45.1
Biology	35.7	64.3
Physics	70.2	29.8
Mathematics	42.5	57.5

The role of performance in enrolment in Science based courses was determined. The female students were asked whether they performed well and the results as summarized below in Table 4.6. When the performance of the female students were cross-tabulated with the probability of enrolment in Science based courses, it was established that there was a significant association between performance and enrolment ($\chi^2 = 76.4343$, $df = 2$, $P = 0.0035$).

Table 4.6: Performance rating of the students based on the past examination scores

	Frequency	% frequency	Percentage likely to enrol	Chi-square (χ^2)	df	P-value
Good	62	44.6	97.8			
Average	44	32.2	67.0			
Poor	32	23.2	32.3	77.544	2	0.0000

4.3 How institutional factors influence female students enrolment in Science-based courses in tertiary institutions in Western Kenya

The second objective of this study was to identify institutional factors influencing female students' enrolment in Science-based courses in tertiary institutions in Western province, Kenya. The research question was: *what institutional factors influence enrolment of female students in science based courses in tertiary institution in western province Kenya?*

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The study also determined the actions of the school for female students not performing well likely to discourage them from enrolment in Science based courses (Table 4.7). Up to 58% of the female students were forced to retake the course, 50% were given extra course load, 30% were ignored by the administration to wait for the main exams while up to 20% were simply expelled from the college with a similar number made to rewind the whole year after very poor performance.

Table 4.7: Actions by schools for poor performing students

	Frequency	% frequency
Retaking the course	78	56.8
Expulsion	40	29
Rewind the entire year	32	23
Given extra course	64	46.4
Ignored by administration	45	32.6

The female students were asked if they had fees problem, and whether were always send home due to school fees. 85% of the female students stated that they had fees problems and 60% reported being send home for school fees. Furthermore, over 70%

of the female students stated that this is one of the main reasons leading to them dropping out of schools.

Facilities in the institutions were also assessed by the researcher who inquired if the student had good facilities in the school. However only 31% attested that there were good facilities for learning.

The overall influence of institutional factors was also determined and related to the enrolment in Science based courses of the female students (Table 4.8). Based on the table, majority of the students believed that there were poor management by the institution, poor facilities, poor lecture rooms, poor buildings, poor meals but still approved the good learning environment, good students discipline, good neighbourliness and professional staff. For all the positive response, the students showed propensity to complete their courses.

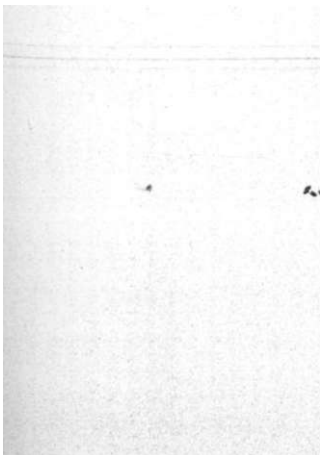


Table 4.8: Effects of the school-based factors on enrolment in Science based courses among female Science based courses students

Factors	Response	Frequency	Percent frequency	Probability to complete
Good school management	Yes	65	47.8	87
	No	71	52.2	13
Good facilities	Yes	53	39.0	67
	No	83	61.0	33
Good learning environment	Yes	79	58.1	81
	No	57	41.9	19
Good students discipline	Yes	96	70.6	61
	No	40	29.4	39
Good boarding facilities	Yes	44	32.4	62
	No	92	67.6	38
Proper classrooms/lecture halls	Yes	51	37.5	45
	No	85	62.5	55
Adequate classrooms/lecture halls	Yes	24	17.6	49
	No	112	82.4	51
Attractive buildings	Yes	89	65.4	21
	No	47	34.6	79
Good meals	Yes	21	15.4	32
	No	115	84.6	68
Good neighbouring communities	Yes	102	75.0	32
	No	34	25.0	68
School staff is professional	Yes	97	71.3	74
	No	39	28.7	26

4.4 Socio-economic background of the female students influencing their enrolment in Science-based courses in tertiary institutions in Western Kenya.

The third objective of this study was to find out the socio-economic background of the female students influencing their enrolment in Science-based courses in tertiary institutions in Western province Kenya. *The research question was what is the social economic background of female students enrolled in science- based courses in tertiary institutions in western province, Kenya.*

Table 4.10 provides information on the effects of the father's level of education and probability of enrolment in Science based courses. Majority of the students father's had no education (32.4%) similar to the percentage with only primary level of education (31.6%) while female students father's with college and university education were only 6.6% and 2.2% respectively The researcher cross-tabulated the female students father's levels of education and the probability to complete and analyzed the relationship. The statistical analysis revealed that there was a significant relationship between students' father's level of education and enrolment in Science based courses among the female students ($P < 0.05$). Female students with the highest probability of enrolment in Science based courses were those whose fathers had college or university levels of education at 88.9% and 100% respectively. On the other hand, female students whose fathers had no education had lower probability to complete (72.7%) similar to the percentage of female students whose father's had primary level of education.

Table 4.10: Effects of the father's levels of education on enrolment in Science based courses among female students in the tertiary institutions

Fathers level of education	Frequency	% frequency	Probability of enrolment	Chi-square (x^2)	df	P-value
None	44	32.4	72.7			
Primary	43	31.6	72.1			
Secondary	37	27.2	89.2			
College	9	6.6	88.9			
Uniyersity	1	2.2	100.0	109.3	4	0.0000

This study also determined the relationships between the number of siblings and probability of enrolment in Science based courses among the female Science based courses students (Table 4.12). Up to 49.3% of the female students had number of siblings ranging from 3-5 followed by female students with 6-10 siblings (25%) and least number of females had over 10 siblings (2.9%). The probability to complete college education was found to be high among students with less than 2 siblings (83.9%) followed by those with 3-5 siblings (80.6%) and least among those with over 10 children (25%). When the number of siblings was cross-tabulated with the probability to complete, it was established that there were significant relationships between number of siblings and probability to complete ($P < 0.05$). Generally the relationships were such that increasing number of siblings resulted in decreasing probability of completing college students among the females' students.

Table 4.12: Effects of the number of siblings on the probability to complete education among female Science based courses students

Number of siblings	Frequency	% frequency	Percentage likely to enrolment	Chi-square (χ^2)	df	P-value
<2	31	22.8	83.9			
3-5	67	49.3	80.6			
6-10	34	25.0	73.5			
>10	4	2.9	25.0	18.543	3	0.0022

Finally, monthly income of the female student's parents was also sought as a factor that affect enrolment in Science based courses rate (Table 4.13). Up to 61.8% of the female students parents earned below Kshs 5000 per month, followed by 34.6% who earned between Kshs. 5000 to 10000 pm. Chances of enrolment in Science based courses among students whose parents earning over Kshs. 10000 pm was 100% but only 77% and 47.8% chances of enrolment in Science based courses among female students whose parents earn Kshs. 1501-5000 and Kshs. Below 1500 pm respectively. When the researcher cross-tabulated the income of the parents and probability to complete education it was found that there were significant association ($P < 0.05$).

Table 4.13: Effects of parents income on the probability to complete education among female Science based courses students

Income levels	% frequency	Percentage likely to enrol	Chi-square (χ^2)	df	P-value
<1500	16.9	47.8			
1501-5000	44.9	77.0			
5001-10000	34.6	72.3			
10001-20000	2.2	100.0			
> 20001	1.5	100.0	76.543	4	0.0001

The researcher inquired from the female students how many siblings their father paid school fees for and whether they were female students or male students. The results are presented in Table 4.14. The female students parents preferred to pay fees for male students as attested by two thirds of the respondents while only one fifth of the female students believed that their parents preferred to pay fees for them.

Table 4.14: Preference of the father in payment of school fees to the siblings

	Frequency	% frequency
Paid for all	31	22.5
Paid for male students	76	55.1
Paid for female students	26	18.8
Did not pay	3	2.2
Total	136	100

The researcher consolidated and rank the information that captures the overall socio-economic background characteristics that influence enrolment in Science based courses rates of the female students in tertiary level colleges. Several information was sought from the female students and the summary is provided in Table 4.15. According to the table, many female students are unlikely to enrolment due to poverty; preference by the parents to education male students, cultural norms such as polygamy, high illiteracy among the parents while early marriages was not a major

cause of female students' enrolment. When the socio-economic status were cross-tabulated with probability to complete, the results indicated that all factors affected enrolment in Science based courses rates ($P < 0.05$).

Table 4.15: Statements concerning female students' perception towards enrolment in Science based courses of Science based courses due to the socio-economic factors

Statement	SA	A	U	D	SD	Rank score	Chi-square (χ^2)	P-value
My parents were poor	91	25	10	8	2	88.7	12.227	0.0097
Parents preferred to educate male students than female students	51	35	9	32	9	72.8	15.222	0.0074
My family was polygamous	37	36	23	26	14	68.2	29.343	0.0004
My parent's income was low	87	13	15*	13	8	83.2	23.443	0.0043
My parents has no formal employment	87	25	15	7	2	87.6	14.543	0.0054
It is not conducive to study at home	10	8	20	39	59	41.0	47.998	0.0000
My father considers me a financial burden	53	41	31	9	1	79.6	33.445	0.0043

4.5 To investigate how students factors influence their enrolment in Science-based courses in tertiary institutions in Western province Kenya

The fourth objective of the study was to investigate how student's factors influence their enrolment in Science-based courses in tertiary institutions in Western province Kenya. *The study question was what student factors influence their enrolment in science based courses in western province Kenya?* This was done using a Likert type attitudinal score of 13 items, which was useful to calculate the overall perception. The scores of the 13 items are as shown in Table 4.16. Most of the students ranked highly performance in Science based Course, future economic prospect of the course, self confidence and necessity of the course.

The overall attitudes of the female students towards Science based courses and die probability to complete are depicted in Table 4.17. Majority of the female students had positive attitudes (58.9%) towards Agricultural Science based Course. Female students with negative attitudes towards Science based courses were moderate in proportion (33.5%), however, the proportion of students with neutral attitudes were the lowest (7.6%) compared to the other two attitudinal categories. The researcher cross-tabulated the attitudes and probability of enrolment in Science based courses among the students. It was established that there was a significant association between perception and probability to complete with more students having positive perception likely to enrolment than those with negative perceptions ($\chi^2 = 76.4343$, $df = 2$, $P = 0.0035$).

Table 4.17: Overall attitudes of the female students towards Science based Course

	Frequency	%	frequency	Percentage likely to enrolment	Chi- square (χ^2)	df	P-value
Positive	81	58.9		97.8			
Neutral	10	7.6		67.0			
Negative	46	33.5		32.3	77.544	4	0.0000

Table 4.16: Statements concerning female students' perception of the Science based courses course and the overall rank scores.

Statement	SA	A	U	D	SD	Rank score
I enjoy my course of Science courses at the college	86	21	21	6	2	86.9
I am sure I am good at learning Science based Course	51	21	20	33	11	70.0
Knowing Science courses will help me earn a living	73	36	13	11	3	84.3
I don't think I could do advances Science courses	87	13	17	11	8	83.5
Science courses will not be important to me in my life's work.	85	22	22	- 5	2	86.9
Males are not naturally better than female in Science courses.	71	8	23	11	23	73.7
Getting a teacher to take me seriously in Science courses is a problem	31	23	27	32	23	61.0
Science courses is hard for me	51	32	32	12	9	75.3
I need Science courses for my future work.	63	41	22	6	4	82.5
I am sure of my self when I do Science courses	96	11	8	8	13	84.9
I don't expect to use much Science courses when I get out of school	63	41	22	6	4	82.5
Women can do just as men in Science courses	96	11	8	8	13	84.9
It's hard to get Science courses teachers to respect me	23	51	20	31	11	66.5
Science courses is a worthwhile, necessary subject	63	41	22	6	4	82.5
I would have more faith in the answer for the Science courses problem solved by a man than a woman	96	11	8	8	13	84.9
I am not the type to do well in Science courses	23	51	20	31	11	66.5
My teachers have encouraged me to study more Science courses	47	45	23	13	8	76.2
Taking Science courses is a waste of time	51	17	36	11	21	69.7
I have a hard time getting teachers to talk seriously with me about Science courses	63	41	22	6	4	82.5
Science courses has been my worst subject	96	11	8	8	13	84.9
My teachers think more advanced Science courses were a waste of time for me	23	51	20	31	11	66.5
Women certainly are smart enough to do well in Science courses	47	45	23	13	8	76.2
I can get good grades in Sscience courses	51	17	36	11	21	69.7

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS AND CONCLUSIONS

5.1 Introduction

In this section, the major findings of the study are highlighted and conclusion drawn from the study. In addition the implications and policy recommendations derived from the research findings are aptly stated. In addition, this chapter also presents suggestions for further research.

5.2. Summary of findings

The major findings from this study were:

Many female students opted for Science based courses since they liked the course, others enjoyed the prospect of being an Science based courses while the highest number of students in mechanical Science based Course decided to take the course because they believed that it was prestigious. However, this is not reflective of their ability in the subject. All the students in the field of Science based courses undertook field attachments despite dominance of theoretical approach to learning but still had confidence with the ability of the institution to provide good learning to the students. It was established that the students undertook their industrial attachments in good industries such as in Science based Course firms, Science based Course contractors and in the manufacturing industries, but also some somewhat suitable areas such as in the government offices and artisanal firms. In terms of syllabus coverage, the students believed that course in terms of coverage, theoretical content, context, time allocation and overall coverage was adequate to prepare them for the Science based courses course but doubted the practicality.

For the considered socio-economic factors: majority of the female students were aged between 18-25 years and their chances of enrolment in Science based courses reduced with age; their father's levels of education were low and this positive increased their chances as the level improved; female students were single with the highest chances of enrolment in Science based courses. For majority of the female students, the number of siblings ranged from 3-5 followed by 6-10 with decreasing chances of completing among the females, as the number of siblings increased. The monthly income of the

female students fathers indicated that majority of the female students' parents earnings were low but the chances of the female students completing increased with increasing father's income. Most of the female students were unlikely to enrol due to poverty, preference by the parents to education male students, cultural norms such as polygamy, high illiteracy among the parents.

Generally the students attitudes toward Science based courses was positive with prospective high rating of ranked highly performance in Agricultural Science based Course, future economic prospect of the course, self confidence and necessity of the course in their future undertakings. This might have been reflected in the generally good performance of the students.

In cases there were poor performance among the students, most of the female students were forced to retake the course, they were given extra course load, were ignored by the administration to wait for the main exams or expelled from the college or in case there were rooms for improvements, they were made to rewind the whole year after very poor performance. Most of the students believed that there were poor management by the institution, poor facilities, poor lecture rooms, poor buildings, and poor meals but still approved the good learning environment, good students discipline, good neighbourliness and professional staff. For all the positive response, the students showed propensity to complete their courses.

5.3 Discussion

5.3.1. Performance in the past exams

The problem arising from negative perception of the Science based Course fraternity stems from the perception that past performance covered in the tertiary institutions differs substantially with the practical requirement for effective Science based Course practices. In order to perform well in a course, the learner needs to be interested and understand the concepts that are dealing with (Kroft *et al.*, 2006). First, the female students were asked why they preferred to study Science based courses at the tertiary institutions. The results indicated that many female students opted for Science based courses since they liked the course (82.1%), others enjoyed the prospect of being in a Science based courses (90.0%) while the highest number of students in Science based

Course (98.0%) decided to take the course because they believed that it was prestigious. Lower percentage nevertheless opted for the Science based Course because they passed their exams (35.2%) and persuasion from the parents (44.2%). On the contrary, lower proportion of die student chose Science based Course because of: lack of alternatives (2.0%), peer pressure (3.1%) as well as a bridge to further pursue other courses (5.8%).

It was dierefore imperative to note that indeed die students of Science based courses were satisfied with the syllabus content, albeit fewer numbers of die students believed that the content coverage was adequate and thus this puts the burden of ensuring high quality syllabus coverage in die hands of the head of Science Department. As a results of the better and efficient methods of teaching, students are often expected to perform better once in the practical field (Kinutliia, 2009; Achote, 2009), yet because sometimes most of these institutions lack necessary tools and equipment or less emphasis being laid on the practical requirement of the students, performance in the field condition is often much uncertain.

All the students in the field of Science based courses undertook field attachments and another two thirds admitted that there is too much theory being taught to them at the expense of practical content of the course. Moreover, only a third of the students attested of acquiring more practical skills during the course taught at the tertiary level colleges while only another one third believed that the content in the industrial job market is similar to the current content being taught at the tertiayi colleges. Despite all the challenges in the course content coverage, only 3% of the students found the content of the Science based courses should be taught outside the tertiary colleges. This in essence means that even though the content coverage was not upto to the standards the students preferred, they were still optimistic that the course of Science based courses could be improved in when teaching was still done at the tertiary level colleges radier than being taught outside the tertiary level colleges similar to assertion by Kroft (2001).

It was also established that facilities were not adequate to handle the practical requirements of the Science based Course adequately and comprehensively. Therefore

the researcher established reasons why the department at the tertiary institutions lacks such facilities. The reason cited for lack of these facilities was attributed to high costs of the equipment. However, high maintenance cost and poor management rules such as procurements were blamed on the lack of these equipment. However, most of the lecturers were able to use the machines. There was a perception among the lecturers that the theoretical content was adequately covered by both tertiary institutions while practical content was emphasized in only few tertiary institutions in agreement with Kraak (2007).

5.3.2 Extent to which social-economic background influences enrollment of female students in science based courses in tertiary institutions in western Kenya

A number of reports and research available indicate the probability of the female students to complete schooling is intricately tied to their socio-economic backgrounds (Sifuna, 1980; Pryor and Ampiali, 2003; UNESCO, 2003; Wabuge, 2005; Okwako, 2006; Njug'e, 2009). According to this study, drop out rates was affected by the family socio-economic backgrounds, socio-culture in the family and literacy levels of the parent. The rise in the level of poverty in Kenya (Kenya National Bureau of Statistics, 2010). The report indicate that 46.8% of Kenyans live below the poverty line and that poverty is one of the major factors, which discourage parents from investing in their children's education. The highest drop out rates was found among children from poor households, which concur with studies by Birdsall *et al* (2005). During the study, there were a total of 136 females respondents Majority of the female students were aged between 18-25 years. The chances of dropping enrolment in Science based courses reduced with age of the female students.

In this study it was also established that parents have high number of children to take care of and therefore preferred to educate male students resulted in slackening education opportunities for female students and this contributed to the female students drop out rates from secondary schools as was also reported by Oduor, (2001). Raju (1973) argues that the difficulty of finding money to pay for the education of sons and daughters in the main use of the premature withdrawal of students from school. The situation where parents have negative attitudes towards education of the girl child or do not see its immediate benefits, the consequence is a high drop-out rate or poor

performance for those female students still in school (Njue, 2007; Nath et al., 2008; Njug'e, 2009; Omondi, 2009; Omwoyo 2009). Social-cultural and religious factors, such as initiation ceremonies and gender socialization, are additional factors responsible for pupils' failure to compete effectively in schools with other children.

For most of the female students, their fathers levels of education were none, primary or secondary education and the chances of the female students completing increased with their father's levels of education. Another important factor that is often related to drop out in Western Province was parental education level in concurrence with earlier studies (Chowdhury et al, 2002; Nath et al, 2008). It is widely believed that low parental education is likely to compromise the parents to prioritize education of their children because they see no benefits in education (Brown and Park, 2002). However, contrary arguments have ascertained that parents with very low educational backgrounds are likely to force their children to go to school and perform well in the hope that the children will help them in future (Duryea, 2003). So the children go to school with parental baggage and see themselves as future helpers of their parents and in the process, they develop negative attitudes towards schooling. If they do, they tend to drop out in greater numbers (Blick and Sahn, 2000) and engage in more income generating activities than children of parents with high levels of education (Connelly and Zheng, 2003; Ersado, 2005). A recent case study of rural villages in Kenya showed parental illiteracy was associated with low household income as factors likely to cause female students to drop out (Pilipili, 2006). This move has made it difficult for parents and communities to support education adequately; consequently, education is now beyond the reach of many households (World Bank/MoE Studies, 2005). This is mainly due to poverty levels, which have been rising in die country.

The, monthly income of the female students fathers indicated that majority of the female students parents earned below Kshs 5000 per month and the chances of the female students completing was calculated to increase with increasing father's income. If children do attend education, changes in the financial situation of parents, as reflected by the volatility of family income, may push some children out of education. The increased level of poverty makes parents unable to feed their children properly and provide adequate health services. In these circumstances, children whose

parents cannot afford costs of instructional materials, school uniforms, tuition fees, and activity fees tend to go to school irregularly and, in the long run, drop out of school or have problems during the entire learning process in the school. Faced with limited resources, and reduced returns from education, parents are not only unable but also unmotivated to educate their children. In the end, these factors have negative effects on children's school participation and the overall performance of students in many subjects in school.

A number of reports and research available indicate the probability of the female students to complete schooling is intricately tied to their home backgrounds (Sifuna, 1980; Pryor and Ampiah, 2003; UNESCO, 2003; Wabuge, 2005; Okwako, 2006; Njug'e, 2009). According to this study, drop out rates was affected by the family socio-economic backgrounds, socio-culture in the family and literacy levels of the parent. The rise in the level of poverty in Kenya (Kenya National Bureau of Statistics, 2010). The report indicate that 46.8% of Kenyans live below the poverty line and that poverty is one of the major factors, which discourage parents from investing in their children's education. The highest drop out rates was found among children from poor households, which concur with studies by Birdsall et al (2005). Family income is normally allied to the affordability of education and as such has a direct impact on whether children attend education (Hadley, 2010). If children do attend education, changes in the financial situation of parents, as reflected by the volatility of family income, may push some children out of education. The increased level of poverty makes parents unable to feed their children properly and provide adequate health services. In these circumstances, children whose parents cannot afford costs of instructional materials, school uniforms, tuition fees, and activity fees tend to go to school irregularly and, in the long run, drop out of school or have problems during the entire learning process in the school. Faced with limited resources, and reduced returns from education, parents are not only unable but also unmotivated to educate their children. In the end, these factors have negative effects on children's school participation and the overall performance of students in many subjects in school.

In this study it was also established that parents have high number of children to take care of and therefore preferred to educate male students resulted in slackening

education opportunities for female students and this contributed to the female students drop out rates from secondary schools as was also reported by Oduor, (2001). Raju (1973) argues that the difficulty of finding money to pay for the education of sons and daughters in the main use of the premature withdrawal of students from school. The situation where parents have negative attitudes towards education of the girl child or do not see its immediate benefits, the consequence is a high drop-out rate or poor performance for those female students still in school (Njue, 2007; Nath et al., 2008; Njug'e, 2009; Omondi, 2009; Omwoyo 2009). Social-cultural and religious factors, such as initiation ceremonies and gender socialization, are additional factors responsible for pupils' failure to compete effectively in schools with other children.

One of the underlying causes of enrolment in this study was lack of parental guidance and counselling for many female students. Meme (1987) carried out a study to investigate the home factors contributing to drop out of female students in primary schools in Ithima location in Meru County and concluded that the rate and causes of drop out among female students vary from school to another due to economic, social, physical and cultural and home based factors but pointed out that one of the most overlooked factor is the culture of communication between the parents and their children. He also further observed that drop out in female students education have been studied in significantly in line with poverty and affordability to pay school fees but not with respect to communication and counselling among parents. Research data indicates that there is a close relationship between lack of counselling and pregnancy and the incidence of female dropout (Nderitu, 1987; Olweya (1993) as was established in the current study where poor counselling by the parents resulted in decreased enrolment among female students.

Female students are generally expected to continue performing traditionally designated duties ever as they attend school. Majority fetches water, firewood, taking care of their siblings and also participates in other manual work at home. For many poor families, female students' labour may be absolutely imperative for family survival. So the relatively greater value placed on the unpaid labour for female students and the inflexible curriculum result to the following: deferred entry, frequent absenteeism, and chronic fatigue. All these negatively impact on the female students' education. The

female students¹ performance is impaired and self-image lowered eventually leading to dropping out of school.

5.3,3 How student's factors influence enrolment of female student in science based courses in tertiary institutions.

Perceptions are the learned predisposition to respond positively or negatively to certain objects, situations, institutions or persons. As such, perceptions constitute the cognitive, affective and performance components (Cage et al., 2009). The attitude of students toward a programme affects the way the programme is implemented and how they view the staff. The perception by most of the employers was negative one as attested to the employments structure. This indicates that there must be some form of problems in the ways the Science based courses from die local tertiary level colleges perform their job. One way that has been highlighted was that the local Science based courses are to theoretical oriented to perform any meaningful practical jobs. The practical aspect of the jobs can however be done by most of the college trained Science based courses who happen to be viewed in favourable light because they also demand less pay (Onyango, 2000). It was established that an increased number of students portends a proportional increase in number of Kenyan trained Science based courses, which could be an indicator that large firms are enjoying the service of the local tertiary level colleges trained Science based courses. This could be possible because large firms can easily pay the local Science based courses and this put a major question about the competence of the local tertiary level colleges trained graduates in jeopardy.

Majority of the student attested that even though they were trained in Science based courses they had negative perceptions about their competence in industrial job market. This created a negative perception where most of the employers did not prefer employing locally trained Science based courses due to their perceived low outputs from these students. They further indicated that outputs from the college trained Science based courses were much superior than the local trained Kenyan Tertiary level colleges Science based courses.

The researcher finally asked the employers of the Kenyan tertiary level colleges graduate trained Science based courses if they believed that the Science based courses

need additional training. About 72% stated that they need additional training to gain competence in the industrial job market, which stems from negative perception about their roles in enhancing outputs from their firms.

Probably one of the most significant areas which continue to affect the quality of teaching at the tertiary level colleges is the remunerations. Normally adequacies of the salaries for most people in the workforce are compared with others in similar fields elsewhere. In this study comparisons of the salaries were made against lecturers' salaries in developed and other African countries. It was surprising, yet anticipated that the salaries provided to the Kenyan lecturers were only 10% those in USA and most European countries and a half of what is being paid in other African countries such as Egypt, Nigeria, Mauritius, and South Africa, which all have better performing Science based Course fraternity than Kenya (Obot, 2007). Perhaps the main reasons for the brain drain from the Science based Course sector can be traced to the low remunerations. According to Morrison et al. (2006), lowly motivated lecturers cannot teach and will look for other additional source^e of extra income, which will eventually compromise their outputs. When salaries are low, they cannot meet the lecturers' needs and thus affect their content outputs to the students of Science based Course. To meet the shortfall in the gap between pay and work, they undertake some odd jobs, some of which have little bearing to their teaching at the tertiary institutions.

All Science based courses sampled students believed that they are indeed adequately trained to handle the challenges of the industrial job market. Probably it is a time to examine reasons why the students chose Science based courses because, some chose the course for which they had little, knowledge about as summarized in Table 4.6. Because of the haphazard nature of choosing the course and sometimes inadequate syllabus contents coverage, most students who had never had any opportunity to work in an industrial firm, hopefully believed that they could handle the training in the job market based on their training in Science based Course.

5.3.4 How institutional factors influence the enrolment of female students in Science based course at the tertiary colleges

There are important components of institutional environment, which shape the structure of the school and hence the learning environment (Olweny, 2009). Therefore, in literature there are a number of researchers have tried to define what school based factors cause female students enrolment. The students are moulded by these environments and can cope with the situation hence perform well or can be discouraged hence lead to poor performance. In Western Province, these factors were found to be varied as discussed in this section.

The first aspect of the school based factor was the school rules. The results indicate that school rules were part of the students' culture and they understood although some of the students did not understand the entire component of the rule packages of the school. It has been ascertained that when school rules are strict then the students' academic culture is shaped by it and in Western Province it is imperative to presumably believe that the rules were strict which nevertheless did not enhance school drop out as envisaged by other researchers. Having envisaged this aspect, it is imperative to note that students who dropped out due to schools mostly concur that the school rules were very strict contrary to the popular opinion among the rest of the students. Apart from strictness of the school rules, violation of the rules by other students was cited as one of the reasons that students opted out of since the female students believed that they could get away with it.

In Western Province, the performance of the female students in Sciences were found to be poor normally were below average score and most schools opted to force female students to repeat, give these female students extra homework or other forms of tasks that were deemed punishing to the female students such as remaining in class after everyone else has moved out, or being send home to get their parent and in some instances teachers ignored these female students. Recently, Mulongo (2010) stated that school administrative policy such as repetition of class and emphasis on examinations criteria onto selection and promotion of students to the next class leads to stress among the student who are not academically talented. He observes that this way of forcing repeat of classes' among student, favour of the academically privileged students and

may lead to age heterogeneity in class, which makes the female students to be unable to cope with the younger colleagues. Accordingly Kimi (1982) blamed the predictable monotony of repeating classes as school main shortcoming and may lead to other social vices such as over-aging by the female student's child and sexual maturation that may eventually lead to pregnancy among female students. This was a cycle blamed for female students easily dropout of school before enrolment in Science based courses of school. He asserts that dropout rates and repetition are directly correlated with socio-economic status, attitude and interest student.

In few instances was counselling done for the students who were not performing well and it is widely believed that poor performance among the female students led to their massive enrolment? These outcomes may eventually relate to higher academic achievement in subjects that are considered more difficult by most students. According to Mgongo (2011), performance of the girl child in Mathematics and Sciences are poor yet these are the same issues that shape their careers and future in the job market. It is probable to believe therefore that the female Students get discouraged if they cannot score highly in these subjects. When I checked at the record presented by the institute principals, it was surprising that most of the female students always get as low as zero percent in Sciences and Mathematics and this can be devastating the moral and attitude of the student. This may also result in repeating and as a consequence, the direct costs as well as the earnings foregone are increased (Omwombo, 2002), which force the female students parents to withdraw their daughters from the colleges in order to save the resources for other children or be directed to other uses.

In tertiary colleges, school fees was found to be major aspect causing female students to drop out of school as previously shown by other researchers (Psacharopoulos and Woodhall, 1985; Shiundu and Omulando, 1992; Shiundu, 2001; Wawire, 2010) and in reports of the county (Republic of Kenya, 2002). The female students parents could not afford the school fees and therefore the students were frequently send home and this has the ability to disrupt the normal learning cycle of the female students and consequently causing them not to catch up in the subjects being taught and this eventually led to drop out.

Another important factor that is often related to drop out in Western Province was parental education level in concurrence with earlier studies (Chowdhury et al, 2002; Nath et al, 2008). It is widely believed that low parental education is likely to compromise the parents to prioritize education of their children because they see no benefits in education (Brown and Park, 2002). However, contrary arguments have ascertained that parents with very low educational backgrounds are likely to force their children to go to school and perform well in the hope that the children will help them in future (Duryea, 2003). So the children go to school with parental baggage and see themselves as future helpers of their parents and in the process, they develop negative attitudes towards schooling. If they do, they tend to drop out in greater numbers (Blick and Sahn, 2000) and engage in more income generating activities than children of parents with high levels of education (Connelly and Zheng, 2003; Ersado, 2005). A recent case study of rural villages in Kenya showed parental illiteracy was associated with low household income as factors likely to cause female students to drop out (Pilipili, 2006). This move has made it difficult for parents and communities to support education adequately; consequently, education is now beyond the reach of many households (World Bank/MoE Studies, 2005). This is mainly due to poverty levels, which have been rising in the country.

Female students are generally expected to continue performing traditionally designated duties even as they attend college. Majority fetches water, firewood, taking care of their siblings and also participates in other manual work at home. For many poor families, female students' labour may be absolutely imperative for family survival. So the relatively greater value placed on the unpaid labour for female students and the inflexible curriculum result to the following: deferred entry, frequent absenteeism, and chronic fatigue. All these negatively impact on the female students' education. The female students' performance is impaired and self-image lowered eventually leading to dropping out of school.

5.4 Conclusions of the findings

- > The curriculum demand was found to be suitable in tertiary colleges, yet students did not seem to have covered the past performance adequately,

most of them having dealt with much theoretical aspects of the courses. This seemed to affect the competence of the local tertiary level institutions trainees.

- > The socio-economic factors such as father's levels of income, number of siblings and income of the parents were the main socio-economic factors affecting the enrolment in Science based courses of Science based courses among the female students.
- > The perception of the female towards Science based courses was generally positive and many opted for the course because they had confidence in it.
- > There were institutional challenges that affected the local tertiary institutions including poor management, lack of basic facilities and generally poor working environment

5.5. Recommendations for policy decision

Based on the foregoing discussion of the findings and conclusion, the following implications and recommendations are offered.* •

- > The government of Kenya should establish a clear outline aimed at regulating the learning resources for Science based courses at the tertiary institutions. This will enable the tertiary institutions to have appropriate and standard resources for the teaching of the programmes.
 - > The government should set aside a given percentage of the funds to each tertiary level college through the Ministry of Higher Education to facilitate the implementation of the practical training programme.
 - > The government should provide resources that will eliminate various problems constraining the effective implementation of the practical programmes in the tertiary institutions. They should strengthen the overall capacity of the training institutions to train people on implementation of the overall Science based Course programmes.
 - > The tertiary institutions should have a capacity to develop their own Science based Course training firms that has competent authorities to run them so that they can provide practical orientation to the students in Science based courses fields.
- V The tertiary institutions should always organise exchange programmes between

themselves and students from the tertiary level colleges in an open discussion and practical learning forum to enhance the practical skills of the Science based courses.

5.6 Recommendations for further research

To bring more light into the issue investigated in this study, the following recommendations have been made for further research.

- > A similar designed study covering the whole of country to find out if the findings reached here hold true for the whole republic.
- > Future research should be conducted to establish if the institutional management can be enhanced and if the management decisions of students are also incorporated in the overall decisions concerning the running of die institutions.
- > A similar study involving females who are in the industrial job market but were equally trained in Science based courses will provide more comparable based approach of the Science based courses fraternity among the female students.

REFERENCES

- Barnabé, C. and Burns, M. (2008). Science teachers job characteristics and motivation in Kenya. *Educational Research*. **36(2)**: pp.171-185.
- Becker, G. (2001). Human capital model: Theories and application. *Journal of Human Behaviour*. VOL 22: pp. 191 -199.
- Bdnabou, R. and Tirole, J. (2011). Intrinsic and Extrinsic Motivation for Science education. *Review of Economic Studies*. **70(3)**: 489-520.
- Benabou, R. and Tirole, J. (2011). Intrinsic and Extrinsic Motivation for Science education. *Review of Economic Studies*. **70(3)**: pp. 489-520
- Bennell, P. and Akyeampong, K. (2007). Teacher Motivation in Sub-Saharan Africa and South Asia. *Educational Papers*. Pp 93
- Birdsall, N., Levine, D. and Ibrahim, A. (2005). Towards Universal Primary Education: Investments, Incentives, and Institutions. *European Journal of Education*, 40(3): pp. 337- 349.
- Bogonko, S. N. (1992) History of Modern Education in Kenya (1895- 1991). Nairobi: Acme Press.
- Chapman, D. (1981). A model of student college choice. *Journal of Higher Education*. **52**: pp.490-505.
- Cudd, E. (2002). Analytic Feminism. One woman's attempt at a definition. Retrieved from Written for the Encyclopedia of Philosophy, Supplement. Retrieved from <http://www.ku.edu/~acudd/Anfemdef.htm>.
- Cummings, D.T., Douglas, D.H. Michael, S.T., Ledock, X.M. Gregory, S.P. and Pauline D.M. (2009). *Educational policies in developing countries (Reviews)*. International Conference on Educational Planning in Tertiary colleges of Linschipin, Sweden.
- Eshiwani; G.S (1993). *Failure and Enrolment in Secondary Schools in Kenya and Zambia*, study of Internal and Extern Causes; Nairobi, UNESCO.
- Hadley, S. (2010). Seasonality and Access to Education: the case of primary education in sub-Saharan Africa, CREATE Pathways to Access. *Research Monograph*. No. 31, Brighton: pp. University of Sussex.
- Hossler, D. (1997). A Research overview of student college choice. Paper presented at the annual meeting of the Association for the Study of Higher Education. Chicago, IL.

- Hossler, D. and Gallagher, K.S. (1987). Studying students' college choice. A three-phase model and the implications for policy makers. *College and University*. 62: pp. 207-221.
- Kane, E. (2004). Female students ' Education in Africa: pp. What Do We Know About Strategies That Work? Washington DC: World Bank.
- Kim, D., Markham, F.S. and Cangelosi, J.D. (2002). Why students pursue the business degree: a comparison of business majors across tertiary institutions. *Journal of Education for Business*. **78(1)**: pp. 28-32.
- Kinyanjui/D.P. (1999). Dissecting the causes of low drop out rates among females in Kenya: pp. Case of Nyeri district. *Management of Education*. **12**: pp. 13-19.
- Kyalo, E; Osano, M. Maundu, K. and Kipkemboi. I. (2006). Education in Kenya: Towards the paradigm of shift of quality. *Journal of Educational Management*. **123**: pp. 23-33.
- Lawton, M. (1997). ETS disputes charges of gender bias. *Education Week*. 16(33): pp. 1-12.
- Lin, L. (1997). What are student education and educational related needs? *Marketing and Research Today*. **25(3)**: pp. 199-212. •
- Littleton, K. and Baninert, M. (2009). Situating differences: The case of gender and learning. In Joan Bliss, Roger Saljo, and Paul Light (Eds.), Learning sites Social and technological Resources for Learning, pp. 171 - 182.
- Lowe, D R. and Simons, K. (1997). Factors influencing choice of business majors - some additional evidence: a research note. *Accounting Education*. **6(1)**: pp. 39-45.
- Luke, N. (2003). Age and Economic Asymmetries in die Sexual Relationships of Adolescent Female students in Sub Saharan Africa. *Studies in Family background Planning*. **34(2)**: pp. 67 - 86.
- Malgwi, C.A., Howe, M.A. and Bumaby, P A. (2005). Influences on students' choices of college major. *Journal of Education for Business*. **80(5)**: pp. 275-282.
- Mazzarol, T. (1998). Critical success factors for international education marketing. *Vie International Journal of Educational Management*. **12(4)**: pp. 163-175.

- McGrath, S. and King, K. (1999). *Education and training for the informal sector in Kenya*. Vol. 2. Education Research Occasional Papers, ODA, London, UK.
- Nafukho, F.M. (1991). *Determining optimal size and existence of economies of scale in Kakamega County secondary schools*. Unpublished M. Ed. Thesis Kenyatta.
- Nzomo, J., Ackers, J. and Migoli, J. (2011). Identifying and addressing the causes of declining participation rates in females in the tertiary institutions. *International Journal of Educational Development*. **21(4)**: pp. 361-374.
- Oketch, O. and Oloo H. (1995). *Education and training for the informal sector in Kenya*, in McGrath, Simon; King, Kenneth: pp. Education and training for the informal sector, vol.2, Education Research Occasional Papers, ODA, London, UK.
- Okwako, L.P. (2006). High female enrolment in Western Province: Is the culture or poverty responsible? *Kenyan Journal of Education*. 17: pp. 134-144.
- Pimpa, N. (2007). The influence of normative referents on Thai students' choice of international education [online] Monash Centre for Research in International Education. Available from: <http://pp://www.aare.edu.au/01pap/pim01016.htm> [Accessed 6 April 2007].
- Pritchard, R.E., Potter, G.C. and Saccucci, M.S. (2004). The selection of a business major: elements influencing student choice and implications for outcomes assessment. *Journal of Education for Business*. **79(3)**: pp. 152-156.
- Rainer, R.K., Laosethakul, K. and Astone, M.K. (2003). Is gender Attitudes of education changing over time? *Journal of Information Systems*. 43(4): pp. 108-114.
- Shiundu, J.S. and Omulando, S. (1992). *Curriculum Theory and Practice in Kenya*. Nairobi, Oxford University Press.
- Simpson, B. (1996). Science Majors-aptitude, interest, and commitment: pp. A profile of 10 years of female biology, chemistry, physics and mathematics students at a private liberal arts college. Retrieved from <http://www.wigsat.org/gasat.40.txt>.

- Smith, D. (2009). *The everyday world as problematic: A feminist sociology*. Boston: pp. North Eastern University Press.
- United Nations Publication. (1994). *Women in a changing global economy: pp. 1994 world survey on die role of women in development*. Paris: United Nations Publications.
- Yamane, T. (1967). *Statistics, introductory Analysis of problems*. Happer Collins Publisher Inc.
- Zhang, W. (2006). *Why IS: Understanding die factors influencing undergraduate students' intention to choose IS major in business schools* [online]. Claremont, California, USA, ACM. Available from: portal.acm.org/ft_gateway.cfm?id=11252408&type=pdf [Assessed 4 June 2007],

APPENDICES

Appendix I: Introduction letter

Date

TO WHOM IT MAY CONCERN

Dear Sir/Madam

I Emily Munhonja, a post-graduate student at the School of Continuing and Distance Education, University of Nairobi. I am conducting a research study titled "***Factors influencing the low female students' enrolment in science based courses in tertiary institutions in Western Province, Kenya***"

You have been selected to form part of this study. Kindly assist by filling in the questionnaire provided. The information given be was treated in strict confidence, and was purely used for academic purposes. Do not indicate your name or unwanted details in the questionnaire.

Thank you

4 •

Yours faithfully,

Emily Muhonja

Reg. No: L50/66014/2010

Appendix 2: Research permit from the Ministry of Education, Science and
Technology

REPUBLIC OF KENYA



NATIONAL COUNCIL FOR SCIENCE AND TECHNOLOGY

Telephone: 254-020-2213471, 2241349
254-020-310571, 2213123, 1219420
fax: 254-020-318245, 318249
When replying please quote
secretary@ncst.go.ke

P.O. Box 30623-00100
NAIROBI-KENYA
Website: www.ncst.go.ke

OurRef NCST/RCD/14/012/1053

26th July 2012

r-mily Muhonja
University of Nairobi
P.O.Box 30197-00100
Nairobi.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *Factors influencing low female students enrolment in science based Courses in tertiary institutions in Western Province, Kenya,* I am pleased to inform you that you have been authorized to undertake research in **Western Province** for a period ending **31st August, 2012**.

You are advised to report to the **Provincial Commissioner and the Provincial Director of Education, Western Province** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

A handwritten signature in black ink, appearing to read 'M. K. Rugutt'.

OR. M. K. RUGUTT, Ph.D. HSC.
DEPUTY COUNCIL SECRETARY

Copy to:

The Provincial Commissioner
The Provincial Director of Education
Western Province.

Appendix 3: Questions for students

Thank you for your interest in participating in this survey. The purpose of this study is to collect data on the factors that influence the low female students enrolment in Science based courses in the tertiary institutions in Western Kenya. The questionnaire is part of my Masters of Arts in Project Planning and Management at the University of Nairobi and is completely anonymous. Your answers was treated with utmost confidentiality. Please indicate the correct option as honestly and as correctly as possible by putting A TICK (V) on die options.

Section A: Performance of female students at KCSE

1 What was your overall mean grade in?

- Chemistry** A [] B [] C [] D [] E []
- Biology** A [] B [] C [] D [] E []
- Physics** A [] B [] C [] D [] E []
- Mathematics** A [] B [] C [•] D [] E []

2. What grades did you expect to score in the following subjects?

- Chemistry** A [] B [] C [] D [] E []
- Biology** A [] B [] C [] D [] E []
- Physics** A [] B [] C [] D [] E []
- Mathematics** A [] B [] C [] D [] E []

3. Which of the above science did you like: Chemistry [] Biology [] Physics []

4. Did you like your performance in the following?

- Chemistry** Yes [] No []
- Biology** Yes [] No []
- Physics** Yes [] No []
- Mathematics** A [] B [] C [] D [] E []

5. Did your grade in any of the science subjects named above land you in your current course at the institution? Yes [] No []
6. Did you find the units in the current Science course adequate for your current field undertakings Yes [] No [] Undecided [] Still under scrutiny []

Section B: Type of institution influencing female students' enrolment in Science-based courses in tertiary institutions

1. Does your school/Faculty/department have the following?

- | | | |
|---|---|---|
| Have sufficient facilities, equipment and materials | I | I |
| Have good teachers (qualified and well trained) | r | l |
| Have good relations with the community and students | I | \ |
| Have full-day teaching and good school performance | l | \ |
| Have good school rules and disciplined students | I | I |

2. What is your idea of good school management?

- Have ability to prepare good school plan; has adequate information andl fe
- Community is involved and participation in education of children l I
- School Director is highly educated I I
- School staff is professional and committed to their work p j
- Students are disciplined |—|
- Have good monitoring of teachers and students' performance

Part C: Socio-economic backgrounds of the students

1. What is your household size?
2. How many siblings does your father pay school fees for?
3. Does your father prefer to pay fees for your brothers or sisters?
4. What is the size of your farm.
5. Do you have any income generating activities during holidays?
6. Does your parent/guardian give you money for practical lessons in schools
7. What is your parent's level of education?
8. Does you community view you as having landed the right course?
Yes []
No 1 []

Below are some statements about you or your parents. Please tick the option that best applies to you. Use the legend: SA-strongly agree; A-agree; U-undecided; D-disagree; SD; strongly disagree.

	Statement	SA	A	U	D	SD
i	My parents were poor					
ii	My parents preferred to educate my brothers more					
iii	We never had enough to eat					
iv	My family was polygamous					
v	My parent's income was low					
vi	My parents never had any formal employment					
vii	The home environment was not conducive for					
viii	I was being educated by my uncle					
x	My parents considers me as a financial burden					

Part D: Perception of the female students towards science courses

SA stands for Strongly Agree, A stands for Agree, U stands for undecided, D stands for disagree, SD stands for strongly disagree

	Statement	SA	A	U	D	SD
1	I enjoy my course of Science courses at the college					
2	I am sure I am good at learning Science based Course					
3	Knowing Science courses will help me earn a living					
4	I don't think I could do advances Science courses					
5	Science courses will not be important to me in my life's work.					
6	Males are not naturally better than female in Science courses.					
7	Getting a teacher to take me seriously in Science courses is a problem					
8	Science courses is hard for me					
9	I need Science courses for my future work.					
10	I am sure of my self when I do Science courses					
11	I don't expect to use much Science coupes when I get out of school					
12	Women can do just as men in Science courses					
13	It's hard to get Science courses teachers to respect me					
14	Science courses is a worthwhile, necessaiy subject					L
15	I would have more faith in the answer for the Science courses problem solved by a man than a woman					
17	I am not the type to do well in Science courses					
18	My teachers have encouraged me to study more Science courses					
19	Taking Science courses is a waste of time					
20	I have a hard time getting teachers to talk seriously with me about Science courses					
21	Science courses has been my worst subject					
22	My teachers think more advanced Science courses were a waste of time for me					
23	Women certainly are smart enough to do well in Science courses					
24	I can get good grades in Science courses					