Inequality of Gender Participation of Females in STEM Disciplines in Higher Education
A case study of KNUST: Ghana

Afia Boahemaa Acheampong

Master of Philosophy in Higher Education

UNIVERSITETET I OSLO

December 1st 2014

ABSTRACT

The study investigated inequality of gender participation in engineering, one of the science, technology, engineering and mathematics (STEM) disciplines in Ghana. It covers the obstacles that Ghanaian females perceive in pursuing tertiary degrees in STEM disciplines, explores why there are or no policies governing females' participation in STEM education by higher education institutions as well as what are the instances of the success of the females pursuing STEM education and how they were achieved.

The research strategy is a qualitative method; the design is a case study, which was held at the Kwame Nkrumah University of Science and Technology (KNUST). Both primary and secondary sources of data were used, such as interviews and document analysis to obtain information for the study. The respondents were females in the STEM and non-STEM fields from KNUST as well as the administrators of the institution. The study was guided by the 'Expectancy Value theory' and some concepts that provided more explanations to the study.

The main findings of the study were that, some traditional beliefs and social constructs of the role of females by the families and communities within the society at large explain the obstacles most of the Ghanaian females perceive in pursuing STEM education, females in STEM education value placed in pursuing the program is strongly influenced by the educational background of their parents. It also revealed that there are no policies governing females' participation in STEM because most institutions believe in having a gender policy in STEM fields, it will rather discriminate male students instead of it encouraging more females into STEM education so as to ensure a fair balance in the STEM participation.

DEDICATION

To all the people who have supported me in diverse ways in making me who I am today, most especially my husband and daughter, Edward Oduro Okae and Ama Serwaa Oduro Okae.

ACKNOWLEGEMENT

Table of Contents

CHAPTER ONE

1.0 INTRODUCTION

This chapter introduces the topic of the study: "Inequalities of Gender participation in the field of engineering as one of the STEM disciplines in higher education in Ghana." It gives a clear picture to its readers by presenting the background of the study, the aim of the study, the problem statement of the study, the research questions, and the thesis outline. The background of the study examines the higher education system in Ghana and Global millennium goal: women in higher education.

1.1 BACKGROUND TO THE STUDY

Recently, higher education access and participation is becoming a major national concern for all over the world. There has been an increased participation of higher education in Ghana, an enrolment rose by an annual growth rate of ten percent between the year 2000 and 2005 United Nations Educational, Scientific and Culture Organization-Institute for Statistics (UNESCO-UIS, 2009). Nevertheless there remains inequality of gender participation in Ghanaian higher education. The participation rate of males continues to outstrip those of females. According to Ministry of Education (MOE, 2012) females' participation rate generally improved by about twenty-five percent in the year 1999 of the total enrolment of the higher education students.

Atuahene and Owusu-Ansah (2013) argue that inequality also persists in the program that a student pursues in higher education, the disparity rate between the percentage of students enrolled in the Arts-and Humanities related programs and, science, technology, engineering and mathematics is very high.

Ministry of Education, Science and Sports (MOESS, 2010), comments that while government policies suggests a sixty is to forty enrolment goal for programs in science and technology and, arts and humanities respectively in the Ghanaian higher education, en-

rolment tends over the last few decades, indicate that this policy appeal is far from being realized. This means that out of the few females who get the chance to enter into higher education in the country, the majority of that population are likely to join the traditional disciplines leaving the Science, Technology, Engineering and Mathematics disciplines (STEM) for only a few females and the males to pursue these courses.

Assie-Lumumba (2008:18), argues that "Gender inequality is one of the areas that differentiates economically advanced countries from the developing nations."

From the statistics of the World Bank (2002), two-thirds to three-quarters of graduates in the field of health, welfare and education are females. Inequalities in higher education courses is problematic; disciplines are selected based on gender, with regards to the society's preferences in students' choice of program of study which interns favor males and, has resulted inequalities in STEM disciplines. In Ghanaian society, 'masculinity' is associated with strength, self-reliance, independence and leadership, while femininity is associated with care for people, conformity, passivity and nurturance (Kelly, 1987). There is still a traditional view that STEM subjects require physical strength failing that there is the interpretative for cognitive strength. This has affected the capability and competency in women, since they are branded as inferior scholars, incapable of reason, abstraction and disembodied and making more women lacking the necessary attributes to succeed in life.

Morley, Gunaward, Kwesiga, Lihamba, Odejide, Shackleton and Sorhaindo (2006) presented a data set on the enrollment of men and women in Ghanaian higher education on first to fourth year students by gender (2006/7) and showed that most women are excluded and marginalized from programs such as STEM disciplines. The data presented that females with the poor background as well as females living in the rural area seem to have the most difficulty accessing higher education in the country. Ghanaian attitudes play a significant role in the outcome of the field of study. The reason is that students' readiness and willingness to learn and study STEM programs is controlled by their social environment.

Science, Technology, Engineering and Mathematics are collectively known as STEM subjects in today's higher education. It is a generally accepted belief that much a coun-

try's future development, wealth and competitiveness depends on the quality and quantity of STEM graduates. Innovation is intrinsically linked to the STEM agenda by the policymakers (Morrison, 2006). According to Morrison (2006) the study of STEM offers students one of the best advances to make sense out of the totality of the world, by making connections between the school, community, work and global enterprise in order to compete in the new world.

Ghanaian female students' enrolment in the STEM fields is significantly lower than male students due to a number of factors such as certain societal beliefs and practices, gender stereotype, perceived gender roles, male domination in decision making, and that women were not raised up to be exposed to many opportunities that are in line with international work and professional development. It is in this respect that the study tries to look at these factors than hinder females' participation in the STEM disciplines in one of the universities in Ghana. In view of this, theoretical and conceptual issues would be dealt with in the literature review chapter and analysis of the findings would generate the answers of the objectives of the study. The study tries to demonstrate the position of Ghana in respect to the global millennium goal: women in higher education.

1.2 GLOBAL MILLENNIUM GOAL: WOMEN IN HIGHER EDUCATION

Every human being deserves equal rights and fundamental freedoms, which the United Nations is established   to ensure the protection of the rights of everybody irrespective of race, status, gender and other ways of lives. The organization is governed by the United Nations Charter, which gives the assurance of the hope of all nations in the fundamental human rights and freedoms.

World leaders adopted the United Millennium Declaration at the Millennium Summit of the United Nations in 2000. It covers almost all the needs and desires of its member states for the century. It stresses a strong commitment to the members' rights to development, peace and security, gender equality, the eradication of many areas of poverty and to sustain human development.

Eight Millennium Development Goals (MDGs), including twenty-one time-bound targets and sixty indicators were formed out of their meetings, MDGs represent a partnership between the developed countries and the developing countries to create an environment – at the national and global levels alike – which is a contributing factor to development and the elimination of poverty. The specific aim of the MDGs is to do away with extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability; and foster global partnership for development United Nations Development Program, National Development Planning Commission and Government of Ghana (UNDP, NDPC/GOG, 2012).

In September 2000, Ghana came out these eight concrete time-bound MDGs and associated indicators. The country has committed to all these goals and implemented policies that are in line with its borders Medium-Term Development Frameworks, such as the Ghana Poverty Reduction Strategy I and II and the Ghana Shared Growth and Development Agenda. Progress towards the attainment of the MDGs has been reported periodically since 2002 to the people of Ghana (UNDP, NDPC/GOG, 2012).

According to MDG/Ghana (2010) Out of the eight goals, Goal three held the promise of promoting gender equality and empowerment of women, with the target of eliminating gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015, with the following indicators for monitoring progress: Ratios of girls and boys in primary, secondary and tertiary education. Share of women in wage employment in the non-agricultural sector. Proposition of seats held by women in national parliament.

Osei-Assibey and Grey (2013) mention that the overall assessment of Ghana's progress towards the MDGs reveals that, though the progress has generally been positive, performance has been made only in some key areas. Access for women to wage employment in the non-agricultural sector has remained quite limited, undermining the country's quest to promote gender equality and women empowerment. It states that progress towards achieving gender equality and environmental sustainability remains inadequate

as a result of inadequate sound public policies and investments, which are their central for achieving the MDGs and accelerating economic growth.

The Universal Declaration of Human Rights stress that every member state, which Ghana is not an exception must ensure equal rights of individuals' primary, secondary, technical and professional education and that higher education access must be given to all, on the basis of merit (United Nations Charter). MDG/ Ghana (2010) shows that Ghana is on the move in achieving gender parity in the primary and secondary education. However, there is gender disparity in the higher education and some of its program of study.

1.3 THE HIGHER EDUCATION SYSTEM IN GHANA

Higher education in Ghana consists of public and private universities, polytechnics and professional institutions operating under the supervision of the National Council for Tertiary education (NCTE). Higher education institutions were formed to impact knowledge, skills and idea to its students in the nation building. The ideal goal of Ghana is to create measures for poverty reduction and to become a middle income country (Republic of Ghana, 2002). An effective way of being part of the middle income country is through the application and the integration of science, technology and innovation that, this vision can be realized, of which the state and higher education are the mutual players of the role. Education in Ghana, both formal and informal, is both highly treasured and rewarded; it has crucial roles in social advancement and in society at large (Addae-Mensah, 2000).

Bailey, Tiffany, Longdon, Makittrick, Khan and Doms (2011) argue that the content of National Science, Technology and Innovation Policy does not specify much about the role of higher education in science, technology and innovation.

Higher education in Ghana over the years has experienced immense growth in its fields such as access and participation, academic facilities and which has resulted in more private higher education institutions with a regulatory policy environment.

In spite of the increase growth in higher education, the participation rate is not spread to cover every social group in the country. Women, individuals from rural centers and those with low socio-economic background are the disadvantage groups.

Morley et al. (2006) revealed that, inequalities persists in accessibility and participation in the area of students' social-economic status, gender and regions of origin, and the type and location of secondary schools attended with all the increase in the participation. Kwesiga (2002) state that, Ghanaian universities have neglected the position of gender which is very necessary in the Ghanaian intellectual field although a lot of critics have been made about the formation of an unfriendly academic environment for women as students and the male-dominance programs.

The 1992 Constitution of the Republic Article 25, Vision 2020 and the Sector-wide Strategic Plan of the Ministry of Education demonstrate the policy document with which the universities are governed, which did not indicate any gender policy for the higher education institutions in the country. The policy framework of Ghanaian public universities that was designed did not cater for gender policies (Tsikata, 2001).

Manuh, Gariba and Budu (2007) comment that though there has been series of comments about need of gender policy inclusion in the national policies of higher education but they all went to no avail. It can be suggested that as universities do not play any serious role to gender issues, gender equity will not be promoted if women's needs and experiences are not specified. As to whether their comments may be true, looking at Ghana's population where women form fifty-one percent while there seem to be low participation rate of females' enrolment in higher education and even more so in STEM education across almost all of the institutions in the country. This study therefore focuses on a public university, Kwame Nkrumah University of Science and Technology, for this particular topic.

1.4 AIM OF THE STUDY

The purpose of this study is to explore and analyze the situation of female in STEM education in Ghana.

1.5 PROBLEM STATEMENT/RESEARCH PROBLEM

Ghana has a population of about twenty four million; females form fifty-one percentage of the population (Ghana Statistical Services, 2012). There is equity of gender in the primary and secondary level of Ghanaian education, but when it comes to the higher level of education, it clearly shows that females form the minority group in higher education participation more especially in the hard- applied disciplines.

United Nation' Secretary General once made a statement at the African Union Summit on the 27 January; 2013 in Ethiopia, which emphatically stated that 'Inequality is a recipe for instability'.

Also, the millennium development goal states that education is the core for the achievement of the set targets and that gender equality and empowerment of women should be uphold by member states, also reasons were given for equality to be uphold, by saying that more people will grow and develop, more people will be equal and just, and more people will work together. Since education is important for the achievement of the MDGs. (UNESCO, 2005).

To this respect there is the need to examine some of the obstacles that females perceive in pursuing tertiary degrees in SEM disciplines, to find out reasons why there are or no policies governing females' participation in STEM disciplines in Ghana and indentify what are the instances of success in females participating in STEM education and how were they achieved.

1.6 RESEARCH QUESTIONS

In order know that there is a gender disparity in the STEM education and to evaluate its influence on the growth and development of the nation. The study tries to answer the following questions:

- ➢ What are the obstacles that Ghanaian females perceive in pursuing tertiary degrees in STEM disciplines?

➢ Are there policies governing female's participation in STEM disciplines by institution and why?

➢ What are the instances of the success of females in STEM disciplines? How were they achieved?

1.7 THE OUTLINE OF THE STUDY

The study consists of five chapters, chapter one comprises of the background of the study, which entails the higher education system in Ghana, the Global Millennium Goals: Women in Higher Education, Low Representation of Females in STEM disciplines in Higher Education, the objective of the study, significant of the study and the organization of the study.

Chapter two outlines the methodology and procedures for conducting the study. These include the population sample, the instruments and procedures for collecting and analysis of data. The limitations of the study are also presented at this chapter.

Chapter three constitutes a theory and concepts guiding the study, a review of some of the related literature which explains factors that contribute to gender disparities in the STEM disciplines in higher education.

Chapter four deals with the presentation, discussion and analysis of data collected on the views of respondents about the main themes from the field together with supplementing secondary data. This is done by taking the conceptual frameworks of this study into a thoughtful perspective, in relation to the research questions

Chapter five gives summary and conclusion to the work, in ways that suggest how best the inequality of gender in STEM disciplines would be balanced.

CHAPTER TWO

2.0 RESEARCH METHODOLOGY AND DESIGN

2.1 INTRODUCTION

The aim of this section is to deal with the research design, the target population, the sample size as well as the sampling procedure in the study. In addition, the research instrument, method of collecting data and methods of analyzing data will also be discussed. This chapter gives brief outlook of qualitative research.

2.2 RESEARCH DESIGN

Research design provides the framework for a research study. It guides the researcher in the data collection and the required design to be used.

With the qualitative method as a strategy, the study employed a case study design; an in-depth study was done at the Kwame Nkrumah University of Science and Technology (KNUST). The history of the institution together with its rules and regulation regarding its academic standards make it different from other institutions in the country. Kwame Nkrumah University of Science and Technology is located in Kumasi, the second largest city in the country, with reference to the University's brochure that was received from the planning unit, the University started as the Kumasi College of Technology by a Government Ordinance on 6 October; 1951. It began its operations on 22 January; 1952, with two hundred teacher training students who were relocated from Achimota College to form the nucleus of the College. Before its accession to a University status in 1961, the College expanded enormously in academic disciplines and infrastructure. The School of Engineering and the Departments of Pharmacy and Agriculture in 1953; followed by the Department of General Studies, Town Planning & Building; and, the Faculty of Science.

As the College developed, a decision was taken to make it a science and technology oriented institution so as to meet the country's needs of the revolution of the scientific era of growth, in this respect the education courses as well as other fields which was

not related to science were moved to other institutions. In December 1960, the Government appointed a University Commission to advise it on the future of University Education in Ghana, in connection with the proposal to transform the University College of Ghana and the Kumasi College of Technology into an independent University. Based on the Commission's Report, the Government, in 1961 decided to establish two independent Universities, one in Kumasi and the other at Legon near Accra.

Consequently, the Kumasi College of Technology was converted into a full-fledged University by an Act of Parliament on 22 August; 1961. The Kwame Nkrumah University of Science and Technology was formally inaugurated on Wednesday, 29 November; 1961. The University began awarding its own degrees in June, 1964. Its name was changed, after the overthrow of then president Dr Kwame Nkrumah on 24 February; 1966 to the University of Science and Technology, Kumasi. The University has since March, 2000 reverted to its original name.

The University has undergone major changes. In October 1965, the Department of Applied Physics, Applied Biochemistry and chemical Technology were established and the name of the Faculty changed to the Faculty of Applied Science. In addition, a Department of Science was set up in the Faculty to teach Sixth Form Science subjects. KNUST holds the vision of advancing knowledge in Science and Technology for sustainable development in Ghana and Africa as a whole.

The reason for choosing this university was that, the case of it being a training college which was known to be female dominated institution and then was changed to be science and technology institution known to be male dominated institution enhanced the investigation of the study. Also it was chosen because it is the second public university which was established for the purpose of training students in science and technology oriented. It has been given the mandate to serve the needs of the whole country and to play a unique role in the national development by identifying national needs in science and technology and addressing them, since its establishment, the university has been adhered to its functions with the training of engineers, technicians, agriculturalists and many other health personals. The university has expanded its responsibilities in the

training students in many other programs such as social sciences, business management and arts.

A study in this institution has helped the researcher to explore and analyze the situation of females in one of the STEM education in Ghana. With this design the researcher was to probe deeply and to analyze intensively of the study.

2.3 SAMPLE SIZE

The population of the study which Bryman (2008) explains it, as the universe of units from which the sample represent. Here the population was made up of all the females in the institution and administrators, whose duties are to make record of current and formal students, facilitate effective students' registration and enrolment, offer counsels to students and many other duties that they perform in the institution. It included both male and female administrators and all females in the University who are directly and indirectly connected.

The study used a purposive sampling of ten respondents, because out of all the types of sampling methods explained by Cohan et al (2007); purposive sampling is a method whereby the researcher selects the case to be included in the sample on the basis of the researcher's judgment of their typicality or possession of the particular characteristics being sought.

In all ten interviews were conducted, three administrators, four female students in one of the STEM fields and three females in one of the non-STEM fields. This method was selected so that the researcher could be able to build the sample that is satisfactory to the specific needs of the study.

2.4 SAMPLING PROCEDURE

Semi-structured interview as well as document analysis was held with the respondents during the research's visit at the university in response to an e-mail that was previously sent to the registrar of the university. Three of the administrators were interviewed, one female and two males. The researcher visited the department of planning unit and col-

lected the data on the students' enrolment ratio by gender and faculty, 2010/2011. The planning unit is the office that provides range of management information and planning support to facilitate informed decision making, planning and policy formulation and the overall strategic development of the University. It has so many duties to be performed at the institution; one of its duties is to provide range of institutional statistics on the various aspects of the University's operations. Four females in engineering faculty were chosen for the interview due time and cost and then three females from business administration department were also interviewed.

2.5 INSTRUMENT ADMINISTRATION AND DATA COLLECTION

The researcher received a Letter of introduction from the University of Oslo, faculty of Educational Science, so as to be able to seek permission from Kwame Nkrumah University of Science and Technology. An e-mail was sent to KNUST by the researcher with the attached letter of introduction before arriving at the university. Though the University could not respond to the e-mail, but the researcher was warmly received by the University when she visited and introduced herself at the reception desk. With the assistance of the registrar, the interviews were successfully conducted.

2.6 DATA COLLECTION PROCEDURE

The interview was started with normal conversation between the interviewer and the interviewees by thanking them for their time, self-introduction, and the length of time to be spent by giving them the assurance that their conversations will be anonymous and the reason of using digital recorder.

The researcher began the main interview with the use of the interviews guide, questions and answers were well asked and answered. Probe question questions were used to make emphasis with clear meanings of thoughts. The duration of the interviews lasted for approximately thirty to sixty minutes.

There was an active participation among most of all the respondents except one female in STEM who wanted to start her interview first because of her appointment, but all the same the researcher got what she actually needed for the study.

The interviews were ended with the researcher's expression of appreciation to the respondents for their kind gesture and their cooperation.

2.7 DATA ANALYSIS

In the process of retrieving ideas and sense from the data collected, the interviews from the respondents were recorded and transcribed verbatim. Themes and ideas were identified and examined for similarities and phrases that represented similar topics were used for the study.

Moreover, after reading through the university's brochures, journals and articles received from the department of planning unit, concepts and themes regarding the admissions and the percentage rate of females in STEM fields were select for the purpose of the study.

Finally concepts and ideas revealed in the literature review were cross-checked by using ideas and themes that were identified from the interview analysis.

2.8 LIMITATIONS OF THE STUDY

The researcher had an encounter of some challenges that were beyond her control even though adequate preparation was made before going to the field. The first challenge was her inability to get respondents from all the STEM disciplines, due to the length of time and energy and space, she had to use only females from engineering faculty as her respondents for the study, whereby, they cannot be used to generalize the problem of inequality of all females in the STEM fields as the findings of the study.

Furthermore, the researcher planned of observing the participation rate of females during of the lecture hours but she got there at the examination period where it became a challenge getting lecture hall with students and a lecturer for her observation. She had

to ask the students for the lecturer's behavior towards females in class as compare to how they behave towards their male counterparts. Also the researcher had to make several visits before getting the administrators, who were in charge of the admissions of students in the STEM faculties. This contributed to the researcher's overspending on the transport cost she planned for the trip.

CHAPTER THREE

3.0 LITERATURE REVIEW

This chapter reviews literature on the Ghanaian culture and gender roles, a theory and concepts which guide the study and previous research in respect to reasons why females must be encouraged to participate in STEM education.

3.1 GHANAIAN CULTURE AND GENDER ROLES

The discussion of female participation in higher education in Ghana cannot be completed without locating it within the context of culture and gender. Culture is the totality of the way of life evolved by people through experience and reflection in an attempt to fashion a harmonious co-existence with their environment the Ghana National Commission on Culture (NCC, 2004).

Culture is very significant in the lives of the people of Ghana. NCC (2004) emphasizes the need for a Ghanaian cultural policy document with the aim of realizing the vision of Ghanaians to respect, preserve and use their cultural heritage and resources to develop a united, vibrant and prosperous national community with a distinctive African identity and personality, and a collective confidence and pride of place among the community of nations.

Moser (2003) identifies three roles of Ghanaian females: reproductive, productive and community managing. She categorizes reproductive roles as childbearing and child-rearing responsibilities, and the domestic tasks undertaken by female representatives, which guarantee the maintenance and reproduction of the labor force. The productive roles comprise work done by females and males for payment in cash or kind. It includes market production with an exchange value, and subsistence home production with an actual use value and also potential exchange value. Females in agricultural production work as independent farmers, peasant wives and wage earners. The community managing roles are the activities undertaken by females at the community level as an extension of their reproductive roles. These activities ensure the safety and provision of the

community's scarce resources of collective consumption, such as water, health care and education. However, this kind of work is voluntary, unpaid and undertaken during holidays.

The state of women in Ghana is framed by cultural and social norms, and the legacy of colonization. To emphasize how colonization and societal patriarchy perpetuate inequality in higher education as well as programs of choice:

In Ghana, for females, there is much societal stress on marriage and motherhood as the primary goal in life, a goal that is deeply ingrained by the time they reach adulthood. Katjavivi (1998) stresses that society expects women to bear the burden of caring for the young, elderly, sick and disabled. The overall welfare of the family falls on women, who are expected to somehow supplement their families' income.

Aidoo (1995) reports that most women are not equipped educationally and technically to play prominent roles in Ghana's industrialization process. The colonial system saw to it that women were either excluded from schools.

The subordinate position of Ghanaian women in society has also been linked to the perceived low relative economic contribution of women to the nation's growth and development. That perception has stemmed from the tendency to exclude most women's activities from the market place. Rural farm women's productive roles are often considered supportive and hence remain largely unaccounted and unpaid. The amount of labor they contribute to the household and community as well as the farm is quite substantial.

This is confirmed by a study conducted by Houston (2003) on 'Overcoming barriers to female education in Ghana'. She writes that generally more value is placed on the reproductive roles of females than on their educational choice and career achievements and that education needs to be prioritized for Ghanaian females who aspire to careers that require advanced qualifications.

Society holds certain expectations of women: they are expected to be attractive, passive, pleasant and modest (Marshall, 1985). To Slauenwhite et al. (1991), women are expected to be co-operative, nurturing and dependent on males. "Girls in Ghana perform twice of the domestic work than boys" (Heady, 2003:387)

Eagly and Diekman (2010) state that a male leader always wields more influence than a female leader, even if they are given the same position and access to the same resources, because males are seen to be more capable in the job than females.

Kuenyehia (1995) reveals that life in Ghanaian society is organized around an unwritten social contract, the gender construct in which women assume the reproductive role while men are ascribed the primary responsibility for the family's economic or financial upkeep. From these perspectives, it can easily be seen that males and females are distinguished not only by their biological sex, but also by behavior, the clothes they wear, the choice of programs they study, the kind of job and activities they do, the decisions they make and the positions they take in society. Such differences, where they exist, are socially constructed, and they vary from one culture to the other.

Gender is an acquired identity that is learnt, changes over time and varies widely within and across cultures; it is relational and not simply to man and woman but to the relationship between them (INSTRAW, Glossary of Gender-related Terms and Concepts) www.un-instraw.org\en. Gender involves a power advantage of men over women in virtually the entire Ghanaian society. For instance women are margined when it comes to independent matters such as taking decision in the programs of study with, the belief that men are the head in every part of life.

Based on this, the idea of gender has historically placed women in a nurturing, submissive role while men are seen as dominant and more aggressive. Men are more likely to assume the occupational role, and women are more likely to occupy the domestic role. Therefore women's choice of programs in higher education is influenced by these domestic roles.

Campbell et al. (2002) argue that educators and many others tend to assume that females and males are different and are indeed 'opposite sexes'. They make gender an important predictor of a person's abilities and interest, they are of the view that using gender in the choice of academic skills, interest and programs create stereotyping to the individuals.

Sithole et al. (2013) argue that gender roles, culture and gender relations have structural barriers. There are challenges to women rising into specific sectors such as leadership

positions that are a result of lack of acceptance of women leaders by both men and women, with the assumption that leadership is for men only.

Di-Tomaso et al. (2011) are of the view that status and associational bias are culturally driven interpersonal processes that act as powerful mechanisms, by which exploitation and opportunity displays are actually accomplished by privilege of gender.

These perceptions of the people in Ghana hinder women's advancement and strategies that create opportunities for more women in higher education since the choice of programs and careers are linked to cultural constraints from both society and organizational institutions.

Katjavivi (1998) stresses that social and cultural factors faced by women in developing societies were the main barriers preventing women from enrolling in higher education. Social structures, more so in developing countries, pressure women to start a family ahead of professional considerations.

These societal expectations could contribute to the belief that men study and work at the industrialized institutions while women nurture the learner at home. Even though, some Ghanaian women have been able to gain admittance to higher education institutions but, within such a male-dominated community, where knowledge and, power tends to be limited to men, it can be challenging for women in higher education, more specifically in the STEM fields. This context structured the relevance of this study regarding the obstacles that females perceive in participating in STEM education.

3.2 THEORETICAL FRAMEWORK

This section describes the guiding theory as well as related literature for the study. It is meant to provide the relevance and conceptual base for the findings of this study. It also explains how the theory link with the research topic base on the related literature surrounding the issue of females' low participation in STEM disciplines. Expectancy Value Theory is the selected framework for this study.

Theory as a term in social research is very important since it provides 'backcloth and rationale' for the study being conducted (Bryman, 2008). This explains that theories assist in giving clear picture and meaning to every research findings. Moreover researchers

are able to deduce and build theories from the findings from their respondents with its base on the framework of the findings, by analyzing and interpreting the research findings. As emphasized by Bryman (2008), theory gives the framework which social phenomena can be understood and where research findings can be interpreted. For this reason the researcher tries to use this theory in the study for easy understanding of the phenomena under study:

3.3 EXPECTANCY VALUE THEORY

Expectancy Value Theory was developed and researched by Eccles, Wigfield and their colleagues between 1980 and 2000 in their studies on the motivational and social factors that influence gender and ethnic differences in mathematics, science and information technology choices (Jacob and Simpkins, 2005).   Eccles et al. (1999) are of the view that peoples' choices (such as course selection, college major), persistence and performance are strongly determined by their beliefs (which are the feelings of importance and interest) and an individual's self-concepts that consists of his or her belief of how skilled he or she is, in terms of how well they will do on the activity and the extent to which they value that activity.

Eccles (1993) in Jacobs and Simpkins (2005) mentioned that an individual's personal value attached to a task is influenced by several factors such as the satisfaction that individual derives from a program chosen, the major program seen as meeting the person's long and short term goals and, encouragement or discouragement from an individual's parents, counselors, friends and in the context of school authorities, administrative structure and policy from selecting a program.

Wigfield and Eccles (1997) suggest that peoples' beliefs and behaviors are shaped by broader influences of which gender is part of it. This model review that, gender is affected by beliefs and choices through gender roles and norms of specific cultures and, this has resulted in the divergence between females' actual performance and beliefs about their abilities. The idea of males having higher self-concepts in STEM disciplines than females even though males' performance in STEM disciplines is similar to or lower than females' performance in the STEM programs is yet to be investigated.

The belief that education and vocational decisions are mostly based on individuals expectations for success and the importance placed on 'options' to them, is what Eccles and colleagues asserted and, they are related to cultural norms, experiences and attitudes and what are commonly associated with achievements.

It is in view of this theory that the study tries to examine how these beliefs and values may interact with gender, which may potentially give us insight into why fewer women are participating in STEM disciplines in Ghana compared to male students.

3.4 CONCEPTS OF THE STUDY

Bryman (2008:143) explain "concepts as the building blocks of theory, which represent the points around which a social research is conducted." The idea of choosing the following concepts below is to throw more light about the Ghanaians attitude towards females' participation in higher education more especially in STEM education. This section tries to provide more insightful explanations into factors which contribute to females' low participation rate in STEM disciplines in higher education in Ghana.

3.4.1 The Concept of Tradition and Modernity

In sociology, tradition and modernity are used as twin concepts. They often challenge each other due to their influence on human culture. Traditional societies usually believe in their customs and are conform to that, while modern societies seem to be dynamic and conform to present centuries. As a result, each of these cultures being tradition or modern will bear differently on-offspring or individuals because of the different socialization patterns that individuals learn as they grow up in these cultures (Scott and Marshall, 2005).

According to Gyekye (1997), traditional societies can be generally be described as being rural, agrarian, pre-scientific, and resistant to change and innovation and bound by the perception of its history. Modern societies are generally associated with scientific, innovative, future oriented, culturally dynamic and industrial and urbanized. This categorization of these concepts is then used in the discussion of tradition and modern cultures.

Gyekye (1997) defines culture as a form of practices and beliefs that has continued to exist over several generations. He goes on to describe the tradition of generation as the

culture of that people; hence tradition and culture shall be used interchangeably in explaining traditional culture in this context.

Traditional Culture is often aligned with practices that usually move together with long-held beliefs, values and behaviors of people. It plays a central role in many cultures African cultures where emphasis is placed on the practices and behavior that people within societies should uphold to and preserve it.

Gyekye (1997), points that tradition is a cultural product that was created by past generations and that having been accepted and preserved, it may be in whole or in parts, by successive generations. They hold on to the revivalist view on keeping the cultural values. That every individual is its generation adapts and conforms to the culture which he perceives to be suitable and desirable to its purpose and aspirations for effective development of individual's life. If tradition is noted as the cultural product of generation, then culture in its general terms could be explained as a way of a group of peoples' (generation) lives constituting their belief, practices and values.

Culture in general may be considered as the secondary environment in which an individual finds himself over and above his natural environment. It manifests in people's customs, beliefs, values, norms, rules, tools, technologies, language, institutions (education, family, religion, work, health care, etc.) and social organizations. Culture can be seen in its true perspective through the connection of these shared values (Amedekye, 1970).

The Modern Culture is express in oxford advance learners' dictionary as anything new with the intention of making it different from the old style. Quicke (1996) describes this concept as the idea of freedom from traditional authority given rise to widening opportunity for self-development and self-fulfillment. It is in contrast to tradition concept; modernity is opened, differentiated and individualized as well as reflective (Quicke, 1996). Modern societies are often concerned with the individual's achievement rather than communal. This concept tends to challenge the traditional culture where individuals tend to conform to the group or communal traditional norm in the society.

Gyekye (1997), states that modern societies are characterized as scientific, innovative, future oriented, culturally dynamic and industrial and urbanized. Therefore if modern culture really individualistic, innovative, culturally dynamic and entirely different from traditional culture, then it can be seen that the concept of modernity has not practically accomplished its task why this is so is that, how can a society claim to live in a modern society and still continue to practice the traditional way of life which does not make them independent in decision making in their daily activities.

The former concept tradition seems to have embedded the later modern concept. That is to say the process of change from traditional culture is open to human structures as people are the creators and actors of their traditions. Some of the values existing alongside traditional norms and ascribed gender roles are deeply embedded and sustained in modern culture (society) and continue to perpetuate in formal sectors which offer potential to instill change. With the studies conducted by Giddens (2006), on 'Balancing work and care' revealed that one of the major factors affecting women's careers is the male perception that for female employees, work come second to having children. There is an assumption that some people have preconceived notions about females that they should prioritize nurturing children than formal (work) education. The use of this concept will help the discussion on how human prejudices and social influences have impact and often hinder females' representation in the STEM disciplines. This discussion links to the concept of gender, which further leads to the discussion of gender stereotype.

3.4.2 Concept of Gender Stereotyping

Gender is determined socially; it is the societal meaning assigned to male and female. Most societies often place specific roles that each sex should perform, although there is wide latitude in acceptable behavior for each gender (Hesse-Biber, S. and Carger, G.L., 2000).

Esplen and Jolly (2006) demonstrated how gender as a term has increasingly been used to distinguish between the sexes. Gender is socially and culturally constructed, and it is used to argue against the 'biology is destiny' line. To them, sex is fixed and based in nature while gender is based in a social construct. In that sense, sex marks the

distinction between women and men as a result of their biological, physical and genetic differences; gender roles are set by convention and other social, economic, political and cultural factors.

The World Health Organization (2010) refers to gender as the economic, social and cultural attributes and opportunities associated with being male or female at a particular point in time.

Therefore gender as a socially construct which is based on the physical nature and the roles assign to them, is argue by many Feminist theories, especially within constructivism. These perspectives see gender identity as a role that is not possessed or something inborn, rather gender is created within the society.

Kelly (1987) holds the assertion that the society demands conformity to its fundamental values and norms and, as result it assigns roles to its members, expecting them to conform to specific behavior pattern.

Gender roles accepted by individuals for them to be accepted into a society are gender stereotypes. Gender stereotypes are 'culture's shared beliefs about the role, behavior and personality traits of males and females (Hyde and Lindberg, 2007). This shows that gender stereotypes are of traditional bases where tasks designed for each sex is of measure distinction. The gender stereotype is concern with psychological and socio-cultural structures which influence gender role and individual. It starts and develops from an individual's home.

Hilton and Von Hippel (1996) state that stereotyping is a cognitive scheme used by social perceivers to process information about people, and it promotes discrimination by systematically influencing perceptions, interpretations and judgment. Samuelsen et al. (2000) also point out that some stereotyping is directed against women and that the pervasive view of society is that scientific and engineering professions are male-dominated; therefore, this has a great impact in the influence on the female sex.

Eagly et al. (2010) add that stereotyping arises and is reinforced by discrimination, justifying disparities between groups. In particular, people infer the characteristics of groups based on the social roles they occupy.

Dovidio (2001), argue that stereotyping is one of the concepts that has systematically affect how people perceive, process information about and respond to group members, as they are transmitted through socialization, the media, and language and discourse. For example, the gender roles assigned to gender influence the choice of educational programs and influence the choice of many males and females. Hyde and Lindberg (2007) further argue that gender stereotyping is prominent in academic domains. Research have shown that the dominance the role of the parent's gender stereotype have exercised on their girl child career choices and development. More especially females from traditional homes tend to pursue traditional career whereas females from modern home are likely to pursue career of her choice simply because she finds herself in egalitarian parents (Hyde and Lindberg, 2007). There is a clear indication that career development lies and depends on the powers and values both parents and society place on girl child from early childhood. Therefore gender stereotyping in this study is seen as how individual is influenced by the environment (society/family) in which he or she finds himself or herself and how it affects their choice of programs. In many studies related to Ghanaian women, stereotypes mark Ghanaian females as home makers conformers and weaker vessel could tend to draw and discouraging them from opting for STEM disciplines and build upon their career on that field to the higher level (Anamuah-Mensah, 2000).

The concept of stereotype used in this section so as to facilitate the understanding the intended motives of society, the ontological and epistemological assumptions of the study, especially in analyzing how societal attitudes serve to contribute female participation in the study of STEM fields.

3.4.3 The concept Attitude

This section seeks to explain the societal preference towards males and females in pursuing STEM programs, and how it can contribute to the inequality in the participation rate of the STEM fields. Gender differences in attitude significantly affect the choice of students' program more especially in STEM related studies as well as performance in STEM fields (Morley et al., 2006).

The concept attitude is described as 'A relatively enduring organization of beliefs around an object or a situation predisposing one to respond in some preferential manner' (Scott and Marshall, 2005:25). This means that an attitude is a feeling that one has towards a situation or case of study (subject). In this sense, it could be thought of as the action, behavior and the way of perceiving something. For instance, the society's idea that science is for boys and difficult as mentioned by some people could tend to motivate some boys to study STEM programs and on other hand tend to discourage some females to study STEM programs as described as a male course.

Sadker and Sadker (1994), show that instructors interact more frequently with males than females in STEM class in higher education. This attitude exhibited by some instructors by could have a direct influence on some students' attitude, participations and even achievement in STEM education. This is the reason why a student is encouraged to study STEM subject is likelihood for the student to develop positive attitude towards the subject and perform better to study and excel. It could be drawn that a specific attitude exhibited will depend on the circumstance invoking it, in this regards, the concept attitude is empirical (Scott and Marshall 2005).

Students' attitude towards STEM subjects are directed by surrounding and prevailing gender influences. The concept attitude will enable the researcher to analyze students, teachers and societal attitude towards females in higher education and the educational system include or exclude females in higher education system. This leads to the discussion to the concept inclusion and exclusion.

3.4.4 Inclusion and Exclusion

The concepts inclusion and exclusion used in this section presents Ghana Education Service report on gender matters with respect to how female and male education is viewed. It also describes the inclusive mechanism Ghana Education Service with its sub division has put in place for girls' education and STEM education (GES, 2003). The concept inclusion was defined by (Miller and Katz) 2002 as the feeling of belongingness: feeling of being respected, valued for who you are; feeling a level of supportive energy and commitment from others so that you can do your best. This implies that inclusion is

the act of involving all individual from different background and provides them with equal access and opportunity to explore and develop their potentials. This concept tries to challenge discrimination (Exclusion).

The report on gender matters is now presented with respect to how most Ghanaians view education of females and males, whether it gives an illustration of inclusiveness or exclusiveness. A newsletter from the Girls' Education Unit Ghana on 'Gender matters' reveals that, nowadays the only thing one hears with the help of the mass media is 'send the girl child to school' as if it is only the girl-child that needs to be taken to school. What of the boy? This question points to the fact that something is seriously not in order with respect to education of the girl-child (Gender matter report GES, 1998). The paper posed a question to educated and uneducated males and females that, if one had a boy and a girl and do not have enough money to take the two children to school, which of the two children would the person prefer to send to school? The answer was 'the boy, of course' why? The follow up answer was exclaimed: Ah! After all, he is a man. He is the one who will bring about the continuity of the family name. The girl will marry and bear another family's name (Interviewee on Gender mater report GES, 1998). There is an as-sumption that some people prefer educating the boy child to girl child because of the fear that the girl will be no longer the asset to her family when married (Anamuah – Mensah, 2000).

The assertion that society and their traditional presumption of women's roles and the preference for educating boys as opposed to girls, affect the opportunities and possibili-ties that women and girls have in these societies (Serpell, 1993) is really so. Giddens (1986), assert that women are subject to 'double exploitation' also support the argument that women are discriminated against and also bear the brunt of domestic chores. This creates the sense and the assumption as to how women are marginalized in the African society more especially Ghanaian context. Meanwhile there is education for all propa-ganda which states everyone has the right to education as it is even a human right dec-laration. Education is a human right and that all citizen including girls and women must have access and enjoy it (FAWE 2008). FAWE's community advocate in promoting girls'

education to sensitize parents to appreciate and internalized the benefit of girls' education (FAWE, 2008).

This supports how females are used as home makers in most Ghanaian homes and how they are treated unfairly right from home and in school. As socialization is the most inclusive concept of teaching and learning in education and schooling (Smehaugen, 2001) the Girl Education Unit sought the need to look at the education of females in STEM subjects, and to encourage them to develop much interest in pursuing STEM programs. With this inclusive mechanism, the concepts will help to find out why are there are or no policies and strategies put in place as far as STEM disciplines for females in higher education is concerned.

3.5 THE REASONS WHY WOMEN SHOULD PURSUE IN STEM DISCIPLINES IN HIGHER EDUCATION

There is a widening gender gap in the field of STEM all over the world. Science, technology, engineering and mathematics education always has been called a meta-discipline:

According to Morrison (2006) the integration of STEM disciplines as effective means of the continuity of the technology in our daily lives and continued that the greatest companies that hold the best minds and innovators of this modern era such as Steve Jobs and Mark Zuckerberg have no female equivalent.

There has been a problem with women and the STEM professions most often. Men end up dominating in technology and industry, and the numbers of women entering these fields is not increasing. A 2011 report by the US Department of Commerce found only one in seven engineers is female. Additionally, women have seen no employment growth in STEM jobs since 2000 (Carr, 2013).

All over the world, there is a gap in the STEM fields. Currently, women have been the minority group in almost all the STEM jobs and whereby the number of females in STEM not improving as time goes on. Few numbers of females holds the bachelor's degrees in STEM programs, even though female graduates in bachelor's degrees are growing (Beede et al, 2011).

STEM education offers students one of the best chances to make sense of the world as a whole, rather than in parts. STEM education removes the traditional barriers erected between the four disciplines, by integrating them into one cohesive teaching and learning paradigm (Morrison 2006).

Martin (2008) states that there is a need to do away with the mind-sets that STEM subjects require physical strength; STEM courses do not require any strength as presupposed by the traditional perspective.

UN Secretary-General Ban Ki-moon emphasises the need for gender equality and women's empowerment as one of his top priorities: central to achieving the MDGs and the success of the post-2015 development agenda. He is of the view that nations with more gender equality have better economic growth. As a result of that, there is a need for actions and policies that nurture and include women's talents, skills and energy, from factory floor to the boardroom.

'If we're going to out-innovate and out-educate the rest of the world, we've got to open doors for everyone, we need all hands on deck and that means clearing hurdles for women and girls as they navigate careers in science'. First Lady Michelle Obama, 26th September 2001.

The Womensphere Nuclei Media Project holds the promise of creating a space for by highlighting the inspiring stories of women leaders in STEM. In collaboration with leading academic institutions, companies and non-governmental organisations (NGOs), they expand scholarship opportunities, and monitor partnerships and career/internship opportunities, to encourage the next generation of women leaders and innovators. They believe that it is critically important to invest in motivating more girls and women to explore and pursue careers and leadership roles in STEM due to the reasons below:

More women in STEM will result in a brighter future and a better world because STEM changes the world and shapes the future. For instance, inventions such as the light bulb, computer and aeroplane have revolutionized how people live. They demand that we should think about the discovery of penicillin and its impact on disease; therefore, they want more women to be involved in the creation of the future.

Women need to take part in solving the problems plaguing the world, from providing clean sources of energy and clean drinking water to finding the cure for cancer.

The economic development of nations relies upon innovation. Investing in expanding the human capacity behind STEM is critical to innovation, thus unleashing innovation and economic in countries around the world.

There are greater economic opportunities for women. Across all countries of the world, there exists a gender wage gap; on average, women earn less than men, but this wage gap is smaller in STEM fields, where there is greater parity in pay.

Careers in STEM fields are intrinsically rewarding: the excitement of exploration 'out in the field', whether on mountains, underwater or in the deep sky; the pursuit of understanding the complexity and richness of the truth through science and mathematics; and the thrill of solving important problems through engineering, innovation and invention of new technologies. All of these possibilities and more await women who pursue careers and leadership within STEM fields.

There is a need to see and develop more heroines in STEM women, who will discover the next fundamental laws of the universe, drive the evolution of computing, and determine the future of medicine and engineer solutions to the world's most challenging problems. As a global society, there is the need to recognize the modern-day heroines who are shaping the future through STEM, and this is why heroines are needed in STEM in order to continue creating a better future (Ganapathy, Olson, Imani, Edie, Kantor, Fimbres, Yinka, Babb and Gerstain, 2014).

Beede et al. (2011) provide a report that shows that the gateway to so many high-paying jobs is a STEM degree; therefore, receiving a STEM degree tends to result in higher earnings later in life. They illustrate the considerable extent to which the earnings premium from having a STEM job or degree varies by gender; women enjoy a much bigger STEM job premium than men, but slightly smaller premium for having earned a STEM bachelor's degree. Their findings provide definitive evidence of a need to encourage and support women in STEM by ensuring gender equity. If women are given high-quality, well-paying jobs in the fields of science, technology, engineering and mathematics, there

is a great opportunity for growth in STEM in support of a country's competitiveness, innovation and jobs of the future.

3.6 CONCLUSION

In general, this chapter has presented us with a fruitful literary background to the study. It has looked into the theoretical framework. It has also presented us with a relevant background to the socialisation roles of Ghanaian society. The literature review has shown several reasons why education is essential for women in STEM so as to connect women to the economic success in the world.

CHAPTER FOUR

4.0 PRESENTATION, ANALYSIS OF RESEARCH FINDINGS AND DISCUSION

4.1 INTRODUCTION

This chapter presents the analysis and discussion of the data gathered from the respondents at the Kwame Nkrumah University of Science and Technology (KNUST). The respondents consisted of three administrators (labeled as A1, 2 & 3), four females in one of the STEM fields namely Engineering (labeled as CoE1,2,3&4) as well as three females from Business Administration outside one of the STEM fields (BA1,2 &3). The analysis also reflects interviews with three administrators from the institution.

With the help of the research questions the findings obtained are organized into three main sections: reasons why few females participate in STEM fields, what has been the motivation of females to study in one of the STEM fields and, lastly the societal attitude of parents, teachers as well as what the authorities (administrators) behave towards females studying in STEM programs. The presentation begins with the descriptive statistics of the enrolment ratio of the female and male participation in the school of engineering; it then followed by the presentation of the analyzed data within the framework of the research questions, the findings from the interviews, observations and documents are presented.

4.2 DATA SHOWING THE ENROLMENT RATE OF MALE AND FEMALE IN THE COLLEGE OF ENGINEERING

During the visit at the institution, documents were received from the planning unit that provides current information on the enrolment of students in the college of engineering. From the analyses of the documents, basic statistics of students' enrolment by gender and faculty were indicated. The following graphs represent the percentage ratio between male and female students' participation in the engineering courses. Fourth year students of first degree in June 2011 enrolment were selected. The reason for present-

ing this descriptive analysis of the females and males enrolment ratio is to make the reader see the clear picture of the current situation.

FIGURE 1

Civil & Geomatic Engineering

FIGURE 2
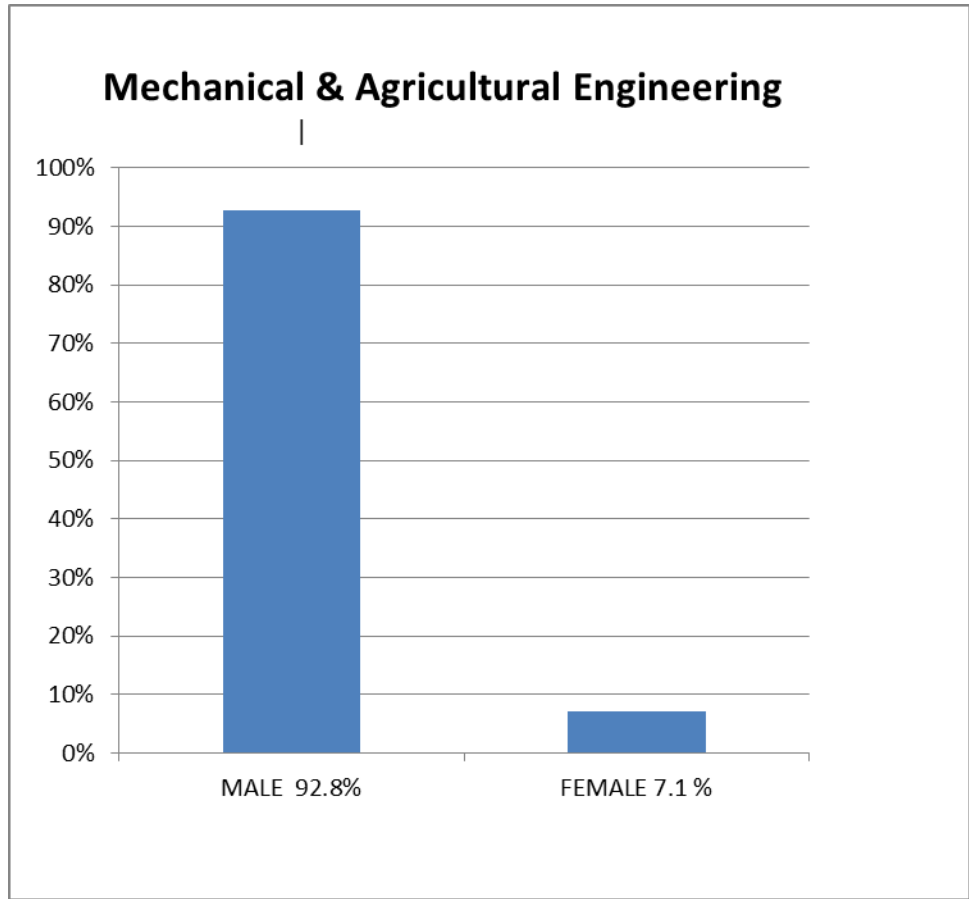
Computer & Electrical Egineering
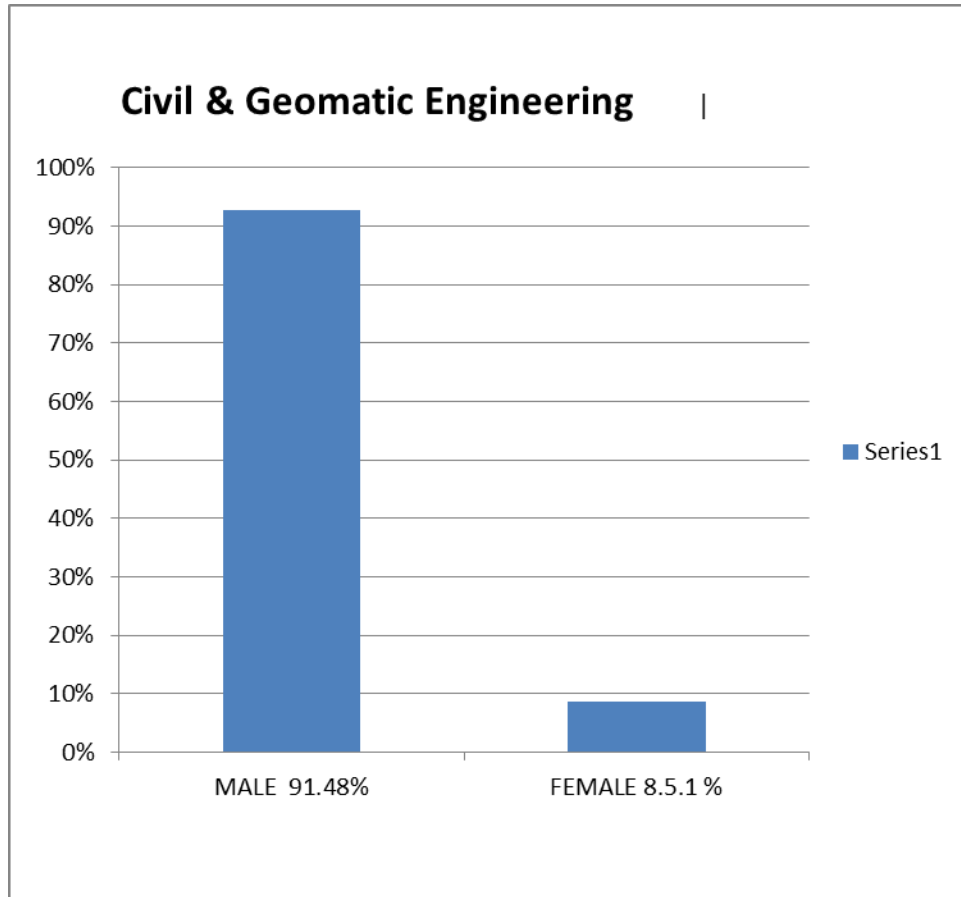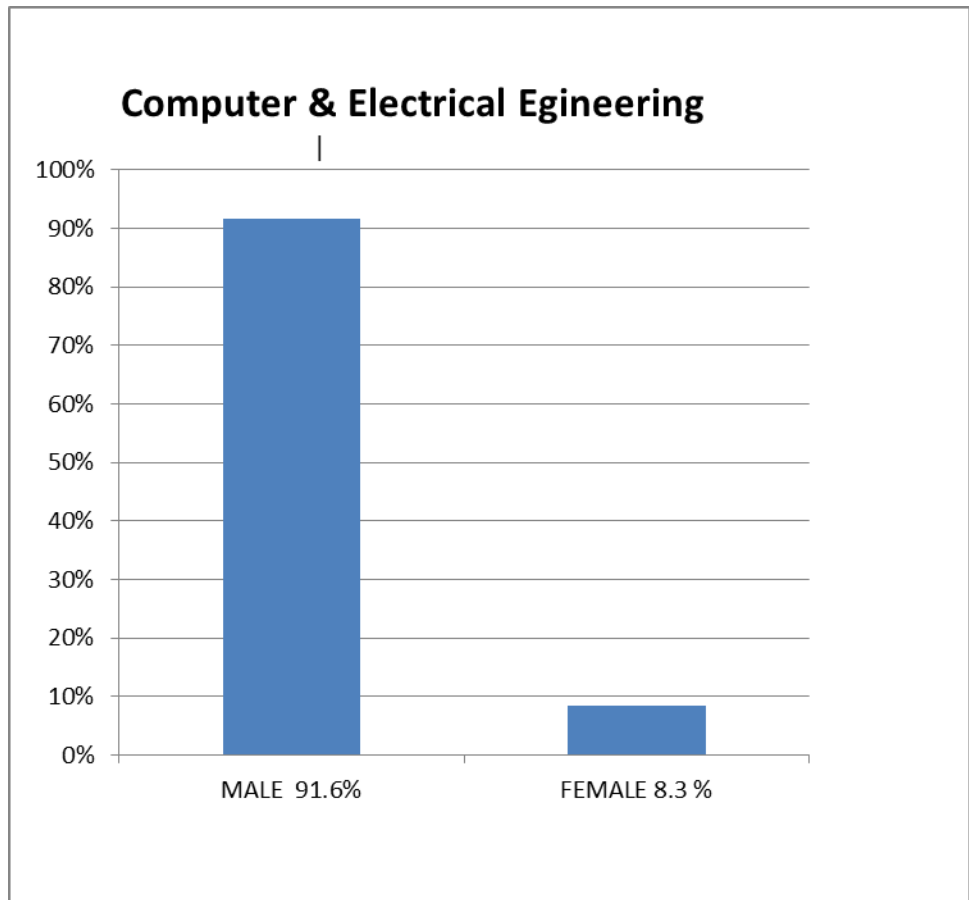
FIGURE 3

The following graphs above indicate females' erolment in the three faculties of the College of Engineering: Mechnical & Agricultural engineering, Civil & Geomatic engineering and the Computer & Electrical engineering. The graphs clearly shows that few females participate in the College of Engineering. Overall the females' participation rate constitute less that ten percent of the total participation rate whereas the males' participation form over nighty percent and above of the total population rate.

4.3 FEMALES IN STEM VIEW ON WHAT HAD BEEN THEIR MOTIVATION

Females in the engineering faculty expressed their views on what inspired them to pursue engineering despite the challenges females have been facing in the society. It was reviewed that they are the minority group in the field after they were asked to give the number of females in the various classes. Interviewee CoE1 said that 'she is the only female in the mechanical engineering class,' some were just three females the maximum number of females in the field was just five out of forty. It is interesting to note that among the females in STEM field that were interviewed; all of the four interviewees, came from the urban centers and cities of the country area, a higher education and financially sound background. This then turns to prove why Morley et al (2006) said, that despite the developmental growth in Ghana, a gap in higher education exist with respect to individuals' socio-economic background status, gender and regions of origin, the type and location of secondary school attended.

They admitted the fact that STEM disciplines are difficult to study being a female, the cost of teaching and learning materials are expensive and they often face the challenge of discouragement from people from the society even their instructors themselves. However when they were asked 'What has been their challenges in choosing a program under STEM field?', it was revealed that they share the same belief that the study of STEM programs is difficulty, expensive and that traditions of the society discourages females to study it, just as the females in non-STEM have held on to, but what they perceive is that though females are weaker vessels as the society believe, but females are able to cope with the males when they work extra hours. According to Interviewee CoE4, ' there is always something to prove in the STEM fields and that, naturally and physically women are weaker than men some time when they are on field she has to work twice as hard as men in order to catch up with the men.' Martin (2008) argue that the traditional society hold the perception that STEM subjects require physical strength; which is not true and that it is high time they do put away that mentality.

An Interviewee CoE3 supported this idea by saying that 'being a female in pursuing such program needs extra time sometime she hardly finds time for her hair, make-up

and not to talk of manicure and pedicure. In her case she grew up with dolls, bright colors and flowers but this is not found in the STEM fields, to her the activities in STEM programs seem different from how she was brought up with. Being a female she sometimes doesn't feel comfortable with the manipulation of knives, cards, boxes, cars and other learning equipment in STEM fields but, since it had always been her desire to serve as a role model and to break the male domineering of the program in the next generation she is studying engineering.' Interviewee CoE2 commented that in civil engineering it demands a lot of activities such as making two dimensional figures, multi-reaction and hand woods, which seems entirely different from how women are brought up in Ghana.

Interviewee CoE1 also added that, 'she got scared of not being able to perform well in studying mechanical engineering and, sometimes she asks herself what at all is she doing in such male-dominated program, when she realized that males are naturally good in drawing shapes and the manipulation of most of the learning equipment, but she said she just have to brush it off and move on.

A common factor that also emerged from the interviews was the desire to be role models as a critical motivating factor for females in the STEM fields. Role Model according to the American Heritage dictionary is a person who serves as an example of the values, attitude and behaviors associated with a role. It went further to talk about role models as persons who distinguished themselves in such a way that others admire and want to emulate them. People all over the world, learn and acquire skills by looking up unto other people they trust as models. All of the interviewees said they desire to serve as examples to the young females to develop interest in participating in STEM fields.

The Interviewees confirmed that inadequate number of female role models in STEM fields serve as impediments to the females' participation rate. For instance as it was mentioned by an interview CoE3 'In the Geometric Engineering: 'it's unfortunate that most of the great STEM discovery were men', she named Euclid as the father of Geometric, Plato, the great philosopher and mathematician and Aristotle the great scientist and a philosopher, which clearly shows that there is lack of female role models in STEM fields. It could therefore be said that the desire to role model by the interviewees was to

also motivate other young females to pursue STEM programs within Ghanaian society without fear or compromise. It could be possible that some parents especially mothers could influence the future of their daughters as they saw that change could only come when the mind-set of the mother is well prepared.

The interviewees do not see any difference between the females and males when it comes to academics. They added that during instructional hours females are able to compete with the males, there hasn't being a case where only females are failing while the males are excelling just as some females are scared of, they added that with practice and perseverance everybody can be made perfect be it male or female. All of the interviewees were proud to mention most of the females in the other STEM programs who have been performing better than the male counterparts.

After sharing their views, it could be concluded that with self-competence, devotion, efforts and encouragements from the persons as well as the society at large, every female can be able to excel in the STEM education.

4.3.1 Non-STEM females' view on why few females participate in STEM fields

From the faculty of business administration, females who were interviewed, expressed their views of not choosing STEM-disciplines as a result of certain cultural practices of the society that made them not to select these programs, they mentioned the belief of Ghanaian society, that, STEM disciplines are difficult to study therefore only males can study it, while social sciences, vocational sciences and humanities are easy to learn and so it must be studied by females, the notion that the cost of STEM programs are very expensive and takes a longer period to accomplished a dream come true and as such there is no need of spending so much funds on a female child, who will soon end up in a husband's home. One female continued 'she used to hear some of the males complaining that STEM programs are difficult, she added that if the males are struggling with the course how could she, being a woman, enter into such programs' (Interviewee BA3).

The above comments such as 'STEM disciplines are for males', ' it is difficult' and that it is very expensive have been the thoughts of the people in the society that have put fears

in most females to undermine their capability and this in turn causes them to avoid pursing STEM programs.

According to the interviewee BA1, 'a traditional belief that, the ideal role of the woman is found in the kitchen, gender stereotypes and the fact that there are few female role models in STEM fields contribute to females' inability to pursue STEM programs.'

A further view from interviewee BA3 shows that, 'in the olden days, people used to attribute any strange behavior to witchcraft. For instance, if you are a female who is fond of arguing for your views or you are fond of coming out with something new or different from what everybody is used to, then you are branded as a witch among your mates.' Therefore in order not to be different from what has been there already that STEM programs are good for males, as a female she will be compel to think of female-dominated programs but not male-dominated such as STEM programs.

Similarly, about the witchcraft, interviewee BA2 expressed that:
"In most rural areas, people still have the perception that it is a taboo for females to pursue STEM programs, because they have strong believed in superstition and witchcraft. Therefore for a female to study STEM clearly shows that she is possessed with some kinds of spirits that is backing her knowledge in that field so this discourages every other female in pursuing STEM." A further response was that 'the society has a mind-set of no matter how far a female reaches in education she comes back to the kitchen therefore there is no need of over spending or investing much money in females' education. STEM programs being expensive to pursue discourages the society to encourage females to study them (interviewee BA1).

Finally, one person added that to this point, that, 'It is not only rural areas that the people believe in superstition and witchcraft but the urban centers as well.' (Interviewee BA3). She gave an instance where her friend was branded as a witch even in the big city where they live with the only reason of studying mechanical engineering of which she was performing better than her male counterparts.

From the views presented on the reasons why few females participate in STEM programs, it was reviewed that some females follow the traditional beliefs by the Ghana so-

ciety to the highest point that even some of the lecturers hold on to this perception that females cannot study STEM programs. The utterance was evident in a response made by Interviewee BA3 that, 'the fact that males are finding it difficult in pursuing them, means that females cannot venture into STEM fields at all.' This supports Scott and Marshall (2005), view that tradition or modern cultures bears differently on-offspring or individuals because of the different socialization patterns that individuals learn as they grow up in these cultures.

 The attribution from both angles- society and females themselves could make it become stereotype in the sense that most females on the one hand, would see themselves as weaker vessel that they cannot carry out these difficult programs (STEM) as assumed by most Ghanaian societies that STEM courses are for males. On the other hand most people found in the Ghanaian society brand females pursuing STEM courses as 'witches' because they believe it is difficult and a program for males.

Despite the views that STEM programs are difficult, the non-STEM females confessed that they have come to realize that STEM programs place tremendous role in human lives as it enables people to broaden human understanding and learn to appreciate how nature works. Notwithstanding that, by the support of STEM programs it was reviewed that the traditions of the society have associated too much arguments and new discoveries from females with witchcraft, whereas modern societies consider these attitudes of females as the functions of STEM programs.

4.3.2 Societal attitude towards females' in STEM programs

In this area, views are perceived from females in STEM and females in non-STEM fields as emphasis is placed by the respondents on the views and attitudes displayed by Ghana society towards females pursuing STEM programs. The views highlighted on themes namely: parents discouraging females from studying STEM programs and instructors' attitude towards females in STEM education.

4.3.3 Parents discouraging females from STEM programs

When the question of how parents and instructors behave towards females studying STEM courses, response that came up from interviewee CoE2 revealed that females are discriminated by parents and instructors. According to this student, parents discriminate females in education in general, she expressed that: 'My mother used to engage me at the kitchen whenever I want to study; she leaves my brothers to study every time. If I utter a word my mother tells me that I am a female and I need to learn how to prepare dishes because after my education, I will marry and prepare food for my husband, but my brother is not going to prepare food for anyone. A woman will prepare food for him' (Interviewee CoE2).

This is a typical African idea which most Ghanaian dwell on to deny their female-child certain rights such as their education (Anamuah-Mensah, 2000). Instead of parents motivating and encouraging the male and female-child, most parents tend to encourage only the male child and leave the female. This could contribute to fewer females in higher education and to the extent of yet fewer females participating in the STEM programs in higher education institutions.

Another female from non-STEM added:

'My parents always give my brother more money than me any time we go to school. My mother often says I can manage mine but my brother cannot manage his.' She concluded by saying 'If my mother could say this, why can't she be convinced that once a girl can manage funds they can likewise be good at home management of the instead of being in school (An interviewee BA3).

Another one added that: 'My mother told me not to opt for STEM courses, since it does not provide job opportunities for females in the country especially females who get pregnant before searching for industrial jobs, she has said most industries do not employ females into their firms due to their nature of giving off duty excuse during the pre-natal, ante-natal and post-natal periods of live' (Interviewee BA2).

The interviewees CoE1,2,3&4 argue that if parents claim that females are good in home management then they must know that females can be good at every field of life if, only they are given the opportunity by the society. All the four interviewee wondered why

must parents discriminate and discourage females in pursuing certain courses in the academic field.

Based on the views stated by both females in engineering and business administration, it was noted that females are not only discriminated against in the study of STEM disciplines, but also in general education as a whole. A female in STEM, recounted her bitter experiences that her mother often engage her at the kitchen to manage household chores at the expense of her examinations preparation. She emphasized her mother leaves her brothers who had no intended examination to play football while she will be asked to manage house hold chores.

This seems to suggest that discrimination starts right from home where females are not treated fairly with the male counterparts. From their opinions and suggestion raised, it means parents need to encourage and motivate females in the STEM fields.

4.3.4 Instructors' attitude towards female students in STEM programs

This section captures how teachers interact with students during teaching and learning activities, female students in engineering were asked to share what happens during the teaching and learning hours on as to how most instructors make effort to favor males or discourage females to study STEM programs by paying more attention to male students than female students.

Several of the interviewees said 'there is no special attention given to females or males at lecture, they are treated equally, and the lecturers expect every student to work hard whether you are a male or female what is important is get the required grade. To their dismay, all the interviewees said they expected their instructors to give them extra time or attention since the society claims that females are weaker vessels. Some of the interviewees claim that they sometimes encounter discouragements from the lecturers, when they were asked 'If they have been every discouraged by any lecturer before?'

As perceived by one female:

'She had a female lecturer whom she expects to encourage her but rather always discourage her, she said her lecturer ones asked her what she was doing in the electric

engineering with her Islamic head gear on her head, she should be thinking of what she will be doing at her future husband's house.'(An interviewee CoE4)

There is the assumption that the kind of attitude portrayed by some instructors, even females' instructors, who are to be there as a motivation factor for young generate on rather discourage the females. This suggest how intensely some teachers discourage and discriminate against females from pursuing STEM programs.

In further instance another female affirmed that:

'She also had a lecture, if you are a female and you don't understand any aspect of lesson and you persuade him to go further, he will tell you that ' you saw a home economics course and you didn't opt for it, you better stop bothering me, you should realize that civil engineering is difficult and it will not be easy for females' (Interviewee CoE2).

This suggests that some instructors therefore seemed to have lower expectation from the females studying STEM program than males and, that females who perform below average are not taken seriously in a male dominated program. Hence the tendency to assists and motivate males in the program than the females. There is an assumption here that there are some Ghanaian literates as well as illiterate who do not know the value of education for females let alone the issues of females in STEM education. It could be finally suggested that instructors need to create opportunities for females pursuing STEM programs in order to challenge and encourage them to excel to the highest level in the development of the nation.

4.3.4 The Administrators' view on the policies governing females' participations in STEM programs

All the administrators that were interviewed said the institution does not have specific policies that encourage more female participation in the STEM program, when they were asked why there are no such policies for gender:

The registrar of the institution (KNUST) categorically stated that 'students are not discriminated towards admissions in the institute and he emphatically stated that admissions are based on merits of the individual applicant and that admission is also based on the quota allocation of the respective department. He also said that applicants are put

together and when they only admit students that fall within their cut off point of the grade. To him he argues that it was not their decision to admit few females and more males in the program (Interviewee A1).

The assistant registrar also added that:

'I think it's necessary for all to be given equal rights in other that some are not discriminated and when special priorities are given to the females the males too will feel discriminated, since education is the key to development and that in this respect priorities must be set right in other to be able to achieve the set objectives in this respect competent students must be selected. He also said gender equity is important but competence is most important than equity' (Interviewee A2).

A female registrar said she has not heard any university that has set policies to enhance more females' participation in the STEM program; she also said there had not been any policy since they established the institution (Interviewee A3).

From the administrators' point of view, females are not different from males when it comes to the selection of study programs, the admission of students into a particular program of study is based on the performance of that student and set out regulations that govern the retention of the student in respect to academic performance. According to all the three interviewees, what the institution is interested in, is to encourage every student to be serious with academic work, as it was mentioned by the interviewee A1 that there are equal drop outs in the STEM fields and that all sexes can be caught in the snare. This means that there has not been a situation whereby only females drop out from STEM fields. A lot of males have also been victims of dropouts. This shows that both males and females have equal learning ability in the STEM fields.

4.3.5 Summary of the findings

In sum, the findings were based on the three main themes: why few females participate in STEM programs, what has been the motivation of the females in STEM and the societal attitude towards females' participation in the STEM programs. Based on the synthesis of views obtained from the respondents, common views shared by both females in engineering and business administration were STEM disciplines are difficult for females

to study, very costly and that it is good for all students who are determine to study to work very hard irrespective of being male or female.

With respect to the societal attitudes findings from the respondents revealed traditional belief and misconception from families and people in the traditional Ghana society that, STEM is for males and females studying STEM courses are labeled as 'witches' were noted, and they serve as hindrances to females studying STEM. It was also revealed that inadequate number of female role models in STEM fields serve as impediments to the females' low participation rate. That all was not all, attitude of some parents also contribute to lower participation of females in the studies of STEM as said by one of the students that ignorance and gender stereotyping of some parents especially those with low educational background tend to discourage the female child from pursuing STEM education.

Finally it was revealed by the administrator that the institution has no policy that tends to favor females in pursuing STEM programs, and that one the registrars said the idea of a policy to encourage more females into STEM education will make the males feel discriminated since every student is entitled to equal access in the every program irrespective of gender.

4.4 DISCUSSION OF THE FIELD FINDINGS

4.4.1 Introduction

This section discusses and analyses the research findings as presented in the section above. A critical look will be taken by considering the three main emerging findings: why few females participate in STEM, what has been the motivation of females in STEM fields and the societal attitude towards females studying STEM programs, by taking note on the parents and instructors' attitude towards females in the college of engineering. Findings under these categories will also serve to the respondents on the topic: "Inequalities of Gender participation in STEM disciplines in higher education." The study tries to analyze and link the discussion of the field findings to the relevant reviews, theory and the previous concepts like stereotype that were stated in the chapter three.

The analysis will assist the emergent findings from the objective of the study. The next point is to discuss the first findings: why few females participate in STEM education and relate it to the findings: what is the motivation of females in STEM education then further proceed to the societal attitude which was in two sub folds parents and instructors. These will be discuss due to the fact that Ghana society is characterized by social agencies such as family, religion, culture, economic and political activities with converging ideologies which define the role expectations of females and males in the process of socialization (Andam et al., 2005). They were found in the study as the influential structures impeding females' participation in the study of STEM education. Therefore critical examination in this area will help to bring under control the emergent findings to facilitate solutions to the objectives and by so doing it will enable the phenomena to be understood.

4.4.2 The emergent findings of the participation rate in the STEM fields

From the descriptive statistics above (figures 1, 2 and 3), the graphs present the total enrolment of gender constituted the fourth year engineering students in 2010/2011. It was observed that, female students' enrolment is significantly lower as compared to the male students' enrolment in the fields. Apart from the fact that STEM programs are important to innovation and job creation, it enables the country in the competition of the global economy and also equips the learner with developmental and transferable skills to most industries in the world. As it was cited by the American first lady, 'If we're going to out-innovate and out-educate the rest of the world, we've got to open doors for everyone, we need all hands on deck and that means clearing hurdles for women and girls as they navigate careers in science'. First Lady Michelle Obama, 26th September 2001.

 Martin (2008) states that there is a need to do away with the mind-sets that STEM subjects require physical strength; STEM courses do not require any strength as presupposed by the traditional perspective.

This is the situation where gender roles have affected such an industrious field of study in the Ghanaian Higher Education. This then lead to the discussion on the gender roles in Ghana and in STEM programs in relation to power.

4.4.3 Gender and Power Relation

The traditional society views and places male and female in assigned gender role and decision making positions. This will describe how society denotes and ascribes tags on both genders. Giddens (2006) defines gender as the physiological, social and cultural differences between males and females and therefore linked to socially constructed notion of masculinity and femininity. This shows gender is constructed by the society based upon the physical nature and the roles assigned to both genders. Although the roles for males and females differ from culture to culture, and there is no particular society in which females are more powerful than males (Giddens, 2006).

Through the socialization process, children grew and are influenced by the traditional norm regarding gender. For instance, in Ghanaian homes and society, it is obvious that males are recognized as heads of the family and this gender (power) recognition is socialized right from home. As a result of the status of this recognition, when males grow they consciously or unconsciously internalized the status of male dominance and tag it as a norm for superiority to dictate and take decisions anyhow. A response from an interviewee CoE2 confirms the superiority and dictatorship of males. That was when whether she receives encouragements from her parents on her choice of program to study, the response given was that, the choice of her program was her father's decision and not herself. She further expressed that 'My father forced me to pursue mechanical engineering meanwhile; I had no interest in doing it' (Interviewee CoE2). This suggests traditional norms coupled with dominance from the home which impedes the right of the female to take her own decision as to which program to study. On the other an Interviewee BA2 remarked that, 'she was rather discouraged not to pursue STEM program by her parents with the reason of its difficulty for females in searching jobs after university. She said her parents believe that it is a 'masculine course'. This explains how some parents have tagged STEM disciplines as male possessed course based on their supremacy to influence their female child and deny them of their right to choose their preferred course of study and in decision making.

Research indicates that gender differences in STEM participation and achievement, though seems marginal in middle grades, moreover, become more substantial as stu-

dents' progress through higher education (Lee & Burkam, 1996). This means as females grow, they decline in the participation of the study STEM education. In this study when a question of which of the sexes performs better cropped up: findings indicated that both sexes are receptive to pursue STEM disciplines. However, several of the interviews in engineering said they work extra hours in order to catch up in class, and begin to lose confidence in them when lecturers start with new lessons. This may be linked and explained that females have been shaped to socialize through traditional laws and customs in order to carry particular gender roles (FAWE, 1999).

The behavior pattern and expectations for females in Ghanaian society could be said to contribute to females' lower participation in the study of STEM education. Findings in this study revealed that even the few females studying in the engineering programs were usually acquiring a cumulative weighted average (CWA) of first class and second class upper divisions. This evidence demonstrates that some females excel in programs; however, the societal misconceptions off dissuade females from pursuing STEM education. It can be argued that traditional gender roles assigned to females who find themselves in a traditional culture oriented like Ghana may suffer such marginalization in the access to education and the choice of programs. The Ghanaian societies have strong socialization structures which have contributed to females' lower participation in the study of STEM education. This then leads the discussion to barriers to females' participation in STEM fields.

4.4.4 Barriers to females' participation in STEM Disciplines

Some aspects of traditional norms, social and economic situations mostly determine females' capabilities to participate in certain sectors, for instance, in employment and particularly in education in most developing countries (Momsen, 2004). As a result there is an under-representation of females in higher education in general and, more dramatically in the STEM disciplines. Social and cultural norms surrounding females studying STEM programs and the believe that females are weaker vessels and are to conform to anything that comes, tend to limit females in their rights to education and their carrier choices.

Marshall (1985) idea that society holds certain expectations of women: they are expected to be attractive, passive, pleasant and modest) and that, of Slauenwhite et al. (1991), that women are expected to be co-operative, nurturing and dependent, show considerable empirical evidence on employers and heads of institution's discrimination against women. With the preconceived idea that lower productivity and higher absenteeism comes from females, most heads of institutions often reject applications from women when recruiting staff for job opportunities (Momsen, 2004). Similar findings in this study confirm how some heads of institutions deny females especially pregnant women opportunities in formal sectors. An instance is the expression made by an interviewee BA2 about how her mother advised her about the difficulty for females in search of jobs after education and that there is no need of spending so much on her education in a STEM program. According to Giddens (2006), one of the factors affecting women's carriers is the males' perception that for female employees, work comes second to having children. These stereotyped views from many Ghanaian leaders limit not only employment opportunities but also education and science education for females in particular (Momsen, 2004). This brings to light in the discussion of some of the traditional beliefs which serve as barriers to females' participation in the study of STEM disciplines:

4.4.5 The belief of witchcraft

In Ghanaian society, there is a belief that females are cognitively weaker compared to males. In view of that, a female student may be labeled in the society as a 'witch' when she is intellectually exceptional. From the interviews, one of the respondents, interviewee BA1&3 made mention of the tag 'witch' as a most common label assigned to brilliant females who perform well in the study of STEM programs. Most of the people in the Ghanaian societies hold the belief that STEM disciplines are difficult and it must be a reserve for males only. Therefore any female who settled in it and excel well is seen as someone who is possessed by supernatural powers and hence they begin calling her witchcraft.

The label witchcraft normally expressed in African context, for the case of Ghanaian society is described differently. There is no one set of meaning ascribed to witchcraft. With

its symbolic effects "witches are regarded as opponents to the natural order of harmonious community life" (Petrus and Bogopa, 2007:4). While Alston (2009) also viewed it as evil and for that matter, a person who possessed witchcraft is said to be evil, to cause harm to others. From these definitions, the first could be explained that witches try to challenge and work against natural order such as the cultural values and norms of the society. Therefore with this perception, it suggests that when female get the opportunity to pursue STEM disciplines, which is considered as a male program of study, they tend to challenge the natural order which could be either challenging the male counterparts. A female in STEM expressed her opinion that 'our society thinks that for a female to study engineering she tries to challenge the elderly' (Interviewee CoE3). As a result of the tag labeled to females, the fear of being stigmatized and victimized as witches shy them way from pursuing STEM education. This sometime discourages the females from participating STEM because the society we live in does not permit females to challenge the elderly (males).

According to Anamuah (2000), many females do not get the opportunity to pursue lucrative and prestigious carriers in science education due to societal perceptions assigned to females' education in general which is traditionally noted as being in the kitchen.

Based on these interviewees' responses what would happen if this witchcraft continues to be used against females' participation in STEM disciplines? This negative sort of tag labeled against females when they excel kills the interest and discourages these females from participating in STEM education to the highest level and this in turns contributes to the inequality of gender participation in STEM disciplines.

4.4.6 Societal attitudes: beliefs and Practice

The expectancy value theorists review that peoples' choice of programs, their persistence in that program and their performance are strongly determined by their beliefs, they hold the believe that gender is affected by norms of specific cultures (Eccles, 1993 as cited in Jacobs and Simpkins, 2002). In the examination of this model the following findings were revealed in the case of lower presentation of females in STEM disciplines in Ghanaian higher education.

Findings from both females in STEM and non-STEM revealed that most Ghanaians, more especially parents and instructors do discriminate against females in pursuit STEM programs. Here is the case where an interviewee CoE2 revealed her bitter experience whereby her mother keep on discouraging her from studying by engaging her in the domestic chores. She emphasized, her mother always tell her that no matter how far she reaches in education she will only come back to the kitchen to prepare food for her future husband. As a result she leaves her brother to study. This could be supported by Heady (2003:387), that 'girls in Ghana report almost twice as many hours of domestic work than boys' This suggests that females in Ghanaian society are most often engaged in household chores due to the intend duties expected from women as future wives, unlike their male-counterparts who even have all the time by themselves. Furthermore, it is estimated in the Ghanaian homes children under the age of fifteen years are used to labor for the family by assisting parents in the household chores as mean of an apprenticeship for their future homes rather than going to school. This kind of practice is especially observed in the south rural areas and in the northern part of Ghana (Stephens, 2000). This creates the assumption that some parents perceive females' education ends at the kitchen and therefore need not to bother themselves with studies much less STEM disciplines.

That was not all, an interviewee BA1 also reveal that her mother always maintained she can manage the little funds given to her better than her brother, so her mother gives more money to her brother whenever they go to school. With this line of attitude of some parents, it seems to suggest that some parents favored and provide more money to their male child to encourage them to study and on the other hand tend to relegate girls to endure whatever situation they find themselves in. This goes with Kelly's (1987), assertion that society (parents & teacher) demands conformity to its fundamental values and norm, and therefore assign specific roles to each of its members, expecting them to conform to specific behavior pattern. It can be argued that the idea that a female-child can manage funds is good enough reason for them to be encouraged to study an essential course such as STEM disciplines which has rather been gendered. Why then must some parents discriminate and discourage girls from pursuing STEM programs?

Mastekaasa et al (2008) claim that females' choices to pursue courses in the higher education are most often centered on the traditional disciplines which are humanities, social sciences and social professions. The Biglan's scheme offers the overview of the various disciplinary cultures; of which he classifies humanities and social sciences as Soft Pure disciplines and social professions as Soft Applied (Becher, 2006).

The fact that females are seen as home makers, they are channeled to traditional disciplines whereas male are favored and trained is superior and this is a patriarchal authority which most Ghanaians rely on and denies their female child their rights.

From the findings it was revealed that 'In Ghanaian societies, some parents perceived STEM programs as a preserve of males' (Interviewed female in STEM). This then sensitized a reflection on the concept of marginalization, where in the context and for the purpose of this study is used as an exclusive mechanism whereby most members of in traditional Ghanaian society used to exclude females from formal education, more especially STEM education. This is a way most Ghanaian parents act to prevent females from pursuing STEM education. However, as Momsen (2004), clearly describes the concept marginalization in different dimensions, it makes the concept serve as a descriptive tool based on its usage in a context. For the purpose of this study, It can be deduced from the statement that people think STEM programs are masculine gender courses and that males could do them better than females is just a construct to exclude females from pursuing STEM education. It could be false construct, because findings from this study revealed that some females performed better than some males. The arguments by feminist theories within constructivism that gender identity is not a role that is possessed, nor something born, but gender is created in social interaction is agreed by the researcher in the sense that both gender whether male or female, could pursue STEM education and succeed once the individual is positively interaction and made to pursue STEM education.

Ghanaian traditional culture places value on males and favored the masculine line. That is, it seems to concentrate on male dominance and gives rise to unequal gender reverence. The norm in the Ghanaian traditional culture placed males on a higher position which is indescribable. This assertion is in line with Bourdieu (1998) view that mecha-

57

nisms of power and oppression are results of cultural arbitrariness, and these are not exercise internally by men against women. Usually, women unconsciously contribute to their own devaluation of self and underestimate themselves by abiding with the male dominated culture (Smehaugen, 2001). This idea could be found in the interviewees' beliefs that females are weaker vessels and because of that there are certain activities that only males can perform better than females. For instance the response made by interviewee BA3 that 'the fact that even males are struggling in pursuing STEM disciplines means that females cannot enter into such fields of study. 'The oppressed, the excluded and exploited in any system that builds on oppression, exclusion and exploitation accept unconsciously the (…) image of self that the dominating has put forward' (Smehaugen, 2001:79).

In Ghanaian society communism (collective dependence) is valued above individualism and complete independence as found in modern society, females in particular tend to live in a 'double-blind' as a result of their self-identity, which is described less successful and valuable (Smehaugen, 2001). The 'double-blind' used in this context for the purpose of this study meant, females are seen as conformers to the patriarchal authority and are limited on their right in the traditional society. That is to say, based on patriarchal authority, some parents have limited females in their choice of studies as they have made females as conformers to traditional orders (norms). For instance, females are assigned to be home-makers, and baby sitters. Interaction with a female student in STEM revealed that some elderly use patriarchal cultural pattern when dealing with their females to deny them their rights to educational opportunities. Some members of Ghanaian traditional society are highly particular of some values of prevailing culture and then seek to exercise it against the female gender. It is with this reason that the feminist theorist attached its deeply ingrained patriarchal bias (Sheba, 2005). This is why equality feminist theorists argued that 'women should be as free as men to determine their social and educational roles' (Weiner, 1997:145).

Expectancy Value theorists believe that individual's expectations for personal value attached to a task is influence by social factors such as the satisfaction derives from the

society and the encouragement or discouragement from an individual's parents, counse-lors, friends or the group the individual is in Eccles in (Jacobs and Simpkins, 2002).

It can be argued that the existing social factors like patriarchy are societal practices and invention. This study has demonstrated how societal practices like stereotyping and gender roles expectation have affected most Ghanaian females in the study of STEM education. With the more of these surrounding influences and impediments challenging females' participation in STEM programs the discussion is preceded on to what has been motivating the few females in the STEM education.

4.4.7 What is behind the success of females in STEM fields?

Based on the information obtained from the respondents that is females in STEM fields, it could be suggested that parent's education is very crucial, because parents' educa-tional background have a great impact on their children's education, more especially fe-males. The background information of the respondents' parents' level of education re-vealed that none of them had a parents' level of education below higher education. Most of the females had at a mother or a father with a doctorate degree in education. In this case it could be deduced that highly educated parents in Ghana have the desire and the interest to afford the cost incurred on their wards' education no matter that ward is a fe-male or a male. It was noted that parents of highly educated background value the need for education for all kids, guide and encourage their females to study the program of their choice without any flimsy arguments to prevent the female-child from studying STEM disciplines. This can be supported by Momsen (2004), that educated parents do not assumed that investments in females' education is waste of money.

Apart from the respondent's parental background of education, it was also revealed that, all the females come from financially sound homes, live in the urban centers of the coun-try. From the interaction with these respondents it was revealed that the interviewees are more concern with individualistic, innovation and believe in the dynamics of the Ghanaian culture. They expressed their habit of individuals' achievement rather than communal achievement. These shows the few females in the STEM fields really disap-prove the traditional cultures which has molded peoples' beliefs and behaviors even in

the choice of educational programs. These females hold on the concept of modernity but not the concept of traditions of the people of Ghana. Tradition and culture are basically linked to how gender role are constructed within Ghanaian schools in particular the way females are trained have made them shun away from pursuing science courses (Dei, 2005). This then supports why Quicke (1996), describes modernity concept as the idea of freedom from traditional authority given rise to widening opportunity for self-development and self-fulfillment. Therefore females in STEM fields made it because they were liberated from the traditions of the Ghanaian cultures.

Finally the interviewees were asked why are they not discouraged from pursuing this program since most of the Ghanaian societies disapprove females' education in STEM disciplines, they answered that, it's not all individuals that are easy to be influenced and are compelled to accept issues anyhow, they went on to say that sometimes, it requires the individual to take a stand on their interest in the choice of study. This expression made the females in STEM disciplines really portray their interest and their determination in the pursuit of the program they have chosen regardless of the negative influences surrounding females' participation in STEM education.

4.4.8 Why are there no policies by the institution as far as STEM-disciplines for females are concerned?

From the findings of this study, the respondent's expressions revealed that the inequalities that persist in the STEM disciplines follow much of the structural discrimination in the Ghanaian society. It was shown that both males and females are tackled by the surrounding influences of the traditional cultural practices, which have forced them into behaviors that specially disadvantage females in the society. The choice of programs, the expected jobs taken is usually based on these stereotypes. As a result of this the students who do not stick to the typical male or female behavior are likely to face unequal treatment and discrimination from the society and the looser of the patriarchal academic system are females. The situation of the country requires strategies such as a policy document by the institution in order to fight the existing exclusion in the country. KNUST as a higher education institution in the country is seen as an institution that plays a key

role in shaping the Ghanaian society in the building of active citizens. Almost all the people of Ghana that occupy powerful positions in the country's growth and development have a background in higher education. In this case KNUST has a very long impact on the gender equity within the Ghanaian society; therefore the institution can be in the best position to fight for gender equal environment in the STEM disciplines that preserves equal chances for both females and males. This then led to the researcher's interview with the institution's administrators as to what kind of strategies the institution is putting in place for the inequality of gender participation in the STEM disciplines. Findings from all the administrators revealed that the institution has no policy that can create opportunities for females in the STEM disciplines. It was made clear that the institution does not see the urgent need to improve the situation of females and males in the STEM fields. They emphasized that, there is no need of making any policies regarding female's participation in STEM education with the reason that females are not different from males when it comes to academic work. To them priority is only given to the individuals' performance but not the gender of that individual.

Again when the administrators were asked whether they have heard about any other institutions with the policies that seek to include more females into STEM disciplines, a no was the answer from the administrators. It could be suggested that as a higher education institution, it has to realized the role of higher education by creating equal opportunities for all people by stressing on the importance of affirmative action to overcome the actual gender based discrimination in the STEM disciplines by making active measures from the institution in order to reach gender equity in the STEM fields.

4.4.9 Conclusion

In sum, Ghanaian cultural practices have negatively impacted females' success in education and to the greater extent contributed to inequality of gender participation in the STEM disciplines. Ghanaian traditional society's misconception that women's role is at the kitchen has impacted most Ghanaian women's formal education to the higher level in general. The few who had the opportunity to go to the higher education too were dictated to and directed to pursue traditional disciplines such as food science, social sci-

ences and humanities faculties. Meanwhile, those who had the opportunity to pursue STEM disciplines to were not encouraged at home and even at the university. Again some of these females are loaded with domestic chores by parents who caused them to be exhausted and as result they do not get the ample time for studies and therefore they have to go extra mile in their academic works.

According to FAWE (1998), illustrated that females are socialized to be aware that males are breadwinners who need to be matured independently, to defend them and fend for their family. Apart from the experiences these females face at home and in education, some of the instructor's attitudes had also contributed to female's under-representation in STEM disciplines and the institution too have neglected the need to ensure a fair balance of gender participation in the field. Giddens (2006:463) explains the hegemony as 'the social dominance of a certain group, excised not through brute force, but through a cultural dynamic which extends into private life and social realms.' The study had clearly demonstrated how power relation had contributed to females' lower participation in STEM education since traditional socio-cultural beliefs and instructional practice perpetuate hegemony and, are rooted not only at home but also in the higher education institution. Gender inequality in STEM disciplines favored males, as they are encouraged by the society.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter provides a summary of the study and the findings made, conclusion drawn from the findings. It also presents recommendations for practice.

5.1 OVERVIEW OF THE STUDY

This study was concerned with the inequality of gender participation in STEM disciplines in higher education in Ghana. The study was a case study at the Kwame Nkrumah University of science and technology (KNUST), respondents were drawn from the University administrators, females from the college of engineering and females from the business administration program, the instruments used for the collection of the data were interviews and document analysis. From the theoretical perspective, education aims at bringing and fostering positive and permanent change in the individuals' lives to make an informed decision and choice to be able to succeed in professional endeavor. It explained how societal beliefs about gender influences choice, persistence and performance of the activity in higher education institution. Wigfied & Eccles (1997), argue that individuals' choice of program, their persistence and their performance in that program can be explained by their beliefs about how well they will do on that program or activity and the extent to which they value that program or activity. Female's low participation in STEM fields is influenced by Ghanaian social construct and practices like STEM disciplines in most of the higher education institutions were perceived to be for male students. However, this perception influenced some females more than other due to factors primarily linked to parental background of education.

The main focus of this study was to explore and analyze the situation of females in STEM education in higher education in Ghana. Females from one of the STEM fields, the engineering faculty and, females from a non-STEM field, business administration and the University administrators were interviewed to solicit their views to present the findings of the study in relation to the inequality of gender participation in STEM disciplines. The issues examined were the reasons why few females participate in STEM fields, factors that motivate females in STEM fields and the societal attitudes: how parents and the instructors behave towards females in STEM fields.

5.2 KEY FINDINGS

The following findings emerged from the data analyzed:

From the analyses of the document received from the planning unit of the institution, a statistical descriptive analyses were provided to illustrate the participation rate of males and females in the college of engineering, the graphs revealed that all the females' participation rate in the engineering programs fell under ten percent of the total participation rate whereas males formed ninety percent and the above of the total participation rate.

5.3 FEW FEMALES PARTICIPATE IN STEM FIELDS BECAUSE OF THE FOLLOWING GHANAIAN PERCEPTIONS:

From the overall study's findings show Ghanaian society hold the belief that the cost involve in the training of students in the STEM programs is too expensive to be spent on a female-child who in no time, will have to get married and manage the affairs of her marital home. Again the society believe that the program structure of STEM disciplines is too complex and difficult for females to study, therefore they encourage males to study it while discouraging females who are not privileged to be guided by parents with sound educational background from pursuing it. This was stressed by Katjavivi (1998) that developing societies have social structures that pressure women to start family ahead of professional conditions.

Furthermore, the power relation between Ghanaian males and females as well as traditional norm exercised in the society has caused females to believe and accept the gendered role assigned to them. For instance, the ideal role of a female is to perform domestic chores such as nurturing and cooking have hindered most females from pursing STEM courses. The preservative traditional norm like patriarchy and family preference had led to discrimination and unequal treatment of males and females, that females are marginalized in the larger society (Andersen, 2006). The traditionally constructed gender roles have affected females' choice of field of study; rendering females with low self-esteem among themselves.

Inadequate female role models in the STEM fields have been noted as part of the contributing factors to fewer females in the study of STEM programs. As the females rarely see more males STEM education, they do not experience the motivation to be enrolled in STEM fields since there is no drive from female role models. Lack of recognition to women in STEM fields has been circulated to have contributed to inequality in STEM education. Beede et al. (2011) comment that females with STEM degrees are less likely than their male counterparts to work in the STEM carriers due to factors such lack of female role models, gender stereotyping and less family-friendly flexibility in the STEM fields.

.

5.4 FEMALES IN STEM FIELDS WERE MOTIVATED BY THE FOLLOWING REASONS:

The study demonstrated that some of the Ghanaian females who pursue STEM programs were motivated by different ideology from the traditional societies. They come from sound educational parental background. The parents of these females are more concern with individual's achievement rather than communal. They have held on to modern cultures instead of the Ghanaian traditional cultures. These parents encourage every child to pursue STEM programs whether a female or male child. Again several of the females live in the urban centers of the country. None of them had a poor background.

As a result the parental support, females in STEM fields have held on to believe that, with hard work, effort and perseverance they are able to compete with their male counterparts in this field of study. The females desire to serve as role models to the young generation in future.

5.5 SOCIETAL ATTITUDE: (HOME AND THE INSTITUTION) TOWARDS FEMALES IN STEM FIELDS WERE THE FOLLOWING:

Traditional beliefs and social constructs by the families and the communities have made STEM programs a gendered course. Family's preference to male education had rendered some females lower in the educational background. Gender biases shown by some instructors also contributed to female's low participation in the STEM fields. It was revealed that even female instructors discourage female's students in the program while some instructor encourage only females with above average Intelligent quotient (IQ) and discourage females with below average IQ.

Lastly, the study demonstrated that there is no policy document by the institution that cater for gender differences in relation students' choice of program and academic performance in all of the educational programs of which STEM disciplines is not an exception.

5.6 CONCLUSION

From the findings of the study, it has demonstrated that inequality of gender participation in the STEM disciplines is surrounded by complex societal constructs which is experienced from the broader social structures: namely from home and the institution. Statistics from the visited institution have shown greater gender differences in enrolment in the STEM fields whereby, females were noted to be under-represented.

Based on the synthesis of the views from the respondents, it could be concluded that barriers to females' representation in STEM fields are noted as: Traditional beliefs and social constructs of the role of females by families and communities within the society at

large. In this case, people have preconceived ideas. Ghanaians believe that females are home-makers and must conform and submit to orders (Kelly 1987) and that they could by no means compete with males. Giddens (2006) asserted that there is no known society in which females are more powerful than males in enforced in the Ghanaian is enforced in Ghanaian traditional society. These prejudices from home, institution and other members from the larger Ghanaian society tend to hinder females' choice in education career.

Traditional practices like gender stereotyping, gender role expectation and misconceptions are still embedded and sustained in the modern society and has perpetuated by the institutions which needs to be rather induce change (Giddens, 2006). This has brought the case of Ghanaian females' education ending at the kitchen and that investment in females' education and more so STEM courses is a waste of fund was noted as a perception to the Ghanaian society. This preconceives idea challenge the Global Millennium Goal three: which held the promise of promoting gender equality and empowerment of women, with the target of eliminating gender disparities in all levels of education.

Furthermore females in STEM fields accepted that they face so many challenges however these challenges do not affect them in pursuing the program. They adopted strategies that made them function as a Ghanaian female and to cope with the stress in pursuing the STEM program therefore they are able to compete with their male-counterparts in the teaching and learning process.

In sum, based on the responses from the respondents, considering the responses from females from the one of the STEM fields, engineering, it can argue that the value that females in the STEM fields place on the program is heavily influenced by their parental educational background whereas, responses from females in non-STEM fields' choice of a non-STEM program can be explained by the beliefs and traditions of the Ghanaian society.

REFERENCES

Addae-Mensah (2000). *Education in Ghana: A tool for social mobility or social stratification?* Ghana. Ghana University press.

Amedekye, E.Y. (1970). *The culture of Ghana (A Bibliography) Accra*. Ghana. Ghana University press

Anamuah-Mensah, J. (2000). *The race against under development: A Mirage or Reality* Accra: Ghana. Ghana University press.

Anderson, E. L, and Kim, D. (2006). *Increasing the Success of Minority Students in Science and Technology.* USA. American Council on Education press.

Andam, A.B., Amponsah, P.E. and Kaufmann, E.E., (2005*). Women in physics in Ghana: Improvement on the Horizon*. America. Springer.

Aidoo, A.A. (1995). *Women in the history and culture of Ghana: Women's studies with a focus on Ghana.* Germany. Schriesheim press.

Assié-Lumumba N. T. (2008). *Higher education as an African public sphere and the university as a site of resistance and claim of ownership for the national project*. Cameroon. CODESRIA press.

Balaji G, Olson C., Imani D., Edie F., Kantor J. S., Robinson L. Y., Babb G., Arielle G. (2014). *Women in STEM: Realizing the potential*. USA. STEMconnector publishers.

Becher, T. (2006). *The significance of disciplinary differences, studies in higher education.* Sussex. SAHE Publication.

Beede D., Tiffany J., Langdon D., McKittrick G., Khan B., and Doms M., (2011). *Women in STEM: A Gender Gap to Innovation*. Washington. Springer.

Bourdieu, P. (1998). *Distinction: A social critique of the judgment of taste*. Routtledge Press. London

Bryman, A. (2008). *Social Research Methods*. (3rd Ed.) . U.K. University press

Carr Rebecca (2013). *Women in the Academic Pipe Line for Science, Technology, Engineering and Math*. USA. AAUDE press.

Cohen L., Manion L., and Morrison K., (2007). *Research methods in education.* New York. Routledge press.

Dei, G. J. S. (2005*). The challenges of inclusive schooling in Africa.* South Africa. Elsevier Ltd.

Diekman A. B. and Eagly A. H. (2010). *Social Structure*. New York. Sage publishers.

Dovidio J. F. and Helb M.R. (2005). *Discrimination at the level of the individual: Cognitive and affective factors.* New Jersey. Erlbaum Press.

Dovidio, J. F, Hewstone, M., Glick, P and Esses, V. M. (2013). *Prejudice, Stereotyping and Discrimination: Theoretical Overview*. USA. Sage.

Eagly A. H. and L. Carli. (2007). *Through the labyrinth: The truth about how women become leaders*. U.S.A. Harvard Business School Press.

Eagly A. H. and Diekman A B. (2008). *What is the problem? Prejudice as an attitude in context.* United Kingdom. Blackwell publishing Ltd.

Eccles J. S. (1993) *School and Family Effects on the Ontogeny of Children's Interests, Self-Perceptions and Activity Choice.* Lincoln. University of Nebraska Press.

Eccles, J. and Barber, B. (1999). *Student council, volunteering, basketball, or marching band:What kind of extracurricular involvement matters?.* Germany. Sage publication.

Eccles. J. S. and Gootman, J. (2002). *Community programs to promote youth development. Washington.* National Academy Press.

FAWE (1998). *Gender analysis for Educational policy making: A workshop manual. Kenya: Forum for African Women* Educationalists Kenya. FAWE Press.

FAWE (2008). *Strategic plan 2008-2012*. Kenya. FAWE Press.

GES (1998). *Gender Matter Report.* Ghana. Woeli press.

Giddens A. (2006). *Sociology* (5th Edition). Cambridge UK. Polity press.

Ghana Statistical Service (2012). *Population and housing census* Ghana. Accra. Sakoa Press.

Gyekye, K. (1997). *Tradition and Modernity: Philosophical reflections on the African Experience. New York.* Oxford University Press.

Hesse-Biber S. and Carger, G. L. (2000). *Working women in America*: USA. Split Dream Press.

Houston, L.S (2003). *It's a Man's World: Overcoming Barriers to Female Education in Ghana.* USA. Digital collection press.

Hyde, J.S. and Lindeberg S. M. (2007) *Facts and assumption about the nature of gender differences and the implications for gender equi*ty. New Jersey .Lawrence Erlbaum Associates publishers.

Manuh T., Sulley G., and Budu, J. (2007*). Change and transformation in Ghana's publicly funded universities*. Partnership for Higher Education in Africa. Ghana. Woeli publication.

Marshall, C. (1985). *Women in Administration. The Journal of educational thought*. Sage Publication. London.

Mastekaasa A. and Smeby J. C. (2006). *Educational choice and persistence in male and female-dominated field fields.* Germany. Springer.

Millennium Development Goals in Ghana (2010). *A new look at the data from the 2008 Ghana demographic and health surve*y. USA. Springer.

Jacobs, J. E. and Simpkins, S. D. (2005).*Mapping Leaks in the Math, Science, and Technology pipeline*. Spain. Wiley publishers.

Kwesiga, J. C. and Ssendiwala, E. N. (2006). *Gender mainstreaming in the university context: Prospects and challenges at Makerere University, Uganda.* Women's Studies International Forum. UK. University of Sussex Publications.

Kelly, A. (1981). *The missing half: Girls and science education. United Kingdom*. Manchester University Press.

Kelly, A. (1987). *Science for Girls? Why girls don't do Science*. England. Open University press.

Kuenyehia, A. (1995). *Women and law: Current status of teaching and research in Ghana. Germany*. Schriesheim press.

Martin, L. (2008). *Power continuity and change: Decoding black and white women managers experiences in local governmen*t. London. Routledge Press.

Millennium Development Goals Report. New York. United Nations Department of. New York. Public Information press.

Miller, A. and Katz J.H.(2009). *The inclusion Breakthrough: Unleashing the real power of Diversity.* California. Berrett-Koehler Publishers.

Ministry of Education. (2012). *Education sector performance report*. Ghana. MOE Publishers:

Ministry of Education, Science, and Sports (2010). *Education sector performance report 2010*. Ghana. MOE Publishers:

Monsen, H. J. (2004). *Gender and development*. New York. Routledge press.

Morrison, A .M. White, R .P, Van V. E., and The Center for Creative Leadership (2006). *Breaking the glass ceiling, can women reach the top of America's largest corporations*? Chicago .Springer.

Moser, L.O.N. (2003). *Gender planning and development: Theory, practice and training.* Hong Kong: Macmillan Press.

National Commission on Culture (2004). *The cultural policy of Ghana*. Ghana. NCC press.

Osei-Assibey E. and Grey K. S. (2013). *Millennium Development Goals in Ghana*. Ghana. Ghana Statistical Service Press.

Petrus, T. S. and Bogopa, D.L. (2007). *Natural and Supernatural: Intersection between the spiritual and natural worlds in Africa Witchcraft and healing.* Canada. Phil papers publishers.

Quike, J. (1996). Self-Modernity and a Direction for Curriculum Reform. *British journal of Educational Studies.Vol.44,No4, pp. 364-376* . UK. Blackwell Publishers Ltd.

Republic of Ghana (2002). *Meeting the challenges of education in the twenty first century (Report of the President's committee on review of education reforms in Ghana).* Ghana. Adwinsa Publication.

Saddler, D., and Saddler, M. B. (1994). *Teachers, school and society*. McGraw-Hill Press. New York.

Simpkins, S. D., Davis-Kean, P. E. and Eccles, S. (2006). *Math and Science Motivation: A longitudinal examination of the links between choices and beliefs*. USA. Springer.

Scot, J. and Marshall, G. (2005). *Oxford Dictionary of Sociology*. Oxford. Oxford university press.

Serpell, R. (1993). *The significant of schooling Cambridge. Cambridge* .Cambridge University press.

Sheba, G. (2005). *When Women come first: Contradictions of Gender.* Los Angeles. University of California Press.

Slauenwhite, E.A. and Skok, R.L.(1991)*. Women in administration: Where are they*? Academia. USA.

Smehaugen, A. (2001). *Inclusion and Exclusion in culture, Learning and Education. A European perspective: The cases of Spain and Norway. Studies in Comparative and International Education,* Institute of International Education. Stockholm. Stockholm University press.

Stephens D. (2000). *Girls and basic education in Ghana: a cultural enquiry*. Germany. Researchgate.

Tsikata, D. (2001). *Gender training in Ghana politics issues and Tools*. Germany. Springer.

UNDP, NDPC/GOG (2010). *Ghana millennium Development goals Report July 2012. Ghana.* ClayDord Enterprises Ltd.

UNESCO (1998). *World Declaration on Higher Education for the Twenty-First Century: Vision and Action. Adopted by The World Conference on Higher Education.* Paris. UNESCO Press.

UNESCO (2009). *World Conference on Higher Education: the New Dynamics of Higher Education and Research for Societal Change and Development*. Paris. UNESCO Press.

UNESCO (2009). *Overcoming Inequality: Why governance matters education for all global monitoring report 2009.* London. Oxford University press.

Valerie E. Lee and Burkam D. T. (1996). *Gender differences in middle grade science achievement: Subject domain, ability level, and course emphasis*. USA. John Wiley and sons inc.(Press).

Weiner, G. (2007). *Conference report, Gender and education in the 'New' and 'Old' Scotland. Centre for Educational Sociology*. Edinburgh-UK.University of Edinburgh Press.

WHO (2010). *Gender, Women and Primary Health Care Renewal*. USA. WHO publications.

Wigfield, A., Eccles, J. S., Yoon, K. S., Harold, R. D., Arbreton, A.,Freedman-Doan, C., et al. (1997). *Changes in children's competence beliefs and subjective task values across the elementary school years: A three-year study*. USA. Gabby Chu publishers.

Wigfield, A., Eccles, J. S., Mac Iver, D., Reuman, D. A., & Midgley, C. (1991*). Transitions during early adolescence: Changes in children's domain-specific self-perceptions and general self-esteem across the transition to junior high school*. Germany. Springer.

World Bank (2002). *Constructing Knowledge Societies*. USA. World Bank press.

World Bank (2009) *Accelerating Catch-Up: Tertiary Education and Growth in Sub-Saharan Africa.* Washington: World Bank Press.

Website/Internet sources

Gorton R. and Alston J. (2009). *School leadership and administration*. (8th Ed.). New York. McGraw Hill http://www.ohchr.org/EN/PublicationsResources/Pages/Publications.aspx. Retrieved on the 20 February; 2014

Hilton, J. L., and Von Hippel, W. (1996). *Stereotypes. Annual Review of Psychology, 47, 237-271.* Retrieved on the 10 April; 2014
http://www.ncbi.nlm.nih.gov/pubmed/15012482?dopt

Katjavivi, P. (1998). *Women and higher education issues. Paper presented at the world Conference on Higher Education*. Paris, France. Retrieved on 10 March; 2014, from http://unesdoc.prg/images/0011/001166/116618m.pdf

Morley, L., Gunawardena, C., Kwesiga, J., Lihamba, A., Odejide, A., Shackleton, L., and Sorhaindo, A. (2006). *Gender equity in commonwealth higher education: Emerging themes in Nigeria,* South Africa, Sri Lanka, Tanzania and Uganda. Department for International Development. Retrieved from http://94.126.106.9/r4d/PDF/Outputs/ImpAccess/Educationalpaper_65.pdf

Morley, L., Leach, F., Lugg, R., Opare, J., Bhalaluses, E., Forde L. D., Mwaipopo, R. *(2007). Widening participation in higher education in Ghana and Tanzania: Developing an equity scorecard (An ESRC/DfID Poverty Reduction Programme funded Research Project).* Retrieved on 3 June; 2014 from *http://r4d.dfid.gov.uk/PDF/Outputs/ESRC_DFID/60335-working_paper_1.pdf*

Sithole Josiah Chaonwa, Lilian Manwa, and Lokadhia Manwa (2013). *Gender equity in education: An analysis of perceptions of Masvingo urban female students, parents and teacher towards the maternity leave policy for high school girls in Zimbabwe*. http://www.academicjournlas.org/JASD. Retrieved on the 10th August 2014.
Retrieved on the 2nd June 2014 http://www.jstor.org/stable/3121909

APPENDIX

INTERVIEW GUIDE FOR THE STUDY

Personal Information

Residence:

Sex:

Field of Study:

Siblings:

Family Background:

Financial Status (100-10)

Semi-Structured Interview with Students in STEM fields, Students in Non-STEM and the Administrators.

STUDENTS

How many males and females are there in your class?

What made you choose a program under STEM fields?

Can you tell me about how you feel in a male-dominated program?

How do the instructors react to the females and males in class?

Who has encouraged or discouraged you before?

In your opinion would you wish more females to participate in STEM fields?

If you were given the chance, would you pursue a STEM discipline; why?

Where have you been getting your financial support?

Do you know what the University is doing in support of females in STEM?

What are your views about females' participation in STEM fields?

How has cultural ideas influence females choice of program of study?

Do you believe that males can perform better than females in STEM fields; why?

Administrators

What is the average percentage of your female students in STEM from 2011 to date?

Can you tell me about females' performance as compare to their male counterparts?

Are there any options that the university thinks of to improve females' participation rate in STEM?

Has there been any female dropout in STEM fields?

Do you know any university in Ghana who seeks to support more females in STEM fields?

Have there been any discussion or key actors on the need to support females in STEM field?

Is it important for the university to support more females to participate in STEM fields?

Are there any options that the university thinks of, to improve females' participation in STEM?

Why are there no policies of the universities governing inequalities in STEM participation?

CODING OF THE INTERVIEWEES

RESPONDENTS	CODE	DATE
Four females from College of Engineering.	CoE1, CoE2, CoE3 & CoE4.	2 April; 2014.
Three females from Business Administration.	BA1, BA2 & BA3.	8 April; 2014.
Three Administrators from the institution.	A1, A2 & A3.	15 April; 2014.