FACTORS INFLUENCING THE RETENTION OF FEMALE STUDENTS IN SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM) COURSES, AT THE TECHNICAL UNIVERSITY OF KENYA

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DECLARATION

This research project is my original work and has not been submitted for award of a degree in any other university or institution.

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This research project has been submitted with my approval as the University of Nairobi Supervisor

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DEDICATION

To the memory of my late father Eliakim Were Onyango and my late mother Rosemary Adhiambo Were for your sacrifice to educate me. I thank you for being my inspiration and role models in my life.

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LIST OF ABBREVIATIONS AND ACRONYMS

CBD	Central Business District
CDF	Community Development Fund
FAST	Faculty of Applied Sciences and Technology
FEBE	Faculty of Engineering and Built Environment
FGM	Female Genital Mutilation
FSST	Faculty of Social Sciences and Technology
HELB	Higher Education Loans Board
HIV	Human Immunodeficiency
KII	Key Informant Interview
KPUC	Kenya Polytechnic University College
MOE	Ministry of Education
MOEST	Ministry of Education Science and Technology
NACOSTI	National Commission for Science Technology and Innovation
NASDCTE	National Association of State Directors of Career Technical Education
NCES	Nation Center for Education Statistics
SDGS	Sustainable Development Goals
SET	Science Engineering and Technology
SPSS	Statistical Package for Social Science
STEM	Science, Technology, Engineering and Mathematics
STI	Science Technology Innovation
TU-K	Technical University of Kenya
TVET	Technical and Vocational, Education and Training
UN	United Nations
UNECA	United Nations Economic Commission for Africa
UNESCO	United Nations Education Science Technology Innovation
UON	University of Nairobi
USA	United States of America

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ABSTRACT

Female students who develop interest in STEM courses are affected by barriers that hinder their achievements, engagement and retention in STEM. Their numbers, graduating from universities reduces as they climb the academic ladder a phenomenon referred to as the "leaky pipeline". The purpose of this study was to examine the factors influencing the retention of female students in Science Technology Engineering and Mathematics (STEM) courses, at Technical University of Kenya (TU-K). This study adopted a descriptive research design. The study was aimed at casting light on the drop-out trends of female students, the systemic factors and the socio-cultural factors influencing the retention of female students in STEM at Technical University of Kenya. A survey was conducted by distributing structured questionnaires to the students. The purpose of the interview was to get information that influence the retention of female students in STEM. Simple random sampling was then used to get a sample size of 149 female respondents who comprised of diploma and bachelor students. Purposive sampling was used to select key informants, 5 teaching staff from a sample of 13 and 5 assistant registrars from a total of 18. Through qualitative approach, the key informants' data was used in order to triangulate quantitative data from students. Data collected was analyzed using SPPS version 20.0. Analysis included the following tests: frequencies, percentages and correlation. The results were presented in tables and charts. Findings showed that majority of the respondents strongly agreed that female students in STEM courses drop out of STEM courses as compared to their male counterparts. It also noted that there was influence of systemic factors which included the institutional and student factors on retention of female students in STEM. This implies that when systemic factors are established in the favor of female students there can be improved retention of female students in STEM. The study showed that the relationship between systemic factors was important for retention of female students in STEM. The study therefore recommended that institutions should put in place targeted strategies for female students to minimize their dropout from STEM courses. Institutions offering STEM courses should put in place mentorship programs to help improve the retention of female student in STEM courses.

CHAPTER ONE: BACKGROUND OF THE STUDY

1.1 Introduction

In a globalized world, scientific novelty is very important for countries' economic competitiveness and better standards of living. Much of prospective job opportunities are based on Science, Technology, Engineering and Mathematics (STEM). STEM courses are connected to majority of technological innovation and patents; this has been proven by research based on economic progress (National Academies, 2010). It is important to recognize the factors that are essential to the retention of female students taking STEM disciplines. In future the students prove to promise a forthcoming generation with technical advancement and academic progress that is relevant and required by any nation's workforce. However, the enrolment of female students who pursue STEM careers remain limited compared to the demand. STEM human capital would improve greatly if the unexploited human resource provided by girls and women is tapped upon (Dasgupta et al, 2014).

Globally advances in technology and development in STEM disciplines are key to economic development. For instance, the United States of America relies deeply on advancement in STEM disciplines to maintain its position as a global influence and the same applies to China's rapid growth (Mitchell, 2011). To a great extent sub-Saharan Africa has experienced benefits in large number of females among college graduates in STEM disciplines. South Africa and Zimbabwe have almost achieved equality between males and females among science graduates. In Mozambique and South Africa, women make up about a third of engineering graduates; this is according to report by daily news (Odhieno, 2019). In Kenya, affirmative action has been brought forth to balance the ratio between boys and girls in education however, there is still gender disparity in STEM disciplines and low intake of female STEM students in institutions of higher learning. Female students in STEM disciplines are the minority and therefore there is need to retain them (Omukoba, 2018). Few female students enroll in STEM courses and even fewer complete their STEM studies. (Mbirianaju, 2018). It is not only sufficient to put STEM in the college curriculum but there is need to create a technical friendly context, by coming up with strategies and objectives that give opportunities to both female and male students and ensure that there is implementation by investing in resources and mechanisms to retain the students where they can take the lead (Bokova, 2014).

In Kenya the introduction of interuniversity transfers and interfaculty transfers in public universities has influenced change of courses from science-based programs to art-based by students who have been enrolled in STEM courses. More should be done by universities to support systems that ensure enrolled female students are retained in STEM (Noy et al, 2014). There are only few studies that have focused on in-depth research on factors that influence female student's retention in STEM courses (Glass et al, 2013). This calls for more in-depth studies to establish the facts that could be influencing the retention of female students in STEM courses in tertiary institutions of learning.

1.2 Statement of the Problem

In Kenya the admission of female students' in STEM courses, in the public universities is low in spite of the current promotion of girl child education, Ministry of Education gender policies and interventions. The number of female students graduating from universities with STEM certificates, diplomas and degrees reduces as they climb the academic ladder a phenomenon referred to as the "leaky pipeline" (Mbirianaju, 2018). There are fewer women than men in STEM related careers because of the leaky pipeline. Female students who develop interest in STEM courses are affected by barriers that hinder their achievements, engagement and retention in STEM. If this is allowed to continue unabated it has the potential of affecting the achievement of the sustainable development goals (SDGs) especially SDG 5 on gender equality and SDG 4 equality education. These could be due to systemic and socio-cultural reasons. Female students may face stereotypes about STEM and lack of compatibility to match with their dreams and passion which may make them shift from STEM courses (Ochanda, 2018). The male students out-number the female students in STEM courses; juggling gender roles and managing the demanding curriculums of STEM courses have been found to undermine the retention of female students in STEM courses (Stout,2014).

If the gender gap in STEM persists, the number of male students who undertake STEM courses in institutions of higher learning will increase compared to the number of female. This results to women being underrepresented in STEM fields both in college and the job market. Although there have been many campaigns on gender equality the number of female graduate students in STEM are still few. The barriers female students face in staying on in STEM fields could be due to systemic and social-cultural factors among others. The retention of female students into STEM careers will bring about gender diversity and will bring a new perspective and encourage more varied approaches of issues related to STEM. In-order for Kenya to realize the benefits of the Big 4 Agenda, which was established by government as strategies to foster economic growth and advancement and provide solutions to the socio-economic challenges facing Kenyans, Universities and Technical and Vocational Education and Training (TVET) institutions need to encourage more women to take up STEM courses. Interventions are required to ensure that female students in STEM have the support they need to continue with studies in STEM. Retention efforts are therefore inevitable in order for the intervention to be appropriate and targeted. There is need to first establish the factors that influence the retention of female students in STEM especially within TVET

institutions given that there has also been limited research conducted in retention of female students in STEM within such institutions.

The research was guided by the following questions:

i. What are the drop-out trends of female students in STEM for the period 2015- 2019 at Technical University of Kenya?
ii. What are the systemic factors that influence retention of female students in STEM at Technical University of Kenya?
iii. What are the socio-cultural factors influencing the retention of female students in STEM at Technical University of Kenya?

1.2 Research Objectives

1.2.1 General Objective

To establish factors that influence the retention of female students in Science, Technology, Engineering and Mathematics (STEM) at Technical University of Kenya.

1.2.2 Specific Objectives

i. To identify the drop-out trends of female students in STEM for the period 2015- 2019 at Technical University of Kenya.
ii. To examine the systemic factors that influence retention of female students in STEM at Technical University of Kenya.
iii. To establish the socio-cultural factors influencing the retention of female students in STEM at Technical University of Kenya.

1.2.3 Assumptions of the Study

The study was guided by the following assumptions that:

i. There is an upward drop-out trends among female students in STEM disciplines for the period 2015-2019.
ii. Institutional factors such as high student workload and inadequate mentoring programs have influence on retention of female students in STEM at Technical University of Kenya.
iii. Cultural beliefs such as patriarchal culture where men have power over women in all decision making, gender roles and stereotype negatively influence on retention of female students in STEM at Technical University of Kenya.

1.3 Justification of the Study

The findings of this study provide information that can be used to improve on the retention of female students in STEM. This would increase the chances of finding more female experts in future. The findings of the study also provided useful information to the university management, to guide them in coming up with ways of addressing the factors that influence retention of female students in STEM both at institutional and student levels. Beneficiaries of the study include the policymakers, interventionists and the academia.

1.5 Scope and Limitations of the Study

1.5.1 Scope of the Study

The study was confined to the Technical University of Kenya to establish the factors that influence the retention of female students in STEM. The variables studied included drop-out trends from the year 2015-2019, systemic factors which include institutional factors like curriculum, pedagogy, mentoring programs and academic advising. The student factors included, studying habits, time management skills, mathematics proficiency and student motivation and self-efficacy. The socio-cultural factors include the cultural beliefs like patriarchal culture, gender roles and stereotype. The study targeted diploma and bachelor students in third, fourth and fifty years who were interviewed with a sample size of one hundred and forty-nine students and key informants interview, from five teaching staff and five non-teaching staff

1.5.2 Limitations of the Study

Following the nature of the study, the following hindrances were experience. Some students and employees were reluctant to give significant information because of fear of being victimized by the administration or thought of exposing their institution to competitors. This problem was solved by assuring them of confidentiality and getting their consent before carrying out the interview. The researcher requested prior official authority from the university administration to carry out the study.

1.5.2 Definition of Terms

This section provides definitions for terms used in the project that are not common or not generally understood. It also has, common terms that have special meaning in the study.

Culture: It affects behavior and its interpretation, as it is both an individual and social construct and exists in each one at the same time and can be observed among people.

Drop outs: Students who leave their academic programs in the university and do not return back to the faculty.

Retention: The measure of students enrolled at university from previous year and continues the following year.

STEM disciplines: subjects undertaken by students pursuing courses related to sciences and applied sciences, technology, engineering and mathematics.

Social Cultural: The ways in which the society behavior, beliefs, values, norms and way of life hinder the retention of female students in STEM.

Systemic Factors: The variable in the study that contribute or inhibit the retention of female students in STEM. These factors are divided into two the institutional factors and the student factors. The institutional factors include curriculum, student workload, mentoring programs and academic advising, pedagogy and institutional environment. The student factors include mathematics proficiency, studying habits, time management skills and student motivation and self-efficacy.

Trends: Consistent behavior and characteristics of female students pursuing stem courses in universities and TVET institutions.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This section reviewed and focused on the already existing literature relevant to the overall and specific objectives of the study. It included the literature aligned to the objectives of the study which are the drop-out trends of female students in STEM, the systemic and the socio-cultural factors that influence the retention of female students in STEM.

2.2 Dropout Trends among Female Students in STEM

Female students' dropout from STEM courses for decades has been among the critical issues in institutions of higher learning. Subsequently low student retention rates should be dealt with because it has negative impact on the institutions (Aljohani, 2016). The leaky pipeline among female students begins, from secondary school through to universities. The female students tend to lack motivation and passion to pursue courses and professions in STEM therefore resulting to mass exist of bright girls who would in future experts in STEM careers (Dasgupta et al, 2014).

According to (White et al, 2016) globally females represent less than 25% of the total STEM human capital because majority of them experience hardship in progressing to climb career ladder. This challenge seems to be pronounced during the initial years when they are admitted in institutions of higher learning they experience challenges learning patterns, lack of intrinsic motivation as compared to their male peers who have the advantage of patriarchal culture. Few numbers of female role models in STEM disciplines has influenced the low self confidence among female students in STEM.

In a longitudinal study by Brainard and Carlin it was perceived that lack of passion and motivation in female students during the initial year with majority of them experiencing some challenges by the final year. Most of the female STEM students leave in their first year, this happens when they have the naïve and not exposed to academic self-confidence and have not settled into their academic major. (Dasgupta et al, 2014)

Globally, the percentage of females pursuing degrees in STEM is low. In Africa the number are

even lower, in 2010 among the STEM disciplines only one of four engineering students was female. Guinea had the least percentage of females in science at 5.8%, the countries which did implement gender mainstreaming in STEM disciplines are Lesotho 55% and Cape Verde 52.3 %. A study done by Prof. Deborah from the university of Colorado (USA) observed that in sub-Saharan Africa, the number of females who enroll in tertiary institution to take up STEM related disciplines are few, clearly showing gender insensitive in education at all levels. Cohorts of women graduate at the technical institutions range from girls to more than half, as in Namibia (58%) and South Africa (60%). The number of female students' admission into STEM disciplines had dropped significantly in Swaziland from a high of 55% in 2005 to 39 % in 2013 (UNESCO, 2013). Female students' taking STEM courses in Kenyan public universities is less than 30%/ (Mbirianjau, 2018). The percentage of female students decreases further at college level, where it is about 27.2 % (Kamotho, 2003).

According to UNESCO data (2017), the percentage of female students who select STEM related fields in higher institutes of learning is about 30%. There is need to promote the enrolment of young people in science, starting at a tender age. The opportunity to bridge the broad gap is still un locked; organizations like UN are offering sensitization of the subject and providing all they can to promote the educational experiences of female students' in STEM globally (UNESCO, 2017).

According to World Bank (1990) report in Kenya the figures of female students in STEM significantly drops at college level of learning. In spite of the effort by the government to achieve sustainable goals by making education affordable and formulating policies there is difference in gender enrolment, which widens among the female students as they move up the educational ladder with more female students enrolled at tertiary levels of Education (UNECA, 1990).

Factors that influence female students' dropping out from college include negative cultural values, teenage pregnancy, early marriages and lack of role models (Koech et al, 2017). There is a growing concern that there is under representation of females in STEM disciplines. (Sass, 2013). The levels of female students in STEM at college levels of education are low and the enrolment in STEM courses in tertiary institutions are equally low this is according to Ministry

of Education Science and Technology Policy (MOE, 2017). According to World Bank (1980) high costs is involved in education process which is a challenge to most of the poor families who find it extremely difficult to educate their children and this adversely affects the transition of female students in STEM from admission year to the next year and hence difficulty in retention. In spite of the government's effort to ensure that college students get bursary from Constituency Development Funds (CDF) the bursary equally is not reducing dropout rates in public institutes of higher learning. (Koech et al 2017).

There are other studies that have focused on factors related to female STEM students' retention in college. Past researchers have demonstrated that the females' confidence in their academic abilities drops remarkably after their enrolment in STEM courses. The drop-in enrolment generally severe in females' students as they transit from mid school level to universities (Gilligsn et al, 1991).

Kenya like most of African countries continues to encounter vast challenges in the mainstreaming gender in primary, secondary and higher learning institutions. Investigation into the low achievement in equality of STEM has been blamed on barriers such as low living standards, financial constraints, and lack of motivation from students, unqualified or undertrained teachers and frequent university strikes. To address the gap in STEM then decisive action to encourage the uptake of STEM subjects from an early age by showing students their significance and bright career prospects should be established (Rajput, 2019).

2.3 Systemic Factors that Influence Retention of Female Student in STEM

2.3.1 Institutional Factors:

2.3.1.1 Curriculum

According to Mitchell, (2016) the reasons for few studies on STEM education is because STEM curriculum at undergraduate level are developed with less involvement of stakeholders and therefore contribute to a lack of undergraduate mentoring programs on female students in STEM. Drop out of female student's in STEM include several factors such as an elaborate and intensive curriculum, high marks, assimilation of context and the time spent in studies. In spite of many reasons that promote student retention, one of the factors used that are more effective is the

entrance continuous assessment tests (Anastasia, 2005). In Kenya the high school grades cannot actually provide accurate basis for retention because in the recent days there has been reports of exam cheatings in high schools (MOE, 2019) Curriculums in STEM disciplines are constantly reviewed (Sithole et al, 2016). Female students in STEM who went through intensive style of learning in high school have achieved the retention of the female students in STEM (Mitchell, 2016). Female students in STEM encounter difficulties such as lack of focus on study, balancing their life also trying to juggle society expectations, gender roles, time management in addition to financial constraints (Mitchell, 2016). For a rapid socio-economic transformation there is need for workforce with STEM background from elaborate and rigor TVET programs. TVET programs provide stable fundamental trainings that ensure STEM competencies and skills for enormous cohorts of students (NASDCTE, 2013).

2.3.1.2 Institutional Environment

In order to achieve retention results the institutions of learning should ensure that the admission criteria and the context of learning are compatible (Thayer, 2000). Involving stakeholders in STEM professions to give guidance on careers, continuous assessment tests, mentoring programs, psychology guidance, training, common skills development and positive study habits should purposely be included in programs in order to successful achieve retention. Working as a team between academic and administrative staff members in institutional activities has positive possibility for achieving effectiveness of the institutional programs. Institutional commitment and support are very important in the university leadership. Strong institutional commitment results to their increase in STEM disciplines it also broadens involvement in STEM innovative practices and achieving of the female students in STEM disciplines. (Blackburn, 2017) Kenya vision 2030 is attached to Science Technology and Innovation (ST&I) which is a state establishment upon which holds the country's political, social and economic fabric (STI, 2016).

2.3.1.3 Student Course Load

It has been proven that generally STEM courses deny their students enough time for social activities (Sithole et al, 2017). The variance in grades could be a determining factor to female STEM dropouts or switch-outs.

2.3.1.4 Mentoring Programs and Academic Advising

Female student's triumph in STEM disciplines can be achieved through mentoring as this has been established as an effective mechanism. When less experienced persons (mentee) are assisted to grow in character and professionally by transferring knowledge from more experienced persons or expertise in a field the relationship is pedagogical and is mentoring. (Crumpton-Young, 2014). Levey (2016) reports that female students' taking STEM prefer women mentors as their approach of mentoring is different from that of male students.

According to a study by Blackburn (2017) Female STEM role models are more likely to influence female college students in STEM to persist and eventually be retained in STEM disciplines. Student advising process is key in instilling confidence among female STEM students. Success in student's can be achieved through the process which include integration of curriculum that accommodates life objectives, and involvement of non-academic or extra-curricular activities (Sithole et al, 2017).

The approach of academic advising is complex therefore, each student requires personal attention in advising that is tailor made to suit their needs. Given the variations, then there should be establishment of committee that can be used to address unique situations of female students in STEM disciplines (Mitchell, 2016). According to the Center on Education and Work (2008) studies carried out on retention indicate that motivating female students is necessary as this would improve their ability to climb their career ladder to further their studies. Providing the requirements to instill positive attitude, dealing with students' academic and career expectation, address their challenges and create a favorable context to all STEM students to excel in their studies. Peers influence female students to take up STEM disciplines. Peer pressure seeking not to be rejected is the main concern in female students in STEM. Among girls, friends' interest influences female's pursuit of STEM disciplines. Female students' decisions to take up STEM disciplines are linked to their friends either taking STEM courses or those who had previously taken the courses. Specifically, female's graduate decision to major in STEM disciplines are projected by success of the performance of previous year's female students this was a research done by National representative (Riegle et al 2006). Exchange of ideas, prepare students to

justify their own positions and expand their ways of reasoning. This collaboration is important because it increase their self-confidence, mastery of their fields and eventually successful completion (Dasgupta et al, 2014).

Successful professional development should be embraced by having opportunities to relate with models and mentors advices. Young professionals identify with celebrities female role models whose interaction allows them to think. Faculty STEM departments have few female role models that the female students can engage with. When STEM professors are female, their presence in class room has clear benefits for female students taking college courses in STEM this effect increase their intentions to pursue STEM courses. STEM departments in colleges should come up with programs that assist to foster ownership of STEM among female students and motivate them to attend different conferences and professional bodies in science which invest in students retention and success (Dasgupta et al, 2014).

UNESCO Nairobi office and its partners, in education sector and state parastatal like and the National Commission for Science Technology and Innovation (NACOSTI) and the University of Nairobi (UoN) organized a mentoring workshop on STEM for high school girls in order to raise their interest in scientific, engineering and technological courses and to also nurture them as Kenya's future female scientists' engineers and technologists. (UNESCO, 2014). Universities should brace career guidance for female students pursuing STEM disciplines. The Government also should support existing policy mediations, which begins at basic levels of education (Mbirianaju, 2018). Retention rate can be looked at in the following ways between parallel students or self-sponsored students and government sponsored students. Retention rate is typically measured on a year-to- year basis. (Levitz, 2008)

2.3.1.5 Pedagogy

In order to increase attendance in STEM courses some of the courses can be merged to increase student performance, perceptions and attitude towards STEM disciplines (Riffell et al, 2006). Education and Learning are dynamic, knowledge changes according to changes according to advancement of technology and context; it is therefore influenced by the instruments of technology and innovation available to a given society. The interpretation of knowledge is

guided by the society context and the culture of the people, this is not exception to scientific knowledge. Although facts are always the same but the way they are culturally interpreted would differ. As technology advance overtime globally, education therefore can no longer continue with medieval ways of teaching. The education sector must adjust the pedagogical approaches to meet the fast modifications as they occur. It is important to accept the realistic fact that society changes including the students of today. In this reality a number of pedagogical approaches should be devised to motivate STEM students including virtual learning by use of smart phones, internet and Apps (Sithole et al, 2016).

According to Kuh et al (1988) institutional behavior dictates and is compatible with the legitimate responsibility in educational surroundings. The young professionals integration to university context often called student engagement and student involvement in campus is key factor in student persistent (Cater, 2006). Female students are attracted to activities related to STEM that are social in nature and are organized around innovations that solve real world challenges. Gender parity is key when organizing teamwork for extra curriculum projects that involve girls in STEM, since most of them are eager to participate where the majority are females (Dasgupta et al, 2014).

2.3.2 Students Factors:

2.3.2.1 Mathematics Proficiency

Female students in STEM need high mathematics proficiency. Attitude among female students in STEM disciplines is important when the students are preparing to attend learning lessons in specific disciplines for example mathematics. All STEM courses require basic skills in mathematics and numerical manipulation which leads to either increase in confidence or lack of interest which leads to failure. Mathematics proficiency requires interest in analytical skills and mastery in the interpretation and application of mathematics concepts (Sithole et al, 2016).

2.3.2.2 Studying Habits

The study habits that students develop eventually influence their interest towards STEM. Research has proven that motivated students apply positive study habits and better academic performance (Stineberikner, 2007). Studying for STEM disciplines differs from studying from

non-STEM disciplines because the studies requires longer study periods than non-STEM courses due to practical lessons and research commitments (Sithole et al, 2016).

The ability of a female student to deal with STEM courses is compatible to their attitudes. Female students should be encouraged to have positive attitude as this would enhance their efforts and ability to perform well in STEM courses (Mitchell, 2016). An essential feature of female retention in STEM is to ensure that the students qualify for graduation and obtain the required points. Because of this institutions of higher learning have set up programs that promote female students in STEM to be successful. Some of the programs include, exchange programs, seminars, and mentoring programs.

2.3.2.3 Time Management Skills

Managing time is one of the vital role of determining the attitude of female students towards the STEM disciplines. The practical lessons, investigations and dissertation writing consume more time of the learners and therefore reduce time for theory classes' also extracurricular activities. Most of the students have challenge to balance time, yet STEM courses require even more time in order to achieve good grades (Sithole et al, 2016).

2.3.2.4 Student Motivation and Self-Efficacy

Female STEM students require encouragement, guidance and challenges, although others are naturally enthusiastic about the learning process. There are dual main principles of motivation founded on the ideology for accomplishing any given task: intrinsic motivation and extrinsic motivation. Intrinsic motivation refers to doing something because of inherent interest the motivation here is "interest" while motivation from external sources refers to finishing assignment for benefit (Ryan et al, 2000).

According to Tinto 1987 retention involves students' admission into institutions of higher learning and they are integrated into the ongoing academic life of their institutions and also the social life. Retention entails the integration, which is involving the student as a qualified individual and society and in the academic context (Mitchell, 2016). The ability of students to be confident and attain good grades in STEM related courses and activities could be referred to as self-efficacy. Past studies on high rate of retention among female undergraduate students in

STEM has been linked to positive attitude. Female students in STEM with positive attitude and have the passion for science related activities tend to have self- efficacy, because of the time and effort they apply to STEM activities. Student accomplishment and engagement in science requires self-efficacy as this increases their prime focus of science educators (Morrow, 2018).

According to Lent et al (1984) investigation conducted to determine the association of self-efficacy theories as it relates to STEM students developed learners who are focused achieved better grades and are retained compared to those who do not focus in technical or scientific major over a period of a year. According to Tinto (1993) the institution plays an important role in student retention. While recruiting students' institutions must have the intention to retain them, this process requires academic goals set by the faculties and expectations of the prospective students. There should, therefore be compatibility between the students' expectation and academic goals with those of the institutions intention and objectives. The institutions in addition should provide facilities, courses and products deemed vital to create a context conducive to student progress and success (Mitchell, 2016) Female students connect theory class experiences with their personal goals and this makes for them makes the course more meaningful (Gentry et al 2004). STEM courses taught from applied science attract female students in STEM as they are interested in courses taught from applied perspective than boys. This is supported by personal obligation to study responsibly, enhance motivation, attention learning and duty identification (Geist et al 2008).

2.4 Socio-Cultural Factors Influencing the Retention of Female Student in STEM

2.4.1 Cultural Beliefs

Culture affects behavior and its interpretation, as it is both an individual and social construct and exists in each one at the same time and can be observed among people (Taylor, 1958). When it comes to choices and decision making then educated women have a wide range because they have advantage of great autonomy. Opportunity to educated female results to progress in their ability to excel in STEM studies because this is essential to acquire knowledge, exposure to issues globally and innovation helps them to handle issues in a positive way (Kabeer, 2003).

Female students in STEM face challenges caused by culture. There are others that are caused by

the socio-economic and the environmental factors. The Ministry of Education Science and Technology (MOEST, 1988) reported that identified reasons for female students' to completing their studies in Kenya include girls getting married while too young, unwanted pregnancy, lack of gender mainstreaming, low confidence, lack of income and the society not appreciating education of girl child.

2.4.2 Patriarchal Cultures

Patriarchal culture where men have power control over women in all decision making is also to be blamed on the challenges that female students in STEM face. Usually females are culturally socialized to be submissive (Kapur, 2018). There are parents with a view that educating female children is not necessary because they would eventually be married and it would benefit the families they are married to. The female students in STEM from these cultural backgrounds cannot participate in advancement of society and train for careers because they are restricted by traditional norms. Female students in many communities are not allowed to go to school and are made to perform domestic chores since their cultures do not value the education of girls (Kinyatti, 1987).

An assessment of equality in Science, Technology and Innovation (STI) that seek to determine how Kenyan women participate in improving their social, economic and exposure to the fast changes in technology and innovation which has resulted to culture change has revealed that Kenyan women are still pushed away from holding senior positions in management or critical decision making positions. They are also not able to acquire higher levels of education as there are blocks that exist in spite of the significant achievement towards gender mainstreaming. The challenges are institutionally, structurally and culturally embedded (Natasha et al, 2016).

2.4.3 Discrimination and Negative Attitudes

Traditional values and beliefs influence the decision to pursue STEM education to females. Formal learning are not meant for females, as they will not be able to utilize their education, skills and abilities in an effective manner in any area (Gitonga, 2009). Kenya has achieved extra progress in the education of female in STEM compared to other East African countries (Berg-Schlosser, 1984). Although this is so female students in STEM still face challenges in pursuing

trainings. Discrimination of female students in STEM access to education persists in many cultures. The difficulties in education begin from families. The communities perceive female students in STEM in a different manner as compared to male counterparts. Male students in STEM are considered more intelligent, proficient, skilled and responsible and within the society as compared to female (Kanyitti, 1987).

Low participation of female student in Science Technology and Innovation was highlighted in 1976 when the National Commission on Education Objective and Policies reported that in Kenya the majority of women did not take up science fields in their careers. The UNESCO conference on higher education in the 21st century held in Paris in 1998 stressed the need for women to have opportunities to higher education especially in areas of science and technology. According to UNESCO Gender and Science Progamme Specialist, "young children can absorb and be influenced by gender stereotypes, and these can be detrimental in creating social barriers." Culture change in learning context, gender disparity and stereotype in society for a long time has been described as a stumbling block to women progress in STEM (Ochanda, 2018).

2.4.4 Early and Forced Marriages

Forcing children into organized marriage by parents is a predominant practice with majority of societies around the globe. The existing practice of early and child marriage is entrenched in the firm societal cultures and is used to serves to strengthen patriarchal culture, gender disparity and power structures. Early marriages deny female students who would otherwise take up STEM disciplines to continue with their studies. More generally, this practice supports the inequalities between men and women and amongst people in all spheres of socio-economic backgrounds (Kapur, 2018). Female Genital Mutilation (FGM) has resulted to loss of potential female students in STEM to drop out of training institutions because of initiation rite. Most of the girls are exposed to diseases like HIV and other infections because of the instruments used to perform this surgery are rarely cleaned. Once a girl has been made to undergo the FGM then they are married off and this affects their education because they have to drop out of trainings (Ouma, 2013).

2.4.5 Gender Roles

Gender roles stereotypes conflict with STEM retention of female students. Gender roles and societal expectations are learnt in early childhood (Eccles et al 1990). Roles that female undertake nurture the girls to be "social and helpful" they are encouraged to specialize in taking care of children and family and concentrate towards activities that emphasize interpersonal relationships. (Dasgupta et al, 2014) Parents' socialization has effect on female students. The parents should encourage their children to take up STEM related disciplines, since this would result into retention of female student science fields. (Simpkins et al, 2006)

2.4.6 Financial Constraints

The nature of financial aid received by the female student's in STEM influences their retention for instance the HELB Loan offered to students' supports the students to finish their studies. The financial implication on education, is a fundamental reason leading to drop-out of female students in STEM discipline because they are relatively higher as compared to art-based courses. It is impossible for the parents and guardians to pay fees when they face financial difficulties. (Berg-Schlosser, 1984) Poverty and financial constraints are challenges in training of many students. Female students in STEM because of the patriarchal cultures in different ethnic groups are vulnerable and hence victims of college drop-out. They are therefore forced to drop out of school or not to acquire the education at all (Kapur, 2018). Lack of financial support among female students in STEM negatively associate with retention of the students in STEM (Gitonga, 2009).

2.4.7 Stereotype

Access to education is paramount challenge to majority of students this worse in girls because they can neither realize their achievement and accomplish their dreams. Female students in STEM are made to feel lower; their position is downgraded as and they are considered as less important than the male students. Female student who are not interested and enthusiastic to take courses that are mostly taken by male students, for example science courses are not endeavor to outperform them boys in anything. (Gitonga, 2009). The female students who are particularly taking in STEM fields should be supported so that they can be retained and take up careers in those fields**.** (Mbirianjau, 2016). Once girls develop interest in STEM disciplines, they are bombard with

blocks that affect their retention and advancement some of the blocks include information suggesting that they do not belong to STEM careers. Doubts about belonging in turn, hinders the female student's success, active participation, and retention in STEM by questioning their ability interests and aspiration if they are compatible with STEM (Dasgupta et al,2014).

Reducing the leaky pipeline of female student in STEM include exchange forums where the female students would freely interact with their peers, and experts who would guide them, these would motivate them and enable them to own their courses. Such programs acts as "social vaccine" that prevents female students in STEM from losing up in their journey to achieve their career choice and overcome challenges associated with STEM (Dasgupta et al, 2014).

2.5 Theoretical Framework

This study was based on two theories namely student retention theory and and Caroline Moser theory.

2.5.1 Student Retention Theory (1993)

Vincent Tinto developed this theory; he theorized that students not to dropout from their studies and eventually acquire their awards, they have to be integrated into their learning context both in academic matters and socially. In addition, they should be committed to the institution system (Tinto, 2007). Lack of capability by students to solve their academic and personal challenges, academic difficulties and inability to cope with scholarly and community life of the institution are the three key reasons for student dropout that the theory points out. The students therefore, should incorporate those areas in academics. According to Tinto (1993) when handling issues of dropout and working towards retention of students in institutions, the institutions should incorporate the students and not to define dropout in a manner that cannot be understood to the student affected. The whole process should be agreeable to the students. When institutions are coming up with a retention policy they should focus on the objectives and strategies that not only retain the students but also recruit students whose goals march with those of the institution. Tinto theory establishes that when there is intensification in communal and school amalgamation would promote retention and motivate students'. Students admitted to institutions of higher learning are made to learn their new context. In second level the students are in "transition" towards completion of incorporation stage and they are accustomed to the new context. After positively adopting the new norms and culture in their present context finally, the students become integrated in to the new community in a learning environment (Aljohani, 2016). Tinto 1993 explains that students admitted to college have to "separate" by coming out from their old shells to allow them adopt to the norm and behavior of their new environment. Effective retention involves institutional commitment to students. The institutions should put the student welfare ahead of other institutional goals. This theory is applicable to the study objective on trends of dropout among students; it explains the reasons behind the dropouts.

2.5.3 Caroline Moser Framework (1980)

Caroline Moser developed this framework in the early 1980s. The basic proponent of the approach seeks to explore importance of gender relations and how they lead to differential access to and control of resources. In this study cultural factor affects the retention of female students in STEM. The theory therefore helps to identify the gender roles, assess the gender needs and how the two factors control decision making within communities. The theory focuses on two main concepts, the women's triple role and the gender needs assessment. Women are over-burdened by roles of society and that affect their productivity. Women's triple role refers to reproductive roles, productive role and the role of community management. Women are burdened by unequal share of unpaid domestic labour, they are undervalued for the contributions they make in the personal and professional aspects and they suffer discrimination and unequal opportunity and this affects their productivity and hence balancing the triple roles assigned by the cultures and STEM.

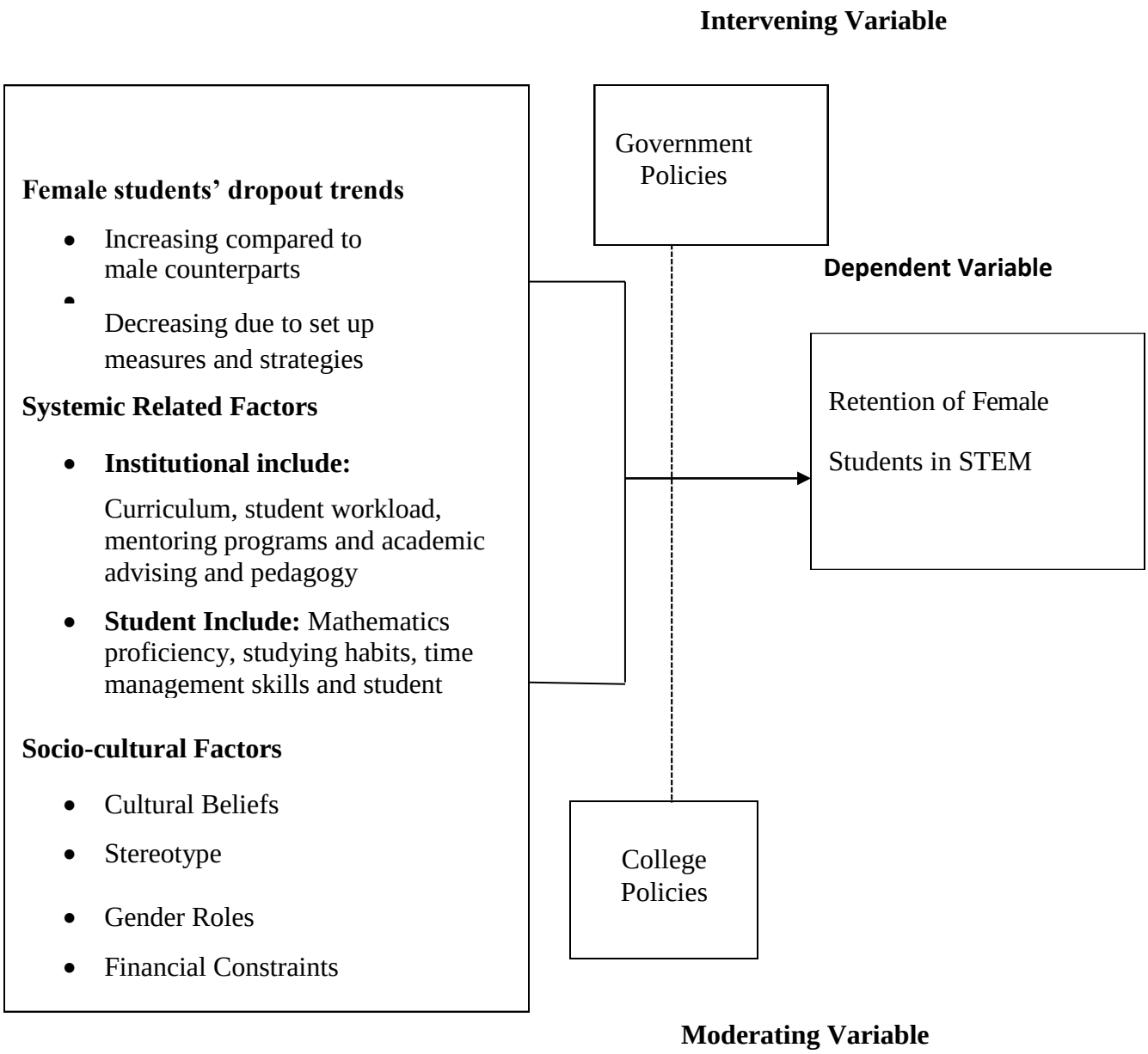
2.5.4 Conclusion

The two theories support the retention of female students in STEM. When students are integrated into their context both in academic matters and socially, eventually these prevent drop-out from their studies. This is supported by the student retention theory. The theory seeks to explain the major variable of the study and the relationships in the factors influencing the retention of female students in Science, Technology, Engineering and Mathematics (STEM) courses. These factors affected by the student background, academic, co-curriculum activities and socio-economic status of the student they influence retention of students into STEM disciplines. (White et al, 2016). The Caroline Moser framework also explains the socio-cultural factors that empower the female students and motivate them to adopt the academic context, women are undervalued for the contributions they make in the personal and professional aspects and they suffer discrimination and unequal opportunity. The three theories are relevant to the study because they explain the relationship between students, faculties, academic context and social factors that influence the retention of female students in STEM courses.

2.6 Conceptual Framework

Fig 2.1 below clearly illustrates the relationship that exists among the variables that influence the retention of female students in STEM.

Fig 2.1 Conceptual Framework



Source: Author (2020)

CHAPTER THREE: METHODOLOGY

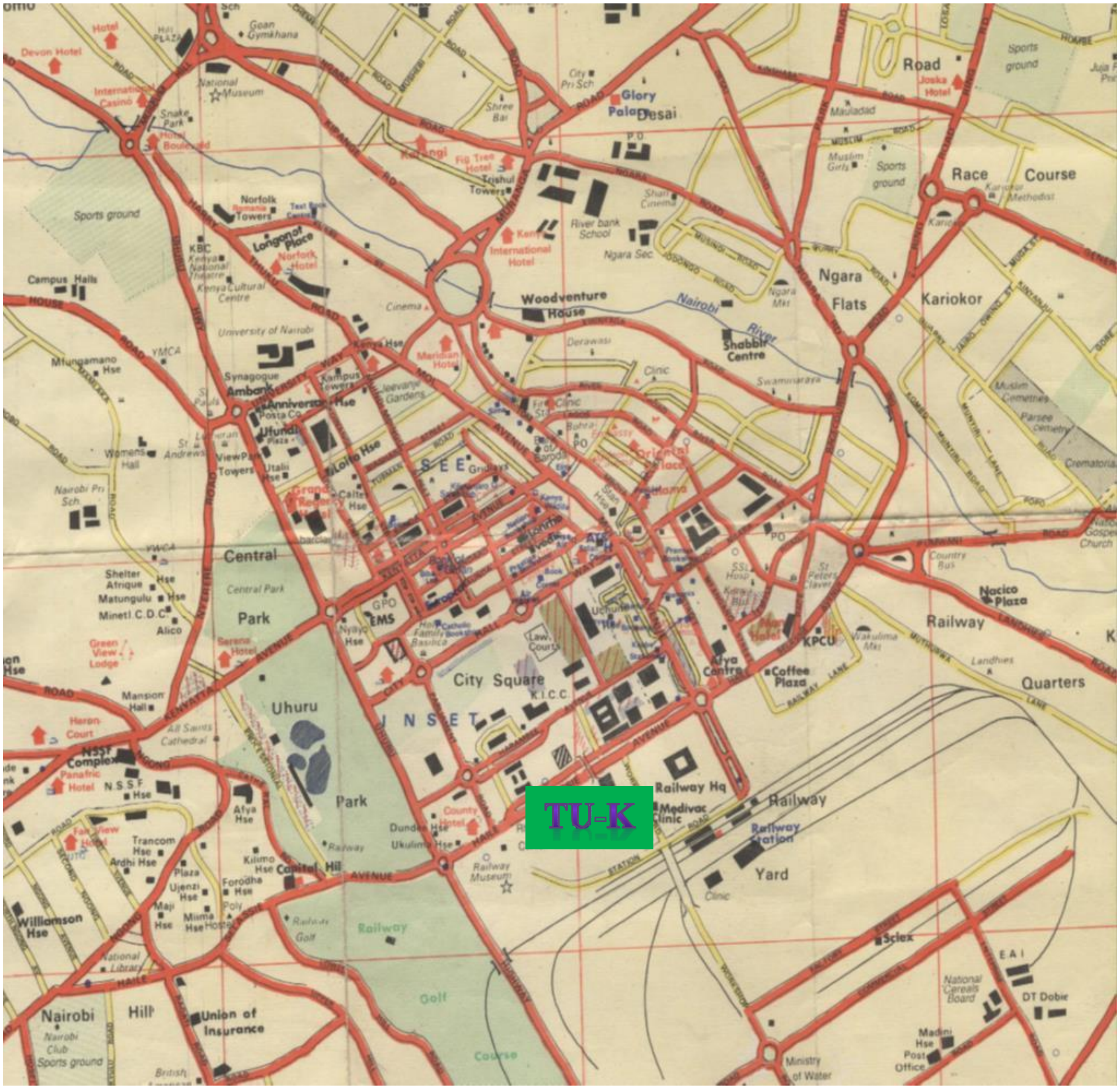
3.1 Introduction

This chapter gives details of the research design that presents, the methodology used to achieve the objectives of the study which was used to investigate the trends of drop out of female students in STEM and critically examine the systemic related and socio-cultural factors that influence the retention of female students in STEM. It is divided into sections namely, research site, research design, study population, sample population, data collection and methods of data analysis.

3.1.1 Research Site

The study was carried out in Technical University of Kenya (TU-K) which in the Central Business District (CBD), in Nairobi County. The Technical University of Kenya (TU-K) aims to facilitate education, training and research in Science, Engineering and Technology (SET) and create an enabling environment for research innovations which are relevant to national socio-economic development. The choice of study at the Technical University of Kenya is because the institution has an outstanding out record in offering STEM training at diploma, graduates and post-graduate levels. TU-K received its charter as a university. This was after the University had gone through a major transition from a Polytechnic to a University College and to its current state as a Technical University. As Kenya Polytechnic University College (KPUC), it was initially established as a technical institution under the name Kenya Polytechnic in 1960, to take up the role of the Royal Technical College that had been elevated to become the present-day University of Nairobi. Over the years, the Polytechnic had experienced great expansion in student enrollment. The university is established as a training institution for middle level manpower in the country. It offers Technical and Vocational Education and Training (TVET) programmes which are STEM based. It has three faculties; the Faculty of Engineering and Built Environment (FEBE), Faculty of Applied Sciences and Technology (FAST) and the Faculty of Social Sciences and Technology (FSST). The university has an average admission of 6,100 students yearly both module I and II. The number of male students' admission is usually higher compared to the female students. All the faculties are science based and hence the relevance of this study.

3.1 Map of Nairobi County



Technical University of Kenya

Source: Survey of Kenya (2013)

3.2 Research Design

This study adopted a descriptive research design aimed to highlight drop-out trends of female students, the systemic related factors that influence retention and the socio-cultural factors influencing the retention of female students in STEM at Technical University of Kenya. A survey was conducted by distributing structured questionnaires to the students. The aim was to obtain the dropout trends among female students, the systemic factors and socio-cultural factors that influence the retention of female students in STEM at Technical university of Kenya. The key informant interviews were conducted with the teaching staff and the assistant registrars from all faculties. The purpose of the interview was to get information describing, the dependent variable which is factors that influence the retention of female students in STEM. Quantitative and qualitative methods of data collection were used to get information from the study sample, specifically a survey and key informant interviews were used to establish the factors that influence the retention of female students in STEM.

3.3 Study Population and Unit of Analysis

3.3.1 Study Population

The total target population for the study was 269 it constituted female students in STEM, 13 teaching staff and 18 non-teaching staff in administrative positions in STEM from 3 faculties. Technical University of Kenya has 18 assistant registrars; 8 assistant registrars from faculties. The assistant registrars are the administrative staff from the schools and their involvement in the study was important to triangulate the quantitative findings. The unit of analysis therefore was individual diploma and bachelor female students in STEM. The quantitative data collated was analyzed using descriptive statistics while the key informant interviews were analyzed thematically.

3.4 Sample Population

The study sample was 149 female respondents, 5 tutors and 5 assistant registrars.

$$n = \frac{N}{1 + N(e)^2}$$

238/1+238 (0.05^2)

238/1.595= 149

n= is the required sample size

N= is the targeted sample size

e^2= error limit (0.0025)

Substituting N in the above formula gives a sample size of 149 respondents.

3.5 Sampling Procedures

Table 3.5 Students Target Population

Distribution of Students Target Population			
Course	**Engineering**	**Applied Sciences**	**Social Sciences**
Diploma	68	53	16
Bachelor	57	46	29
Total per Faculty	125	99	45
Target Population	**269**		

To get study subjects from the target population, Yamane (1967) formula was used to determine the sample size of 149 female respondents, then, purposive sampling used to select 5 teaching staff from a total of 13 and 5 assistant registrars from a total of 18. The total sample was therefore 159 participants. The students in STEM were selected without bias from the target population. Students pursuing diploma and bachelors program made up the strata of the target population. To have proportional representation from each stratum in all the learning programs, Faculties of (Engineering, Applied Sciences and Social Sciences), a sample was drawn independently in the same ratio so as to have similar percentage of each total. Simple random sampling was then used to ensure that each element in each stratum has equal probability to be selected for the study. Pieces of papers was written numbers equal to the elements in each stratum then random numbers selected up until the required numbers was reached as shown in the proportional allocation for each category. This process was repeated until sample from each category is selected.

Table 3.5.1 Student Sample Population

Distribution of Students Sample Population						
Course	**FEBE N**	**FEBE n (nxN1)/N**	**FAST N**	**FAST n (nxN1)/N**	**FSST N**	**FSST n (nxN1)/N**
Diploma	68	38	53	29	16	9
Bachelor	57	32	46	25	29	16
Total per Faculty	125	**70**	99	**54**	45	**25**
Sample Population 149						

3.6 Data Collection Methods

3.6.1 Survey

A questionnaire (Appendix II) was developed and was administered to 149 study respondents with the help of class representatives as the research assistants. The questionnaires contained both open and closed ended questions and was designed to address the objectives of the study. The open ended questions allowed the respondents to communicate their views freely without being forced to fit within the answers. The study employed a variety of interviewing techniques. These enabled the researcher to acquire information on the dropout trends among the female students and at the same time explore the views on systemic and socio-cultural factors that affect the retention of female students. Data was collected using structured questionnaires in order to ensure uniformity in response and to encourage participation. Key informant interviews using face to face individual interviews were conducted for the teaching and non-teaching staff.

3.6.2 Structured Interviews

The questionnaire was kept short, the questions were structured and closed-ended; the interviews involved questions on demographic data and ranking questions related to the theme of the study which is factors that influenced the retention of female students in STEM. It covered the dropout trends of female students in STEM for the period 2015-2019 and the systemic and socio-cultural factors that influenced the retention of female students in STEM. A sample of 149 students undertaking STEM courses was selected for the interview from all the faculties. The researcher obtained an authority letter from the University to collect data. The researcher distributed the questionnaires to the respondents with the help of class representatives as the research assistant and allowed the respondents time to fill the questionnaires and pick them after one week.

3.6.3 Key Informants Interview

The Key Informants Interviews (KIIs) target informants considered knowledgeable about students and faculties. These included 5 teaching staff from three faculties and 5 assistant registrars from none teaching staff. The face to face interview involved experience and opinion open-ended questions. They provided additional information on the relationship between the students' retention and dropout trends among female student in STEM courses in the period 2015 to 2019, systemic and socio cultural factors that affect the retention of female students in STEM. The researcher purposively identified informants who were teaching staff and assistant Registrars in STEM faculties were interviewed.

- Teaching Staff - The informants were picked from all schools; the interview was able to subjectively evaluate the experience captured in the theme of the study. One teaching staff from each school in the faculty was interviewed.
- Assistant Registrars - The researcher secured appointment for the interviews. The questions involved included experience and opinion questions these questions focused on the theme and helped to come up with valid analysis of the study. The researcher appreciated that face-to-face interview gave an opportunity for the researcher to create a good rapport with the informant and therefore obtained all necessary information and did follow up questions whenever there was need. It also gave an opportunity to read the non-verbal communication and destructions were minimized. This type of data collection was flexible in terms of time and location since it was easier for the researcher set up anywhere to conduct the interview.

3.7 Methods of Data Analysis

The quantitative data collected from the questionnaires was cleaned and checked for consistency. All questionnaires were adequately checked for reliability and verification. The cleaned data was entered into and analyzed using the Statistical Package for Social Science (SPSS) version 20.0 The computed data was then presented using descriptive statistics including frequencies, percentages and correlation. The data were coded and tabulated and kept into frequencies the researcher involved the use of diagrams such as tables and charts The qualitative data collected from the Key Informants was transcribed and checked for clarity and completeness. The data was then sorted according to the objectives of the study. In analyzing the qualitative data, the

purpose of the evaluation and what the study was intended to achieve was reviewed. These questions helped the researcher to decide how to begin data analysis thereafter key informant interviews were coded and analyzed.

3.8 Ethical Considerations

Ethical considerations are the moral principles guiding research, from interpretation through to completion and publication of results and beyond. According to Mugenda and Mugenda (2003) when a researcher embarks on data collection exercise it is important to ensure that all ethical considerations are followed to the letter. As an ethical consideration in research, the researcher asked for official authority from the Technical University Administration to carry out the research. The respondents were given information about the study and their voluntary participation sought. The researcher requested the respondents to sign the consent form and they were assured of anonymity. The information obtained was kept and used for academic purposes only.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

4.1 Introduction

This Chapter focuses on the respondent's perspectives on the factors influencing the retention of female students in Science, Technology, Engineering and Mathematics (STEM) courses, at the Technical University of Kenya. The study was guided by the following objectives: Firstly, to identify the drop-out trends of female students in STEM for the period 2015- 2019 at Technical University of Kenya, secondly, to examine the systemic related factors that influence retention of female students in STEM at Technical University of Kenya and lastly to establish the socio-cultural factors influencing the retention of female students in STEM at Technical University of Kenya. The study had 100% response rate in terms of questionnaires that the respondents returned after follow-up calls to the participants reminding them about the questionnaires.

4.2 Background Information on Respondents

4.2.1 Demographic Characteristics

A total of 149 female respondents were recruited into the study, given the scope of the study and were interviewed using the survey. Among the participants were five teaching staff and five assistant registrars whose qualitative data were interviewed to triangulate the quantitative data from students. The study was first interested in assessing background characteristics of participants, therefore the researcher sort to check on the distribution of participant's age and marital status and the current year of study.

4.2.1.1 Age of the respondents

The age group in years was indicated by the respondents. In this study individuals age was not a consideration to the selection of respondents. The reason for indication for age was to ascertain that respondents were normally distributed.

The research findings on age of participants indicate that 25 (16.8%) of the respondents were between ages 17 and 20 years; 95 (63.8%) between ages 21 and 25 years; 29 (19.5%) of the respondents were above 26 years. The respondents were between the age of 21 and 25 years, this result projected that they were the most in numbers. This results show that a large number of the respondents which was at 63.8% had an average ages of between 21-25 years. The reason for this is because they were in their third, fourth and fifth years of studies and this are the average ages.

Table 4.2 Age of the respondents

Age	Frequency	Percent	Valid Percent	Cumulative Percent
17-20 years	25	8.4	16.8	16.8
21-25 years	95	31.9	63.8	80.0
26 years and above	29	9.7	19.5	100.0
TOTAL	**149**	**50.0**	**100.0**	

The research findings on marital status of participants indicated that 24 (16.1%) of the respondents were married while 125 (83.9%) were unmarried. This result indicates that most of the respondents were single. This was because most of the respondents were module I students and they were young fresh from high school unlike majority of module II students are working class who are working class and probably most of them are married.

Table 4.2.1 Marital status of the respondents

Status - Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Married	24	8.1	16.1	16.1
Single	125	41.9	83.9	100.0
Total	**149**	**50.0**	**100.0**	

Table 4.2.2 shows that out of 149 female participants, 80 (54%) were in 3rd year. 41 (27%) were in forth year, 19 (13%) of the participants were in 5th year while 9 (6%) of the participants were in greater than 5th year. This results implies that majority of the participants which was 80 (54%) were in third year. Also, the results gives a snapshot of drop out of female students whereby, the number of students keeps going down from 3rd year with the largest number of students to 5th year with the least number of students.

Table 4.2.1.1 Current year of study for the respondents

Year of Study Valid	Frequency	Percent	Valid Percent	Cumulative Percent
3rd	80	26.8	53.7	53.7
4th	41	13.8	27.5	81.2
5th	19	6.4	12.8	94.0
Other (> 5th year)	9	3.0	6.0	100.0
Total	**149**	**50.0**	**100.0**	

4.2.2 Attractiveness of STEM to female students

Respondents were asked whether or not STEM course was attractive to female students. The results showed that out of 149 participants who respondents, 119 (80%) said that STEM course was not attractive to female students while 30 (20%) said that STEM course was actually attractive to female students as shown in table 4.2.2.1

Table 4.2.2.1 STEM Attractiveness of STEM to female students

Attractiveness Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	30	10.1	20.1	20.1
No	119	39.9	79.9	100.0
Total	**149**	**50.0**	**100.0**	

The quest to comprehend why people behave as they do is derived from the study of motivation. This can also be referred as "the reasons underlying behavior" (Chanal et al. 2010). Motivation has multiple theories. My study supports what Maslow argues on factors of motivation, (Maslow, 1943), deal with people necessity and ambitions which motivate them. Why and how motivation happens is elaborated by the process theories such as expectancy theory by Vroom (1964) and also the equity theory explained by Adams (1963). A study conducted by Talley et al, (2017) survey carried out in three years and studied one thousand students observing the students and their context and how this indicators reflected upon the resulting academic performance that was determined by the aim in longitudinal regulation. The final success and retention of students in STEM is determined by their ambitions in relation to their context and how they easily adopt to their environment. The finding in this study is supported by the hypothesis that female students align their goals to the context of STEM

academic learning, and this adaptation influences their performance and ultimately their success and persistence in STEM. The study applied a mixed methods research approach and was used to collect student perceptions related to interest and motivation by collecting data through the use of questionnaires and conducting focus groups. Results indicated that female students that show early interest in STEM activities and family socializing behavior as ones that contributed the most towards influencing their interest in STEM and motivated them to persist in their studies and pathways as future STEM professionals. My study puts a more specific context to the results of Talley et al (2017) by agreeing with their findings and stating as shown in figure 4.2 that found peer pressure and career talks as the main motivators to female students towards pursuing STEM course.

4.2.3 Motivation

Motivation behind the pursuance of the STEM course was a question asked to the respondents. Several factors as shown in figure 4.2 were cited to have motivated the participants to pursue a STEM course.

The chart shows that majority 43 (86%) of female students joined the course because of the cut-off points, followed by family influence 39(78%), peer pressure 32(64%) and career talks 23(46%). This results also shows that female students did not have interest in STEM course hence interest was not a motivating factor for them to join the courses the results also pointed out to the lack of mentors at 3(6%) and role models at 3(6%) as motivators.

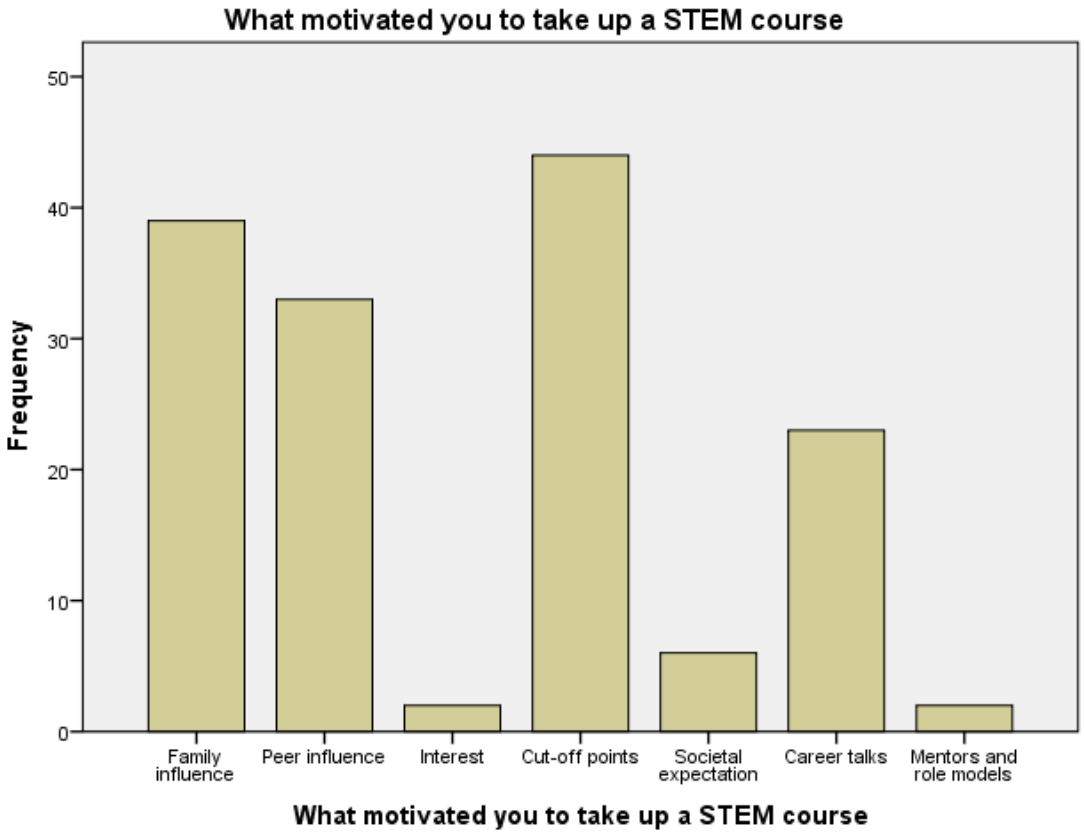


Figure 4.2 Motivation for STEM course

4.3 Dropout trends of female students in STEM for the period 2015-2019 at Technical University of Kenya

The first objective of the study that sought to establish the drop-out trends of female students in STEM for the period 2015-2019 at Technical University of Kenya. Participants were asked to rate the extend in whether they agreed or disagreed with the following three statements: Firstly, female students in STEM courses have high trending to drop-out as compared to their male counterparts, secondly the institution has set up measure and strategies that ensure there are effective practices to prevent female students in STEM from dropping out of college and thirdly, there are relationships among female students in STEM and their demographic characteristics which influence drop-out trends among them. Participants were required to rate the responses in the scale of 1. Strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree.

The first statement sought to find out whether or not female students in STEM have drop-out more as compared to their male counterparts. When responding to this question, 7(4.7%) strongly disagreed with the statement, 9(6%) disagreed, while 28(18.8%) were not sure. Also, 29(19.5%) agreed with the statement and 76(51%) strongly agreed with the statement. This result shows that a quarter of 25.5% of the respondents strongly agreed that female students in STEM courses have trends of drop out as compared to their male counterparts.

Table 4.3 Female students in STEM courses drop-out more as compared to their male counterparts

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	7	2.3	4.7	4.7
Disagree	9	3.0	6.0	10.7
Neutral	28	9.4	18.8	29.5
Agree	29	9.7	19.5	49.0
Strongly agree	76	25.5	51.0	100.0
Total	**149**	**50.0**	**100.0**	

The study sought to find out whether or not the institution had set up measures and strategies that ensure there are effective practices to prevent female students in STEM from dropping out of college. When responding to this question, 18(12.1%) strongly disagreed with the statement, 30(20.1%) disagreed, while 86(57.7%) were not sure about the statement. Also, 15(10.1%) supported the statement. Result showed that most of the respondents which were 86(57.7%) were not sure whether or not institution had set up measures and strategies that ensure there are effective practices to prevent female students in STEM from dropping out of college.

Table 4.3.1 Institution has set up measure and strategies that ensure there are effective practices to prevent female students in STEM from dropping out of college

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	18	6.0	12.1	12.1
Disagree	30	10.1	20.1	32.2
Neutral	86	28.9	57.7	89.9
Agree	15	5.0	10.1	100.0
Total	**149**	**50.0**	**100.0**	

The study also sought to find out whether or not there was relationship among female students in STEM and their demographic characteristics which influence drop-out trends. When responding to this question, 8(5.4%) strongly disagreed with the statement, 12(8.1%) disagreed, 16(10.7%) were not sure about the statement, 57(38.3%) agreed with the statement while 56(37.6) strongly agreed with the statement. This result shows that a large number of the respondents which was 38.3% agreed that there exists a relationship among female students in STEM and their demographic characteristics which influence drop-out trends.

Table 4.3.2 Relationships among female students in STEM and their demographic characteristics which influence drop-out trends

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly agree	8	2.7	5.4	5.4
Disagree	12	4.0	8.1	13.4
Neutral	16	5.4	10.7	24.2
Agree	57	19.1	38.3	62.4
Strongly agree	56	18.8	37.6	
Total	**149**	**50.0**	**100.0**	

A study conducted by (Chen, 2013) stated that women who initiate STEM courses drop out sooner. Because of this pervasive issue of students leaving STEM majors, the STEM pipeline is often described as “leaking.” Moreover, this phenomenon occurs more frequently among women

than men. In Africa the number are even lower, in 2010 among the STEM disciplines only one of four engineering students was female. Guinea had the least percentage of females in science at 5.8%, the countries which did implement gender mainstreaming in STEM disciplines are Lesotho 55% and Cape Verde 52.3 %. A study done by Prof. Deborah from the university of Colorado (USA) observed that in sub- Saharan Africa, the number of females who enroll in tertiary institution to take up STEM related disciplines are few, clearly showing gender insensitive in education at all levels. Cohorts of women graduate at the technical institutions range from girls to more than half, as in Namibia (58%) and South Africa (60%). The number of female students' admission into STEM courses had dropped significantly in Swaziland from a high of 55% in 2005 to 39 % in 2013 (UNESCO, 2013). Female students' taking STEM courses in Kenyan public universities is less than 30%/ (Mbirianjau, 2018). The percentage of female students decreases further at college level, where it is about 27.2 % (Kamotho, 2003).

Research efforts have identified numerous reasons that contribute to gender disparities in STEM retention, including unwelcoming "chilly" climates (Cheryan et al 2009), gender-typed attitudes (Strough et al, 2013), lower self-efficacy among women (Heilbronner, 2013), perceived misalignment between STEM and women's values and negative stereotypes regarding STEM (Hill et al 2010). An understudied contributor to the reason of females are disproportionately less likely than men to stay in STEM majors is the influence of the anticipation of future conflict between work and family life. This finding also applies to STEM careers where women are affected more severely than men by their desire to have a family (Etzkowitz et al 2008). Indeed, incompatibilities between family responsibilities and work among women were the driving factor that pushed them out of STEM careers (Heilbronner, 2013). Although research evidence suggests that discordancy between the family and work domains is a significant barrier for women once in STEM careers (Etzkowitz et al, 2013).

One of the key informants was asked about drop-out trends of female students in STEM for the period 2015-1019 and the following was the response:

> *…….As an institution we have observed time and again that many women who begin college as Science, Technology Engineering and Mathematics STEM majors do not carry through to completion. Among students enrolled in STEM fields between 2015 and 2019 many have left the course. This is disappointing. We are trying our level best to come up with best remedy to this issue.*
>
> **Key Informant Interview, Academic Management**

4.4 The influence of systemic factors on retention of female students in STEM

The second objective sought to establish how systemic factors influence the retention of female students in STEM. Participants were asked to rate the extend in they agreed or disagreed with the items in the scale of 1. Strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree. Responses are tabulated in table 4.4

Table 4.4 Distribution of responses on systemic factors on retention of female students in STEM

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	Count Row N %				
The course I undertake requires thoroughness and consistency	16 10.7%	12 8.1%	24 15.1%	38 25.5%	59 39.6%
There are enough female role models and mentors for female students to look up to in STEM discipline	25 16.8%	70 47.0%	20 13.4%	15 10.1%	19 12.8%
Female students do not face institution infrastructure barriers when they pursue STEM disciplines	12 8.1%	16 10.7%	8 5.4%	49 32.9%	64 43.0%
I am self-motivated in the pursuance of STEM course	6 4.0%	80 53.7%	35 23.5%	17 11.4%	11 7.4%
I am passionate about pursuance of STEM course	18 12.1%	68 45.6%	28 18.8%	13 8.7%	22 14.8%
My course allows me enough time for social activities	60 40.3%	42 28.2%	12 8.1%	20 13.4%	15 10.1%
My course load is manageable	16 10.7%	22 14.8%	87 58.4%	16 10.7%	8 5.4%
mentoring programs and academic advising is effective in the institution and academic advising is effective in the institution	9 6.0%	20 13.4%	89 59.7%	20 13.4%	11 7.4%
My mathematics and numerical skills are sufficient	6 4.0%	12 8.1%	15 10.1%	90 60.4%	26 17.4%

Table 4.4 shows distribution of responses from female students pursuing STEM course. The research statements measure the influence of systemic factors which include institutional factors like curriculum, student workload, mentoring programs and academic advising, pedagogy and student factors like mathematics proficiency, studying habits, time management skills and student motivation and self-efficacy that influence the retention of female students in STEM. The first statement sought to establish whether or not the course undertaken by female students requires thoroughness and

consistency. In responding to this statement, 16(10.7%) strongly disagreed with the statement, 12(8.1%) disagreed, 24(15.1%) were not sure, 38(25.5%) agreed with the statement while 59(39.6%) strongly agreed with the statement. This result was strongly agreed by most of the respondents at 39.6% that the course undertaken by female students requires thoroughness and consistency. The second statement sought to establish whether or not there are enough female role models and mentors for female students to look up to in STEM discipline. In responding to this statements, 25(16.8%) strongly disagreed with the statement, 70(47%) disagreed, 20(13.4%) were not sure, 15(10.1%) agreed with the statement while 19(12.8%) strongly agreed with the statement. This result shows that there are enough female role models and mentors for female students to look up to in STEM courses, a large number of respondents which was 47% disagreed with the statement. Few female students take STEM courses; lack of successful female role models and mentors who can reinforce the female students' lack of "belongings'" in STEM is the reason behind. Lack of self-confidence among female students makes them to avoid STEM majors and leave the courses prematurely. The female students tend to lack self- confidence as compared to their male peers who have the advantage of potentially strong cultural influences because of the nature of the STEM courses which for a long time have been masculine dominated. Gender biases and stereotypes persist unintentionally in the society which results to discriminatory decision- making.

The third statement sought to establish whether or not female students do not face institution infrastructure barriers when they pursue STEM disciplines. In responding to this statements, 12(8.1%) strongly disagreed with the statement, 16(10.7%) disagreed, 8(5.4%) were not sure, 49(32.9%) agreed with the statement while 64(43.0%) strongly agreed with the question. This result projected that a large number of the respondents which was at 43.0% strongly agreed with the statement that female students do not face institution infrastructure barriers when they pursue STEM courses. This implies that female students do not face institution infrastructure barriers when they pursue STEM disciplines.

The forth statement sought to establish whether or not students are self-motivated in the pursuance of STEM course. In responding to this statement, 6(4.0%) strongly disagreed with the statement, 80(53.7%) disagreed, 35(23.5%) were not sure, 17(11.4%) agreed with the statement while 11(7.4%) strongly agreed with the statement. The statement that pursuance to STEM was self-motivated was strongly disagreed by most of the respondents at 53.7%. It means that female students were not self-

motivated in the pursuance of STEM course. The fifth statement sought to establish whether or not students are passionate in the pursuance of STEM course. In responding to this statements, 18(12.1%) strongly disagreed with the statement, 68(45.6%) disagreed, 28(18.8%) were not sure, 13(8.7%) agreed with the statement while 22(14.8%) supported the statement. This projected result reflected that most of the respondents at 45.6% disagreed with the statement on there was passionate in the pursuance of STEM course. It means that female students were not passionate in the pursuance of STEM course.

The sixth statement sought to establish whether or not STEM course allowed student enough time for social activities, in responding to this statement, 60(40.3%) strongly disagreed with the statement, 42(28.2%) disagreed, 12(8.1%) were not sure, 20(13.4%) agreed with the statement while 15(10.1%) strongly agreed with the statement. This result show that a large number of the respondents at 40.3% strongly disagreed with the statement that STEM course allows student enough time for social activities, in responding to this statement. It means that students did not have enough time for social activities. The seventh statement sought to establish whether or not the course load was manageable, in responding to this statement 16(10.7) strongly disagreed with the statement, 22(14.8%) disagreed, 87(58.4%) were not sure, 16(10.7%) agreed with the statement while 8(5.4%) strongly agreed with the statement. majority of the participants which was 87(58.4%) were of neutral opinion. The eighth statement was on whether or not mentoring programs and academic advising was effective in the institution, in answering to this statement, 9(6.0%) strongly disagreed with the statement, 20(13.4%) disagreed, 89(59.7%) were neutral, 20(13.4%) agreed with the statement while 11(7.4%) strongly agreed with the statement. The result projected that most of the respondents were of neutral opinion. This means that students were not sure whether or not mentoring programs and academic advising was effective in the institution.

The last statement sought to establish from students whether or not they had sufficient mathematics and numerical skills. The students agreed to this statement. Majority of the students said that they had sufficient mathematics and numerical skills. Research efforts have identified numerous reasons that result to gender disparities in STEM retention, including unwelcoming “chilly” climates (Cheryan et al 2009). Similar findings to my current study are seen in the work of Cheryan et al who stated that “females may experience chilly climates in STEM especially because historically this has been male

dominated fields". (Heilbronner et al 2013), perceived misalignment between STEM and negative stereotypes regarding STEM. (Hill et al 2010). The findings of this study agrees with the work of Heilboronner et al that women tend to have lower academic self-efficacy and hence need to have mentoring programmes in institutions. An understudied contributor to why female are disproportionately less likely than men to stay in STEM majors is the influence of the anticipation of future conflict between work and family life. A study conducted by Tinto (2006) noted that although motivation was thought to be the only reason for student retention however, later on, this view of retention yielded to one focused on the relationship between students and their context. As a result, greater emphasis was placed on the role of institutions in students' decisions on whether to stay or leave (Spady 1971).

Since then, several major theories/models have tried to explain student retention/attrition; the effect of precollege characteristics, parental socialization, and college experiences studies to determine their relationship to female STEM major persistence have been carried out. In a study by Espinosa (2011), the experiences of 1250 women of color and 891 Caucasian women attending 135 colleges nationwide were collected via a reflective of their 4 years of study and post baccalaureate goals. Results of the study showed that the role of women's college experiences was most paramount in the persistence of STEM majors (Espinosa 2011). Women of color who persisted in STEM engaged more often with peers to discuss course content, joined STEM-related student organizations, participated in undergraduate research programs, had altruistic ambitions, attended private colleges, and attended schools with a thriving community of STEM students. Ong et al. (2011) reviewed nearly 40 years of research on postsecondary educational experiences of women in STEM majors. Their synthesis of 116 research studies provides insight in the factors that influence the retention, persistence, and achievement of women of color in STEM majors and careers. Some of the factors they found to influence the undergraduate experiences of women of color in STEM persistence were STEM enrichment programs, interactions with peers and faculty, academic sense of self, and personal agency and drive. Several teaching staffs and assistant registrars mentioned some factors that might affect female student career in STEM. Most of the qualitative results supported the quantitate result on the influence of systemic related factors on retention of female students in STEM.

One of the key informant was asked about systemic related factors that influence the retention of female students in STEM, the following was the response:

> *….women's careers in STEM is affected more severely than men's careers …some of the factors that facilitate their dropout include precollege factors ….parental socialization, and college experiences …examples of these factors include presence of or the desire to have a family….ineffective mentoring programs in the institution and many other factors……*
>
> **Key Informant Interview, Lecturer**

4.5 Correlation between systemic factors on retention of female students in STEM

After describing the status of systemic factors, the researcher went further to analyze the relationship between systemic factors and retention of female students in STEM. The results are tabulated in table 4.5

Table 4.5 Relationship between systemic factors on retention of female students in STEM

Correlations

		Systemic factors	Retention of female students in STEM
Systemic factors	Pearson Correlation Sig.(2-tailed)	1	.448 .042
	N	149	149
Retention of female students in STEM	Pearson Correlation Sig. (2-tailed)	.448 .042	1
	N	**149**	**149**

Table 4.5 shows a correlation of 0.448. This was a positive moderate relationship between systemic factors and retention of female students in STEM. It implied that when systemic factors are checked in the favor of female students there was improved retention of female students in STEM.

4.6 The influence of socio-cultural factors on retention of female students in STEM

The last objective analyzed in this section, the influence that socio-cultural factors have in retaining female students in STEM. This section analyzed the third objective of the study which was to determine how socio-cultural factors influence retention of female students in STEM. Socio-cultural factors were an independent variable. The study sought to establish the opinion of the respondents on the status of socio-cultural factors. Five items drawn from the questionnaires were analyzed and reported in terms of frequencies and percentages. The respondents were asked to rate the statements on the scale of 5 in which 1 detonated strongly disagree, 2 disagree 3 neutral 4 agree and 5 strongly agree. The result are presented in table 4.6

Table 4.6 Influence of socio-cultural factors on retention of female students in STEM

	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
	Count Row N %				
Some cultural beliefs and practices hinder female students from pursuing STEM disciplines leaving them with few options to choose from.	7 4.7%	7 4.7%	14 9.4%	30 20.1%	91 61.1%
The society expects female students to shy away from STEM disciplines and leave it to male students	9 6.0%	14 9.4%	15 10.1%	63 42.3%	48 32.2%
Female students face so many challenging barriers when they choose to pursue STEM studies as opposed to their male counterparts.	10 6.7%	15 10.1%	11 7.4%	42 28.2%	71 47.7%
Female students are to less extend expected to pursue STEM studies compared to male counterparts.	2 1.3%	4 2.7%	48 32.2%	55 36.9%	40 26.8%
My education is affected by family/household responsibilities	0.00%	29 19.5%	112 75.2%	4 2.7%	4 2.7%

Table 4.6 shows distribution of responses from female students pursuing STEM course. The items measure the influence of social-cultural factors on retention of female students in STEM. The first

statement sought to establish whether the cultural beliefs and practices hinder female students from pursuing STEM disciplines leaving them with few options to choose from. In responding to this statement, 7(4.7%) strongly disagreed with the statement, 7(4.7%) disagreed, 14(9.4%) were not sure, 30(20.1%) agreed with the statement while 91(61.1%) strongly agreed with the statement. This result shows that most of the respondents which was 61.1% strongly agreed that some cultural beliefs and practices hinder female students from pursuing STEM leaving them with few options to choose from. The second statement sought to establish whether the society expects female students to shy away from STEM disciplines and leave it to male students. In responding to this statement, 9(6%) strongly disagreed with the statement, 14(9.4%) disagreed, 15(10.1%) were not sure, 63(42.3%) agreed with the statement while 48(34.2%) strongly agreed with the statement. This result shows that the society expects female students to shy away from STEM disciplines and leave it to male students, large number of respondents at 43.2% strongly agreed to this statement.

The third statement sought to establish whether female students face so many challenging barriers when they choose to pursue STEM studies as opposed to their male counterparts. In responding to this statements, 10(6.7%) strongly disagreed with the statement, 15(10.1%) disagreed, 11(7.4%) were not sure, 42(28.2%) agreed with the statement while 71(47.7%) strongly agreed with the statement. This result shows that a large number of the respondents which was 47.7% strongly agreed that female students face so many challenging barriers when they choose to pursue STEM studies as opposed to their male counterparts. The fourth statement sought to establish whether female students are to less extend expected to pursue STEM studies compared to male counterparts. In responding to this statements, 2(1.3%) strongly disagreed with the statement, 4(2.7%) disagreed, 48(32.2%) were not sure, 55(36.9%) agreed with the statement while 40(26.8%) strongly agreed with the statement. This result shows that female students are to a less extend expected to pursue STEM studies compared to male counterparts, in responding to the statement most of the respondents at 36.9% strongly agreed.

The fifth statement sought to establish whether education was affected by family/household responsibilities. In responding to this statements, 29(19.5%) disagreed with the statement, 112(75.2%) were not sure, 4(2.7%) agreed, while similar number strongly agreed with the statement. This result shows that majority of the respondents which was 75.2% were unsure whether or not family/household responsibilities affected the education of female students. The demographic for

participants in this study showed that 24(16%) of the respondents were married while 125(84%) were not married. Still with demographics, participants were not sure whether or not family/household responsibilities affected their education. Perhaps lack of uncertainty resulted due to the low number of married participants because, as shown in the demographics, out of 149 participants, only 24 reported to be married.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter covers summary of the findings, conclusions drawn from the study as well as recommendations based on the study findings and suggestions for further studies.

5.2 Summary of the findings

The study investigated the factors influencing the retention of female students in science, technology; engineering and mathematics (STEM) courses, at the Technical University of Kenya. The study objective were the following: To identify the drop-out trends of female students in STEM for the period 2015- 2019 at Technical University of Kenya, to examine the systemic factors that influence retention of female students in STEM at Technical University of Kenya and to establish the socio-cultural factors influencing the retention of female students in STEM at Technical University of Kenya. To start with, respondents were asked to state the motivation behind the pursuance of the STEM course, in responding to this, it was established that majority of female students joined the course because of the cut-off points, family influence, peer pressure and career talks. The results showed that female students in STEM course did not have interest or interest was not a motivation factor, did the results also pointed out to lack of mentors and role models as motivators. Respondents were asked whether or not STEM course was attractive to female students. The results showed that out of 149 participants who respondents, 119(80%) said that STEM course was not attractive to female students while 30(20%) said that STEM course was actually attractive to female students.

The first objective sought to determine drop-out trends of female students in STEM for the period 2015- 2019 at Technical University of Kenya. The statement that sought to measure this variable whether or not female students in STEM courses have drop-out trends out as compared to their male counterparts. This result showed that majority of the respondents which was 51% strongly agreed that female students in STEM courses have drop-out trends as compared to their male counterparts. The second statement sought to find out whether or not institution had set up measures and strategies that ensure there were effective practices to prevent female students in STEM from dropping out of college. This result showed that majority of the respondents which was 57.7% were not sure whether

or not institution had set up measures and strategies that ensured there are effective practices to prevent female students in STEM from dropping out of college. The third statement sought to find out whether or not there was a relationship among female students in STEM and their demographic characteristics which influenced drop-out trends. This result showed that majority of the respondents which was 38.3% agreed that there exist relationships among female students in STEM and their demographic characteristics which influence drop-out trends.

The second objective sought to determine the influence of systemic factors on retention of female students in STEM. This objective noted that there were no enough female role models and mentors for female students to look up to in STEM courses, it also noted that female students were not self-motivated and passionate in the pursuance of STEM course, also mentoring programs and academic advising were not as effective in the institution. The results also showed that the course did not allow students enough time for social activities. A correlation between systemic factors on retention of female students in STEM had a value of 0.448 which was a positive moderate relationship between systemic factors and retention of female students in STEM. It implied that increase in systemic factors improved retention of female students in STEM. This meant that systemic factors were important for retention of female students in STEM. The third objective was to assess the influence of socio-cultural factors on retention of female students in STEM. The results from this section showed that cultural beliefs and practices hinder female students from pursuing STEM disciplines leaving them with few options to choose from, it was also established that the society expects female students to shy away from STEM disciplines and leave it to male students. It was also established that female students' face so many challenging barriers when they choose to pursue STEM studies as opposed to their male counterparts and that female students are to less extend expected to pursue STEM studies compared to male counterparts.

5.3 Conclusion

(i) The study concluded that female students in STEM courses had drop-out trends as compared to their male counterparts in the years 2015-2019.

(ii) The study also showed that the relationship between systemic factors and retention of female students in STEM was positive moderate which implied that when systemic factors are checked in

the favor of female students there was improved retention of female students in STEM courses. This means that systemic factors were important for retention of female students in STEM.

5.4 Recommendations

(i) The study recommends that institutions should put in place strategies to minimize attrition of female students from STEM courses.

(ii) The study also recommends that institutions offering STEM courses should identify, install, utilize and embrace systemic factors. These factors are divided into two the institutional factors and the student factors. The institutional factors include curriculum, student workload, mentoring programs and academic advising, pedagogy and institutional environment. The student factors include mathematics proficiency, studying habits, time management skills and student motivation and self-efficacy. These will improve retention of female students in STEM courses since there was positive moderate relationship implying that increase in systemic factors improved retention of female students in STEM.

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APPENDICES

APPENDIX1: CONSENT FORM

Dear Recipient,

I am a Master's student in the Institute of Anthropology, Gender and African Studies at University of Nairobi pursuing a course in Gender and Development Studies. I am undertaking a research study on factors that influence the retention of female students in **Science, Technology, Engineering and Mathematics (STEM)** at Technical University of Kenya.

You have been purposively selected as an informant in this study by virtue of being a STEM female student at the Technical University of Kenya. I humbly request for your participation in this study. Please note that the information obtained from you will be treated with utmost confidentiality and will only be used for academic purposes. I therefore, will not keep a record of your name or address, also there will be no disparity on answers you give, all answers will be considered.

Instructions:

- You have the right to stop the interview at any time or skip any questions that you are not comfortable answering.
- Your participation is completely voluntary but your experience will be of great help to the study.
- Fill in the black spaces provided or tick ( ) your answers from the choices provided.

Please sign below consent to participate

Signature:_____

Date:_____

Carolyne Were

APPENDIX II: QUESTIONNAIRE FOR FEMALE STUDENTS IN STEM

Section A – Demographic Data

1. What is your gender

   Male ( ) Female ( )

(b) What is your age bracket?

17-20 years ( ) 21-25 years ( ) 26 years and above ( )

2. What is your marital status?

   Single ( ) Married ( )

3. What is your current year of study?

   Third year ( ) Fourth year ( ) Fifth year ( )

4. Which course do you study?_____

5. Which department are you in?_____

6. Which school are you in?_____

7. Which faculty are you in?_____

Section B: Research Question

8. What motivated you to take up a STEM course?

   a) Family influence ( )

   b) Peer influence ( )

   c)Interest ( )

   d) Cut-off points ( )

   e) Societal expectation ( )

   f) Career talks ( )

   g) Mentors and role models ( )

9. What is your perception towards STEM?_____

10. Do you think STEM courses are attractive to female students?_____

    If yes why_____

Please write your level of agreement to the statements below on factors that influence the retention of female students in STEM

1. **Strongly agree 2. Disagree 3.Neutral 4 Agree 5 Strongly agree**

11. The drop-out trends of female students in STEM for the period2015-2019

1. Female students in STEM courses have drop out trends as compared to their male counterparts_____
2. The institution has set up measures and strategies that ensure there are effective practices to prevent female students in STEM from dropping out of college_____
3. Are there relationships among female students in STEM and their demographic characteristics which influence drop-out_____

12. The influence of systemic factors on retention of female students in STEM

1. The course I undertake requires thoroughness and consistency_____
2. There are not enough female role models and mentors for female students to lookup to in STEM disciplines_____
3. Female students face institution infrastructure barriers when they pursue STEM disciplines as opposed to their male counterparts_____

13. The influence of socio-cultural factors on retention of female students in STEM

1. Some cultural beliefs and practices hinder female students from pursuing STEM disciplines leaving them with few options to choose from_____
2. The society expects female students to shy away from STEM disciplines and leave it to male students_____
3. Female students face so many challenging barriers when they choose to pursue STEM studies as opposed to their male counterparts_____

THANK YOU

APPENDIX III: QUESTIONNAIRE FOR KEY INFORMANT

1. Gender: Male ( ) Female ( )
2. What is your occupation

   Teaching Staff ( ) Assistant Registrar ( )

3. How long have you been a staff in the Faculty?
   0-1 years ( ) 2-5 years ( ) 6-10 years ( ) 11andabove ( )

4. **The drop-out trends of female students in STEM for the period 2015- 2019**

   i) What is your take on the dropout trends among female students in STEM for the period 2015-2019?

   ii) Briefly explain your opinion on what should be done to reduce the drop-out of female students in STEM disciplines before completion_____

5. **The influence of systemic factors on retention of female students in STEM**

   i) What is your take on the systemic factors that influence the retention of female students in STEM?

   ii) Briefly explain your opinion on what systemic related factors should implement to ensure female students STEM are retained in institutions. _____

6. **The influence of socio-cultural factors on retention of female students in STEM**

   i) What is your take on the socio-cultural factors that influence the retention of female students in STEM?

   ii) Briefly explain your opinion on what socio-cultural factors should implement to ensure female students STEM are retained_____

THANK YOU